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FROM ADDITIONS AND WITHDRAWALS TO ENVIRONMENTAL FLOWS

Reframing Debates in the Environmental Social Sciences

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Sociology is known for its academic debates. These debates are vehicles to accumulate understanding and interpretation of a constantly changing modern order. In the environmental social sciences, one of the axes of debate recently centered between Treadmill of Production ideas and Ecological Modernization perspectives. This article reviews the nature of that debate and aims to move beyond it. In using the sociology of networks and flows, the future research agenda for the environmental social sciences is reframed and reformulated.

Keywords: *environmental sociology; environmental flows; ecological modernization; social theory; environmental governance*

1. CONFLICTING PERSPECTIVES IN THE ENVIRONMENTAL SOCIAL SCIENCES

Ever since the emergence and articulation of an environmental subdiscipline within the social sciences in the 1970s, different schools of thought have entered into more and less forceful contestations on, among others, the "roots of the environmental crisis"; the main social dynamics that have to be held responsible for environmental deterioration and reform; the social actors and institutions involved in environmental conflicts; and the economic, social, and political "effects" that go along with the environmental crisis. Such debates are not surprising because they form key mechanisms for accumulating knowledge, insights, understanding, and theoretical profoundness in the social sciences. Hardly ever are such debates resolved or closed in a "normal science" way: by confronting empirical evidence with distinct interpretation schemes to determine the adequacy and inadequacy of theories. More often, debates are reformulated, conflicting interpretation schemes are integrated into a more encompassing synthesis or differences get outmoded for various reasons without really being solved.

One of the more fundamental and central axes of debates in the environmental social sciences in the 1990s has been between what we might label a neo-Marxist Treadmill of Production (ToP) perspective and an Ecological Modernization (EM) interpretation scheme. Various discussions, in not only the environmental social sciences but also far beyond that, can be understood along this axis, although they are not always labeled in such terminology. This article deals with that controversy, but not so much in terms of being right or wrong. The major argument this article

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makes is that these debates are in need of reformulation, especially against the background of a rapidly changing global world order and the related emergence of new social theories. This article starts with reviewing the current debate up until now and the attempts to deal with these conflicting perspectives. The second part of the article uses insights from the sociology of networks and flows to renew the agenda for fruitful discussions in 21st-century environmental sociology.

2. TREADMILL OF PRODUCTION VERSUS ECOLOGICAL MODERNIZATION: A REVIEW OF THE DEBATE

Building on a longstanding Marxist tradition in sociology, the Treadmill of Production perspective emerged in the early days of the environmental social sciences, from the early 1970s onward. It started to get formulated more coherently in 1980, with the classical study of Allan Schnaiberg, and has since then not been removed from the theoretical agenda of the environmental social sciences. Ecological Modernization ideas, in contrast, have their foundation much later (cf. Spaargaren, 1997). This new perspective was formulated from the mid-1980s onward following the failures of classical state responses to the environmental crisis in the early 1980s (cf. Jänicke, 1990), the crises in the conflict-ridden environmental movement in West-European countries and the growth in environmental concerns in terms of sustainable development. This Ecological Modernization perspective was deliberately formulated in response to—among others—the perceived inadequacy of neo-Marxist interpretation schemes, and it should thus not surprise us to find severe debates between the two (cf. 2.1). But there are also—not very often cited—similarities (cf. 2.2).

2.1 Differences and Controversies

In looking at both positions more systematically, five major points can be raised to clarify the differences between the two schools of thought (see Mol, 2002; Schnaiberg, Weinberg, & Pellow, 2002, for a more extended comparison).

First, Ecological Modernization studies concentrate on "environmental radicalism" rather than on "social radicalism." That is, in their assessments of existing patterns of change-in-the-making, Ecological Modernization perspectives tend to focus on the contributions to *environmental* reform and not primarily on the effects of these changes in terms of various other criteria. Ecological Modernization is thus first and foremost an environmental social theory. Neo-Marxist scholars seem to be primarily interested in changes that involve a transformation of the capitalist or treadmill character of production and consumption. The hypothesized one-to-one relationship between the "relations of production" and environmental disruption causes them to count changes as significant only if they undermine or at least tame the treadmill.

In addition, the two perspectives differ in what we might call the dependent variable they construct: Whereas the one searches for "absolute" sustainability (neo-Marxist), the other focuses on "relative" environmental improvements (Ecological Modernization).

Third, the two perspectives differ in their assessments of the environmental changes that have been set in motion from the late 1980s onward: window-dressing (Treadmill of Production) versus structural changes in institutions and social practices (Ecological Modernization). Neo-Marxist scholars insist (and show) that they

see no real, lasting environmental improvements: nothing new to report. Ecological modernizationists claim (with evidence) that an assessment of environmental transformations in terms of window-dressing seems to bypass the differences that exist between the current period of institutionalization of the environment—regardless of all the shortcomings and limited successes—and that of the 1960s and 1970s.

Fourth, a distinction should be made between the nature of the changes advocated by the two frameworks. As most theories in the environmental social sciences, and quite distinct from postmodernist interpretations, both neo-Marxist and Ecological Modernization perspectives contain analytical as well as normative, and even prescriptive, dimensions. Most neo-Marxist studies display a major gap between the quite advanced and detailed theoretical analyses of the immanently destructive character of the treadmill of (global) capitalist production, on one hand, and the suggestions made for concrete trajectories toward social change, on the other. In contrast, within Ecological Modernization there is a closer link between the analyses of existing changes-in-the-making in main institutions and social practices, and the design of "realist-utopian" (cf. Giddens, 1990) trajectories for environmental reform for the near future.

Fifth and final, a distinction can sometimes be found in the kind of environmental problems that form the object of evaluation or are used to argue for certain positions. We touched on this previously in noticing that the "apocalyptic horizon of environmental reform," arguably more dominantly used in neo-Marxist inspired studies, is often only related to the so-called high-consequence risks of climate change, biodiversity, and the like (Mol & Spaargaren, 1993). At the same time, "conventional" environmental problems such as surface water pollution, solid waste, local and regional air pollution, and noise are—or at least have been until the mid-1990s—the more typical objects Ecological Modernization studies use to enhance their position. Not surprisingly so, since in the latter fields major achievements have been realized since the early 1970s.

2.2 Commonalities and Similarities

Irrespective of these major, fundamental controversies between EM and ToP, it is important to notice at least three commonalties between both frameworks, especially vis-à-vis other more-or-less dominant theories in the environmental social sciences.

Central objects in both the Treadmill of Production and in Ecological Modernization are (a) processes of production and consumption and (b) the environmental disturbances that go along with these basically economic activities. The organization of production and consumption, and the material flows (in terms of "additions and withdrawals") that "mediate" between society and the natural environment following production and consumption, are taken as a kind of definition of the environment.

That means, second, that both perspectives deviate to a major extent from stronger constructivist approaches that define environmental problems only in terms of social constructions and storylines. Neo-Marxist and Ecological Modernization theorists easily converge and agree in their criticism against strong social constructivism, without neglecting the social dimensions involved in defining environmental problems.

More in general, both perspectives can clearly be put into—different branches of—the modernist project, taking firm stances against all kind of postmodern anal-

yses of environmental problems and solutions. In looking for alternative (organizational) structures that better meet the "standards" of sustainability, the focus of both perspectives remains on the core clusters of modernity: science and technology, the industrial organization, the capitalist mode of production, modern systems of values and culture, and the nation-state system.

3. ATTEMPTS AT "CLOSING" THE DEBATE

Several suggestions have been made to interpret and to some extent close the debate between these two sociological perspectives on the environment: empirical research to find out which of the schools is right and wrong (3.1), geographical contextualization (3.2), and looking for theories that help to understand and perhaps even bridge gaps (3.3).

3.1 Empirical Research (and Its Limitations)

According to Fisher and Freudenburg (2001), the way to move the EM-ToP debate forward toward closure or resolution is to be found not so much in further theoretical elaboration but rather via empirical testing. Via empirical research, the relevance of both approaches for understanding, interpreting, and explaining environmental continuity and change could be clarified, and the "working domain" could be identified.

A typical example of such an approach can be found in studies on urban waste recycling in American cities. In applying a Treadmill of Production perspective, Allan Schnaiberg and his colleagues have carried out in-depth research on urban waste recycling schemes in Chicago, focusing on environmental regression and the linked social problems and inequalities promoted by the Chicago Blue Bag and other programs (cf. Pellow, Weinberg, & Schnaiberg, 2000; Weinberg, Pellow, & Schnaiberg, 2000). Their conclusion basically is that Ecological Modernization has little to offer in understanding what is happening in American urban recycling schemes. In contrast, and challenging a Treadmill of Production interpretation, Scheinberg (2003) has looked into the same empirical subject from an Ecological Modernization perspective, concluding that the development of American urban recycling can be interpreted as a typical case of Ecological Modernization, supporting most of its basic tenets.

This, and other empirical research on one subject from different theoretical traditions, illustrates the limitations of empirical studies in closing larger theoretical debates. So where, for instance, York and Rosa (2003) and to some extent also Carolan (2004) try to illustrate the limited value of Ecological Modernization by only using specific empirical evidence and questioning methodologies, it is usually not too difficult to challenge and contradict their conclusions. Empirical validations often simplify the theoretical refinements, contrasting empirical evidence in the same range can often be identified, and methodological arguments within a quantitative style of sociological neo-Malthusianism (York and Rosa) have different meanings when compared to methodologies applied in the context of a qualitative style of historical sociology approach (Mol and Spaargaren). With respect to such more encompassing theories, the relation between theory and empirical evidence cannot be done away with via a naïve positivist "verify or falsify" claim: the black swan is never the falsification. Of course, theoretical claims need to be related to empirical evidence to prevent them from becoming footloose constructions floating around in a theoretical space only. But theoretical frames have their

contributions in understanding and interpreting these "facts and figures" related to the dynamics of environmental deterioration and reform. It is interesting to witness how easy theorists of both traditions agree to be cautious in using empirical evidence only in criticizing their "opponents."

3.2 Contextualization in Practices and Place

A second line in the various attempts of understanding and closing debates between the two schools of thought can be seen in specifying the difference in their objects of reflection, basically along two lines: (a) the social practices under study and (b) geographical specification.

In the first category, Carolan (2004) can be used as an illustration, where he seems to suggest that the difference between Ecological Modernization and the Treadmill of Production partly lies in the neglect of the domain of consumption by the former. The strong focus on only the domain of (industrial) production would partly explain ecological modernizations' optimistic outlook. Others have identified a stronger emphasis on exhaustion of natural resources (withdrawals) by Treadmill of Production scholars, whereas Ecological Modernization studies concentrate on "additions," the emissions, to the environment. Regardless of the fact that these interpretations are heavily contested (cf. Mol & Spaargaren, 2004, on Carolan's consumption claim), they offer us limited explanation on why in the core domains of production the frames continue to differ so strongly.

The most frequently mentioned and arguably the most promising specification of the object of both theories is a geographical one. Several authors have suggested that it is not by accident that the Treadmill of Production perspective has been developed and still has most of its adherents in the United States. Equally, there would be a logical and causal connection between the Ecological Modernization school of thought and the Northwest European region. In both cases, the specific geographical, or rather social and political-economic, constellation has strongly influenced the emergence and maturation of the theories, as well as their strong contestation of competing interpretation schemes. For instance, both Buttel (2000b) and Mol (2001) explore the Eurocentricity of Ecological Modernization, starting from the fact that both the theoretical roots and most of the empirical work is heavily biased to Northwest European countries. But contrasting studies are there, showing the value of Ecological Modernization beyond the European continent (cf. Sonnenfeld, 2000) and Treadmill of Production beyond the United States (see several contributions in Mol & Buttel, 2002).

3.3 Theoretical Integration and Interpretation

Third and final, several authors have used other theoretical constructions to interpret, understand, and close the difference between Ecological Modernization and Treadmill of Production.

In applying a Habermasian framework, Dana Fisher (2002) concludes that the differences between the two schools are to be interpreted in their focus on different types of crises, subsystems, and spheres. According to her, Treadmill of Production scholars have basically an interpretation of the current constellation in terms of liberal capitalism and thus interpret the environmental problems basically in terms of problems in the economic subsystem only: The second contradiction of capital is in the end an economic argument. Ecological modernizationists, in contrast, focus also on other subsystems and spheres, most notably the political and

sociocultural spheres, and thus they interpret environmental crises and reforms in terms of overcoming rationality and legitimation crises.

In reviewing the Ecological Modernization literature, Fred Buttel on various occasions (2000a, 2000b) suggests that a stronger foundation of especially the Ecological Modernization ideas in classical and contemporary sociological theory might clarify further the basic position of the theory and relate it to other perspectives. Evans's (1995) work on embedded autonomy and state-society relations, overall frames of reflexive modernity, and the classical founders of the discipline (Marx, Weber, Durkheim) deserve mentioning in this, according to Buttel. Such a project could clarify and specify the time-boundedness of both theoretical schemes, differentiating between the continuities over long time spans in neo-Marxist interpretations of the ecological crisis ever since capitalism started to take shape, and the shorter time spans and historical specificity on which Ecological Modernization claims to have relevance.

4. MOVING BEYOND THE DEBATE: THE SOCIOLOGY OF ENVIRONMENTAL FLOWS

4.1 The Sociology of Flows and the Environment

Instead of assessing the value and relevance of these interpretations on differences and attempts at "closure" in detail, we aim here to move beyond the debate between the two perspectives. The recent emergence of a sociology of flows enables us to do so. Although this attempt will not solve the academic debate, it might provide the discipline with a new pulse. A new "sociology of flow" perspective (a) brings the two schools closer to each other in terms of common research agendas, (b) opens up new perspectives that might combine strong points in both perspectives, and (c) no longer allows both theories to withdraw in geographical niches or localism, which is essential in a era marked by globalization. A "sociology of flows" contributes to a new—and to some extent joint—agenda for 21st-century environmental social sciences.

The sociology of flows is most strongly identified with the recent work of Manuel Castells and John Urry, whereas a frontrunner group of authors—of which Saskia Sassen is an exemplary member—delivered building stones for constructing this theory. Although the theoretical traditions of Castells and Urry differ, they unite in emphasizing the growing relevance of networks and flows in understanding and interpreting modern society at the recent turn of the millennium. Several conventional categories in 20th-century sociology (nation-states, societies, capital accumulation, actors) are abandoned, reinterpreted, or replaced (by new concepts), fundamentally altering the sociological tradition.

Although in the sociology of flows environmental flows incidentally function as illustrations of global flows (especially climate change, the ozone layer, and the movement of solid waste) and of the difficulties of nation-state-based governance, in general, environmental themes can be said to suffer from marginalization and a lack of profound analyses. In this section, we want to evaluate the potentials of the sociology of flows for the environmental social sciences, or to put it in terms of the debate mentioned above, what has the sociology of flows to offer in studying "additions and withdrawals" in an era marked by globalization, networks, and flows? But this confrontation is also vice versa. We will make use of present-day insights, experiences, themes, and studies from the environmental social sciences

(especially—but not only—ToP and EM) to assess the value of the sociology of flows as we think the tradition of the environmental social sciences in flow analyses has something to offer. While bringing in knowledge and insights about *environmental* flows into the sociology of flows, we evaluate, assess, and reformulate parts of this emerging sociology of flows perspective. We will do so around four major themes: the definition of flows, the relation between the social and the material ("hybrids"), issues of power and inequalities, and (global) governance.

4.2 Definition of Flows: Changing Research Agendas

With Sassen (1994) and Castells (1996, 1997a, 1997b), transactions, flows, and the "space of flows" are very much the privileged domain of global economics and information and communication technologies. It is the new constellation of these latter two that are at the origin of global flows of especially money, information, and related economic services. Not surprisingly, environmental flows, or more in general material flows, are not included in Castells's "flow analysis." The environment or nature comes in only as negative side effects of the "space of flows," which in the end comes down to a reformulation of the conventional point of view of environmental economics (external effects) in combination with the traditional "protest-approach" in environmental sociology (social movements organizing resistance against modernity).

When compared to Castells, John Urry (2000, 2003) provides a much broader interpretation and definition of flows, widening the perspective considerably beyond just economics and information (technology). At the same time, he radicalizes the flow perspective by making flows and fluids the key units of (sociological) analysis and the organizing principles of social systems in the 21st century. Fluids and flows are to be regarded as the "utterly crucial categories of analysis in the globalizing social world that have in part rendered both regions and networks less causally powerful" (Urry, 2003, p. 61). The result of this move is a rather imprecise and arbitrary picture: anything that moves can be interpreted as a flow, from clouds to people, from vibrating atoms to transboundary solid wastes. What the sociology of flows adds to—and how it might change the agenda of—the environmental social sciences becomes clear when one compares the "additions-and-withdrawals" idea with this new sociology of flows.

First, the additions-and-withdrawals perspective is rather region-focused, static, and place-bound in comparison with the sociology of flows. The sociology of flows is especially developed as an answer to the shortcomings of the strong region and society orientation of sociology. The clustering of objects in regions around which (nation-state) boundaries are drawn becomes untenable, especially through globalization. And globalization can also no longer be interpreted as just another region on a higher aggregation level. The sociology of flows puts global fluids, global network dynamics, and the "space of flow" on the research agenda, rather than localities, static practices, and the "space of place." The idea of boundaries and fixed clusters, especially within a nation-state society, is replaced by borderless global fluids. This comes close to some of the environmental analyses of World Systems Theory (cf. Bunker, 1996). But most of the environmental analyses conducted within World Systems Theory situate and discuss environmental flows within the concept of nation-state societies, with additions and withdrawals flowing in between rather fixed networks and scapes, following walled routes. The arguments in favor of global fluids and against local statics should be taken seriously by environmental flow analysts. But this should not result in placeless per-

spectives. Notwithstanding processes of disembedding, deterritorialization, delocalization, and the becoming footloose of global financial and economic flows, Sassen (1994), Hoogvelt (1997), and others illustrated that flows of financial capital and information have to be processed at places (the metropolitan cities), that they originate their profit from places and that they have to "settle down" at places, for example, as (green) investments in skyscrapers and other material objects (Melchert, 2004).

Second, up until now the environmental social sciences rather seldomly investigated or analyzed environmental flows as such. Most studies on additions and withdrawals focus on social practices of production, consumption, mining, agriculture, and the like, resulting in additions and withdrawals and the concomitant ecosystem changes. As the sociology of flows perspective would have it, material substance flows become the genuine unit of analysis in the environmental social sciences, around which actors and social practices—labeled in terms of nodes and moorings, institutional developments and scapes, discourses, and networks—can be identified and analyzed to understand these fluids sui generis and the (policy) issues of management and control they bring along with them. Framed in the Human Exemptionalist Paradigm versus New Ecological Paradigm (HEP-NEP) dichotomy, which was put so forcefully on the agenda by Riley Dunlap and William Catton (Catton & Dunlap, 1978; Dunlap & Catton, 1979) in the 1970s and 1980s, this can even be interpreted as a further radicalization beyond the NEP. An environmental interpretation of the sociology of flows places "material flows proper" at the center of analysis. It is this radicalization of the NEP that results in the end in questions on whether we are to trespass the boundaries of the sociological discipline (see below).

So third, although—in the case of environmental flows—the sociology of flows pushes material flows into the center of analyses, it at the same time makes environmental flows inherently social. An environmental flow is not only or just material substances and technical infrastructures but also the scapes, nodes, networks, and discourses that go along with the flows in question. In this respect, it distinguishes itself from most environmental sciences/studies models and paradigms, such as environmental system analysis, substance flow models, and industrial ecology. In analyzing flows, the sociology of flows concentrates on the social embeddedness while at the very same time emphasizing the material dimension. Such a perspective might be fruitful in bridging the gap between some of the environmental science traditions that put material flows as their core material object, on one hand, and neo-Marxist, World Systems Theory, and other "realist" perspectives as developed in the environmental social sciences, on the other.

Fourth, from a sociology of flows perspective, environmental flows in terms of additions and withdrawals are to be regarded as a rather narrow and static interpretation of environmental flows, because the focus is on only one aspect, for example, the final stage of the flow process (the net additions to the environment or the net withdrawals from the environment). The dynamics of the flows themselves as displayed along the way, their behavior as constantly moving, deterritorialised fluids, is left undertheorised. If we are to take the sociology of flows serious, environmental flows—and our analyses of these flows—do not stop once they have been extracted from the environment or added to the environment. There is no goal or end stage in flows, and this viewpoint has to have consequences for the way we treat our object of analysis. Phosphate cycles and the characteristics of the automobility system on the move would be more archetypal objects of study than

the extraction of ores, or the emissions of heavy metals from plating industries into surface water.

Finally, the sociology of flows would reinterpret some of the environmental social science studies that have never been identified with flows and flow analysis. In the sociology of flows, flows are not necessarily or exclusively material. They also can be for the most part social, or a combination or hybrid: a social-material flow. Those environmental social science traditions focusing on, for instance, social movements and environmental nongovernmental organizations (NGOs); on environmental information, knowledge, and labeling; or on discourses, ideas, norms, and values can be reworked into an environmental sociology of flows. The mobility of environmental ideas, information, and interpretation frameworks flowing between networks and nodes around the globe can—according to the sociology of flows—be interpreted in much the same way as material flows. Rather than place-bound, geographical communities, mobile placeless communities are emerging under conditions of global complexity, each involving a particular intersection of belonging and traveling, for example, groupings or alliances organized around food, gender, environment, spirituality, road protests, culture, and so forth. These communities are within and beyond the nation-state. Regions, boundaries, and places become relative, permeable, and in most cases have limited relevance for understanding mobility within and between these social entities. The mobile flows themselves might not be material in such cases, but the infrastructures, the nodes, and the route used certainly are. Linking environmental issue networks (e.g., around climate change) with particular environmental substance flows would then become a challenging perspective. However, such a widening of the flow concept in the environmental social sciences enhances the need for further systematization, categorization, and definition of environmental flows. The category "additions and withdrawals" should be replaced for new flow categories.

In all, we think reinterpreting and reconsidering environmental flows in ways suggested by the sociology of flows is beneficial for the environmental social sciences because it opens up new kinds of theoretical analyses, it prepares ground for new empirical research, and it helps move beyond the too narrow nation-state perspective dominant in 20th-century environmental social sciences.

4.3 In Between the Social and the Material: Hybrids

Within the environmental social sciences and environmental studies, the relation between the social and the material, between society and nature, has always been tense and subject to controversies and debates. The HEP-NEP debate, the clashing constructivism-realism controversy, and the debates surrounding the Latourian/Callonian actor-network theories (ANTs) all give evidence of this wrestling with the material dimensions of social theories in the context of environmental social change. Within the sociology of flows it is especially John Urry who, building rather strongly on actor-network theories of Latour, Callon, and the reinterpretation of Mol and Law (1994), tries to overcome (or do away with) the dichotomy of the social and the material. In doing so, he goes way beyond the conventional schemes of environmental sociologists, who generally speaking are already satisfied with the recognition of the fact that material conditions do matter for social practices and institutional developments. The sociology of flows does not accept the distinction of the material and the social and argues for a merge of the natural and the social into hybrids, putting "material worlds" or hybrids at the center of analysis (cf. Urry, 2003).

In doing so, the sociology of flows, as developed by John Urry at least, moves away from the "oversocialised" analyses of classical sociology that explain social facts by social facts only. Both Treadmill of Production and Ecological Modernization scholars seem to be sympathetic to Urry in his effort to construct nature and society not independently from the material flows that sustain social life. But this bringing closer together of the social and the material has a number of consequences, which should be given careful attention.

First, the merging of the material and the social dimension of flows brings Urry to question the adequacy of sociology as a discipline and to call for a stronger cross-disciplinary collaboration. In his most recent works, Urry argues in favor of the in-migration of other—also natural science—disciplines into sociology. Understanding the complexity of globalization forces sociologists to look around into other sciences for all the help they can get in interpreting and understanding global mobilities. He also would not hesitate to integrate various disciplines into a new (complexity) science for interpreting and understanding global modernity: "The complexity sciences seem to provide the best means of transcending such outdated divisions, between nature *and* society, between the physical sciences *and* the social sciences" (Urry, 2003, p. 18).

Although in the environmental field the calls for integration and for the abandonment of strict monodisciplinary scientific work are all too frequent and familiar, it is remarkable to find such calls with one of the leading contemporary social theorists. The search for and the practices of multi- or interdisciplinary collaboration have been debated vividly in the environmental (social) sciences and studies already from the 1970s onward. At that time, there was a more or less similar claim that the complexity of environmental problems could not be understood, let alone solved, by natural sciences or social sciences working separately. Several attempts have been made to develop environmental studies into a new, integrated scientific discipline, with its own theories, concepts, and research methodologies. Most of these initiatives emerged from the natural or economic sciences and tried to incorporate other social sciences (e.g., integrated environmental assessment, industrial ecology). In contrast, Urry's attempt for integration originates from the social sciences, where the terms are set for the in-migration of natural sciences. This makes his claim the more interesting for social scientists. However, the experiences with 20 years of developing integrative methodologies and conceptual frameworks in the environmental (social) sciences has not resulted in major advancements in analyzing, interpreting, and solving problems related to additions and withdrawals. Partly, this failure can be explained by a lack of attractive and promising, cross-disciplinary, conceptual work, which manages to attract adventurers from different disciplines. A flow perspective might surpass this drawback. But it is too early to give up the disciplines and the conceptual division between society and nature. In the end, also with Urry's hybrids, flows, scapes, and related formal concepts, the proof of the pudding will be in the eating: the success and attractiveness will be determined by the ability to (better) analyze and understand global fluids.

Second, with considerable attention being paid to the material dimension, the result is a much stronger emphasis on technology and technological developments in sociology and the social sciences compared to, for instance, structuration theory. Both in Castells's Network Society and in Urry's recent work on flows and mobilities, technology is brought to the core of social development and change. Environmental sociologists of different kinds would feel comfortable with such a strong emphasis on technological developments in interpreting, explaining, and criticiz-

ing (late) modernity. Technological infrastructures have always occupied a central place in the environmental social sciences, whether it be in the form of utility infrastructures, production plants, environmental technologies, or consumer products such as cars and computers. Both Ecological Modernization studies and the Treadmill of Production approach do not see technology in itself as a problematic category.

Third, the merging of the social and the material tends to downplay any conventional idea of agency. In line with actor-network theories, it is not only human agents who act in networks, fluids, and scapes. According to the sociology of flows, both human agency and material objects can "act," can make a difference. There is no autonomous realm of human agency, there are no uniquely human societies. Societies are made up of hybrids, and when accepting the notion of hybrids, the language of actants, referring both to humans and objects or technologies, becomes inevitable. With Urry, the merging of the social and the material is inextricably bound up with his "turn to complexity." It is complexity science that brings him to the rather strong emphasis on the impossibility for actants to purposefully steer and control social developments and to create and sustain structures, in sum, to act as knowledgeable and capable agents. Actants are linked up in Urry's theory of complexity with iteration. Courses of action based on local information lead to unpredictable consequences at the global level due to nonlinear processes of iteration. In the end, we are left with inherently unpredictable fluids. Urry comes close to system theory where he develops the (mechanical) notion of "attractors" as the main force causing changes in fluids and their movements through scapes. The question becomes noteworthy, then, how far removed we are with John Urry from the classical—and in social science often disputed—ecosystem perspectives as put forward by, for example, Odum (cf. Odum & Odum, 2000).

4.4 Power, Inequality, and Access

Within the sociology of flows, power and inequality are no longer only related to ownership of capital, as has been the dominant view in neo-Marxist studies, or to the state, as was the mainstream conviction in most other schools of thought. In addition to these "conventional" categories of power and inequality, the sociology of flows defines new inequalities in terms of having relative access to or being decoupled from, flows. Groups, persons, cities, and regions with access to the core flows and located in or close to the central nodes and moorings, are the wealthy and powerful. Following Rifkin (2000), it is access to the information flows via the Internet, to the flows of monetary capital and to the skills of people moving around the world, that distinguishes the better-off peoples, groups, cities, and regions from their marginalized equivalents. This "access to" concerns both direct access as well as the ability to structure the scapes and nodes to partially influence the fluids in terms of speed, direction, intensity, and so forth.

In following this analytical pathway, a sociology of environmental flows would pay attention to the conditions for access to environmental flows and to the scapes that structure the current of strategic environmental fluids and analyze in some detail the consequences for groups, actors, and organizations to whom access is denied or who do not manage to establish links with the relevant networks. This would reorient conventional environmental flow studies as conducted mainly from a natural science perspective (e.g., material flow analysis, industrial ecology, etc.). It also would enrich conventional additions-and-withdrawals studies, as power and

inequality are being linked to flows in a more direct way. Power is thought to reside in the "additions and withdrawals" themselves, not only in the social practices of production and consumption. The environmental justice paradigm and studies can be seen as a category that fits very well into such an environmental flow sociology.

Arguably, environmental sociologists interested in studying questions of inequality and power from a sociology of flows perspective would choose Castells's work as the most promising starting point. Castells is explicit and outspoken in his analysis of inequalities in the network society, especially by his tension between the "space of flow" and the "space of place." Those with access to and in (partial) control of the key economic and information flows can be said to dominate the new informational world order, at the expense of the place-bound local actors outside the core nodes of the global networks. Not unlike many political economists and neo-Marxist environmental sociologists, Castells discusses inequalities in relation to the environment primarily in the context of a rather simple dichotomy: place-bounded environmental movements resist the omnipotent actors of the space of (economic) flows. Within Castells's framework there seems to be little room for including environment and environmental reform within the time-space dynamics of the space of flows itself as, among others, ecological modernization scholars would have it. Although Urry's notion of power is much less articulated (in part due to his notions of iteration, system theory, and self-referentiality), and seems sometimes detached from human beings, he provides more conceptual space for a broader, more encompassing analysis of inequality and environment. By interpreting environment and nature as attached (also) to flows rather than seeing them only as part of the "space of place," and by providing an interesting new conceptual framework for analyzing the scapes, nodes, moorings, and networks determining the dynamics of flows, questions of access to and exclusion from flows make power analyses less predetermined and more open in character. But the advantages of such an "openness" could disappear overnight when the concept of power is being tightly linked to iteration, self-referentiality, and complexity in a way that does not fit easily the social science tradition of dealing with inequality and power in relation to human agency. When compared to his earlier work, John Urry, in his recent work on complexity, seems to move away from power as conflict, transformative capacity, and control to a discussion of power in the context of iteration, chaos theory, complexity, and self-referentiality (Urry, 2003). This is not entirely unproblematic.

4.5 State, Governance, and Regulation

Within the environmental social sciences, the role of the state and issues of governance always had and still have a prominent place for several reasons. First, as a collective good, the environment is seen by many as in need of regulation beyond market dynamics. The state has been for a long time the "natural" institution to regulate consumption of collective goods, even following studies on state failure (cf. Jänicke, 1986, 1990) or neo-Marxist studies on state-capital linkages. This position was only reaffirmed when international and global environmental problems reached the political and research agendas and institutionalists and regime theorists turned their attention massively toward the environment from the early 1990s onward. Second, most studies in the environmental social sciences—including the two schools addressed in this article—have a strong normative undertone: Environmental deterioration is often studied and analyzed with an explicit or implicit

idea of improvement, management, and reform. This always entails a kind of governance, although the notion of governance has been broadened considerably beyond state governance.

But environmental social scientists have never been naïve on the state. Their conventional position on the state and politics is very much in line with 20th-century sociology: Nation-state-based politics have difficulties controlling increasingly internationally organized capitalist markets, networks, and economies. Governance of global economic practices and flows runs counter to the specific relations between states and markets in modern, capitalist societies. In that sense, Treadmill of Production and Ecological Modernization scholars share insights. The sociology of flows partly follows this line, where it emphasizes the changing role of nation-states, state control, and governance, without asserting the end of governance or possibilities of control. In his earlier work on flows and mobility, Urry emphasizes the shift from a gardener state to a gamekeeper state, seeking to identify the new ways in which states try to "regulate" global networks and flows. Castells (1996, 1997a, 1997b) equally downplays the role of the regulating or gardener state but emphasizes new governing agents and arrangements on stage, for example, social movement networks and multinational corporations. This is all not too far beyond the reformulations of the "environmental state" in more recent studies and theories in the environmental social sciences, such as those on mediation, on transparency, on subpolitics, on state-society relations, and on global governance (Mol & Buttel, 2002).

But where the sociology of flows identifies the growing importance of global fluids in the context of complexity theory, ideas of governance start to take a dramatic turn. One should not be too surprised that environmental social scientists feel rather uncomfortable with Urry's emphasis on uncontrollable, unpredictable, nonlinear, and unmanageable fluids that move through space and time via numerous iterations and "interventions" of actants. The changes and even the chaos in these fluids have little to do with human agents actually and deliberately seeking to change the flow in size, moment, direction, or consistency. Individual agencies or states seem no longer to be very relevant categories in structuring and governing flows or in predicting outcomes. States and governmentability do not seem to belong any more to the vocabulary of this complexity science of (environmental) flows.

This all results in abandoning the concept of unintended consequences, a notion that has always been strongly related to ideas of external effects in the environmental sciences. Due to systemic complexity, iteration, the dissolution of agency and governance, and the idea that fluids have no goal or end state, "unintended" consequences are interpreted as systemic features (Urry, 2003, p. 14) rather than unwanted and not foreseen side-effects or failures. As a consequence, the concept seems to loose its critical meaning and normative claim.

5. NEW AGENDAS FOR NEW DEBATES

In engaging with the sociology of flows we want to formulate in this final section the terms for a renewed debate within the environmental social sciences, surpassing the ToP-EM debate. In outlining the terms of this debate, we will focus on reformulating three controversies within the ToP-EM debate: dynamics of capitalism, governance and control, and civil society.

5.1 From Capitalism to Space of Flows

Treadmill-of-Production scholars clashed with Ecological Modernization scholars on the greening of economic—or capitalist—processes of production and consumption. It is especially capitalism and its internal contradictions that took center stage in that debate. Following the sociology of flow, the focus would move away from capitalism, capitalist relations of production, and the contradictions that come along with that. Coming from a Marxist background, Castells emphasizes that although the capitalist character of modernity has not vanished, the central axis—or tension if one wants—in today's modern society should be found in the space of flows versus the space of place. For the environmental social sciences, a new debate then starts to emerge on the representation of nature and environmental interest and qualities in the space of place and the articulation and inclusion of environmental interests and rationalities in the space of flows. To what extent can environmental considerations be represented, articulated, and particularly "regulated" in the space of flow, where money, capital, people, and material substances criss-cross borders in global networks? Or should we only interpret and understand the space of flows as ecologically "insensitive" and even destructive, in need of bottom-up and localized counterveiling powers, as Castells seems to suggest? From an environmental perspective, the dichotomy scheme offered by Castells is not satisfactory since it emphasizes in the space of flows disembedding of nature and the environment over and at the expense of new mechanisms of re-embedding, while at the same time it localizes nature and the environment only in the space of place, neglecting the place-bound communities and identities involved in environmental disruption.

To start the debate, we think the environmental social sciences have a contribution to make in showing how "space of flow-based" regimes, for example for the handling of water, food, people, or energy, can be combined with equally important dynamics of the space of place in aiming for environmental improvements (Spaargaren, Mol, & Buttel, in press).

5.2 "Global" Governance?

The former point closely relates to the debate on environmental governance and the nation-state. No matter how diffuse, how widely spread among a variety of actors, and how far located outside the nation-state institutions, ideas of governance and reform (as well as criticism on governance and failing environmental reform) have always belonged to the very essence of the environmental social sciences (and of ToP and EM). However, following the sociology of flows, the terms of the debate on environmental governance will change:

- from "geographical" governance to governance of "mobilities";
- from questions of state sovereignty to questions of network governance; and
- from state-market relations to flow-place relations.

But the environmental social sciences in general also feed back into and challenge the sociology of flows. Especially where John Urry uses global fluids as the new unit of analysis he makes nation-states into an irrelevant category and flows as no longer subject to any purposeful or directional governance and "control" by knowledgeable and capable agents. This might at first seem to be close to a neo-

Marxist position on global capital, but on second thought, it strongly deviates from it in that multinational corporations (MNCs) and global financial institutions are believed to be as much "out of any control" as states and NGOs.

If accepted, a sociology of flows perspective on (the absence of) governance has far-reaching consequences for a "sociology of environmental flows." In moving beyond any form of governance, regulation, steering, and control, the environmental social sciences would move to a discipline of mere interpretation and understanding. We, as (environmental) social scientists, can then indeed no longer be legislators but only interpreters (cf. Bauman, 1987) of a changing nature and environment. Complexity, system theory, and postmodernity seem to be the ultimate consequence. Arguably, that would be one bridge too far for both ToP and EM perspectives. In the end, both work toward strategies of environmental reform, no matter how realist or utopian these are.

5.3 Beyond Civil Society

Finally, the interpretation of and debate on what has often been labeled civil society will shift. Most of the time, civil society actors have been approached positively by environmental social scientists, interpreting them as counterveiling powers against the logic of capital (Treadmill of Production), advocates of environmental rationalities (Ecological Modernization), or designers of "post-industrial utopias" (cf. Frankel, 1987). In all these interpretations, environmental NGOs—as key environmental representatives of civil society—are placed outside the logic and domain of state and market, as place-bound actors engaged in environmental interest representation and collective identity formation using rationalities that are distinct from political and economic ones. This interpretation seems to be in need for revision, and with that the "assessment" of the role, place, and contribution of NGOs in environmental reform strategies.

In Castells's interpretation scheme, civil society and its environmental representatives have still predominantly been related to the space of place. With globalization, and global flows and networks, we think this interpretation loses much of its adequacy. First, civil society and environmental NGOs are as much part of the global flows and networks as they are related to local places, as others have emphasized (Keck & Sikkink, 1998). Second, their identities, interpretation schemes, action radius, and strategies can no longer be easily grasped under one common denominator, as used to be done for the environmental movement of the 1970s and 1980s. Third, the sharp distinction between civil society NGOs and what used to be labeled economic and political actors becomes increasingly messy. Notions as subpolitics, public-private partnerships, and government organized NGOs (GONGOs) point to that. This all becomes clear when we compare, for instance, the global networks and coalitions WWF, Conservation International, and Greenpeace are engaged in with the arrangements in which local environmental groups in African cities and villages participate. It also becomes evident when one relates environmental interests and considerations with global media, the Internet, and the significant amounts of global capital being spent in nature conservation by environmental NGOs.

It turns out to be increasingly inadequate to analyze (collective) actors in terms of their dominant rationality and their positioning in the (national) political, economic, or civil society domain. Such features less and less determine their course of action and one cannot draw any lasting conclusion from that with respect to their

(potential) contribution to environmental revolution or reform. Increasingly, actors' access to, and ability to co-design, global networks and flows become relevant features. Here, Treadmill-of-Production ideas on inequality, unequal distribution of power, and domination are relevant, but these no longer match in a one-to-one relation with either civil society/NGOs or environmental interests. A whole new set of questions seems to emerge from what Rifkin (2000) colorfully portrayed as the shift from ownership to access.

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