Socio-ecological systems don't exist:

Toward a critique of the ontological foundations of Earth System Science

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Abstract: In contemporary research on global environmental change, a terminology based on systems theory is widespread. One of the main instances where the notion of systems has been advanced is the Earth System Science Partnership and it's theoretical foundation in Earth System Science (ESS). The ESS approach conceives of the Earth as one single systemic object comprised at the most general level of two components: the ecosphere and the anthroposphere. Together, the ecosphere and the anthroposphere, nested as they are, constitute the socio-ecological system of the Earth and the aim of ESS is to study this system, effectively encompassing the total sum of everything existing on our planet, as a whole, as a fully integrated single entity. Underlying this holistic scientific approach is a mode of thought that equates the social with the natural, that sees fundamental similarities rather than differences between the essential characteristics of society and nature. Departing from such an ontology, the ESS community purports to develop integrated ways to act upon the socio-ecological systems of the Earth as a whole in a way that optimizes the whole of humanity's chances of a sustainable way of life. Hence, considering the important role of ESS in the study of contemporary processes of global change and the emerging field of sustainability, the ontology inherent in the approach play an important role in the quest for a sustainable society. However, from a social-theoretical perspective there are profound reasons to question the notion of society and nature as parts of an integrated whole and the undifferentiated ontology inherent in the holistic approach of ESS. This becomes evident when one attempts at providing an elaborate definition of the concept of society, a definition which is missing in the ESS approach. In this paper, I depart from sociological systems theory, especially as it has been developed by Niklas Luhmann, in order to arrive at such a definition of society, and I show that the only essential characteristic of society is meaningful symbolic communication between subjects. Since such communication only can occur between human subjects, there is in extension a fundamental and irreducible difference between society and its environment. Meaningful symbolic communication functions in a way that has no equivalence in nature, and most importantly it has no immediate systemic connection to nature. In other words, society can only communicate about nature, never with nature. Therefore, it is reasonable to treat society and nature, or social systems and ecological systems, as two different ontological kinds with different defining characteristics. This implies that they cannot be acted upon using a unified strategy. In conclusion, this implies that there are reasons to conceive of the ontological foundation of ESS as flawed and in need of reconceptualization.

1 Introduction[1]

Earth System Science (ESS) has become an important theoretical and methodological approach in contemporary research on global environmental change, including the interdisciplinary field of sustainability science. With the launch of a new International Human Dimensions Programme on Global Environmental Change (IHDP) project in 2009, called Earth System Governance (ESG), with the purpose to apply the ESS approach to problems related to global environmental governance, the ESS endeavor is currently making an explicit turn into the realm of social science.

Based primarily on theoretical developments in systems theory and complexity theory, empirical findings in systems ecology, the emergence of new technologies for monitoring the state of the planet Earth, ESS is developing into a "holistic super-discipline"(Lövbrand *et al.* 2009), trying to include everything existing on our planet – including non-material entities such as society – in its theoretical models, and in so doing develop a non-reductionist approach to problems related to contemporary environmental change.

According to ESS, the Earth and everything it contains are components of one single system, conveniently entitled the Earth system. This system, unprecedented in spatiotemporal scale, consists of two main components: the ecosphere, which in turn is subdivided into other natural systems such as the atmosphere and the biosphere, and the anthroposphere encompassing all human activities (Schellnhuber 1999). Although all of these components are probably to be conceived of as objects in their own right, due to their systemic interrelatedness they are in the end part of the same object, according to the proponents of ESS. According to such logic, the total sum of everything on our planet – things, processes and immaterial objects alike – amount to a single integrated whole, one "single, self-regulating system comprised of physical, chemical, biological and human components" (Moore III *et al.* 2001). Hence, according to ESS, the Earth amounts to a socio-ecological system in the singular.

The task of ESS is to approach this complex entity as an object of scientific research. Even though ESS make use of cutting edge complexity science concepts such as non-linearity,

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[1] This is a tentative draft of a planned future paper, not a finished product.

multiple stable states, multi-scale feedbacks and critical thresholds, and thus seemingly disaggregates its research object, it still does not shy away from the fundamental notion of the Earth as being *one*.

In this paper, I turn to the theoretical foundations of ESS and develop a critique of these foundations, and argue that they are fundamentally flawed and in need of correction. I will argue that the ontology inherent in the ESS approach is overly simplistic and theoretically naïve, and that this shortcoming is a result of its inadequate conceptualization of society. By utilizing the same systems theoretical schema for the definition of society and ecological systems alike, ESS manages to equate these entities with each other and basically sees them as identical. Hence, in the name of methodological holism, ESS becomes responsible for performing major reductionist conceptualizations, not very different from the reductionist conceptualizations performed by the theoretical traditions ESS criticize for not being able to grasp contemporary environmental problems in their entirety.

The conception of society and ecological systems as identical obviously also makes it possible for ESS to conflate these two entities into a coherent whole. In turn, this allegedly holistic view enables ESS to approach society and ecological systems with a (hypothetical) common set of unified strategies and practices. This strategic holism has far-reaching consequences, both in terms of scientific development and the future development of environmental politics. In this paper, I will outline the premises of a critique of these developments, with primary emphasis on how the reductionist ontology inherent in ESS paves the way for such developments.

By taking the concept of society seriously and actually trying to identify the fundamental characteristics of society, that is, by developing a coherent and refined definition of society and an accompanying theory of society, it becomes obvious that the crude definition of society as merely systems of human activity ontologically and systemically related to nature quickly turns problematic and insufficient. In this paper, as an example of how such a definition and theory can be developed, I turn to the sociological systems theory of Niklas Luhmann. The usage of Luhmann's theoretical approach in this paper is not arbitrary. Except for the obvious reason that it takes the concept of society seriously and approaches it with impressive analytical rigor, there are primarily two main reasons why Luhmann's work is of

interest for contemporary science concerning global environmental change. First of all, his theoretical approach is one of very few examples that aim to conceptualizing society ontologically without isolating it from its surroundings. Although it is always society and the different parts of society that are of primary interest for the Luhmannian perspective, the extrasocial environment of society (i.e. natural systems) are never fully bracketed out of the analysis; society is provided with a substantial definition in relation to nature.[2] Second, Luhmann's theory is yet again an example of very few general social theories that has been utilized by their founder, in this case Niklas Luhmann himself, in order to explain why modern society seems to create unsustainable environmental change and why modern society displays such inability to deal with environmental issues. All in all, this makes Luhmann's theory appropriate for the study of the relation between society and nature and certainly interesting for contemporary research on global environmental change.

In this paper, in line with the Luhmannian approach, I define society ontologically as a system of meaningful communication, differentiated into specific subsystems. Since such communication only can occur between human subjects, social systems are always operationally closed and never systemically connected to natural systems. Therefore, society and ecological systems can never converge into a coherent whole at the ontological level. From this follows that society and ecological systems cannot be approached by the same set of unified strategies and practices, since they are two distinct ontological kinds. If this line of arguments has bearing, it can be argued that not only are the ontological prerequisites of ESS incorrect, but most importantly the policy implications and decision support it puts forward might also be ineffective and questioned.

2 The object of critique: ESS and the identity of society and nature

ESS is rather hard to pinpoint as a scientific field, perhaps mostly because of its status as a burgeoning scientific discipline in the making and the accompanying theoretical vagueness that comes with such a status, despite the fact that it was originally established as early as during the 1980s, then as an umbrella term for NASA's research activities. Conceptual vagueness is most certainly noticeable in the ESS approach's attempts to develop into a scientific discipline that has something to say about social matters as well, in addition to its

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[2] Although slightly anachronistic in contemporary scientific discourse on environmental problems, I make use of the concept of nature and at the moment simply use it synonymously to natural systems.

traditional focus on natural phenomena. But despite the theoretical vagueness and ill-defined scientific boundaries of ESS (Clifford and Richards 2005) and the often sweeping and generalizing style of the arguments its proponents put forth, it is possible to identify one common feature all attempts at outlining its characteristics seem to share, and that is the notion of the Earth as *one*.

The different accounts of ESS and the depiction of this holism vary in terms of sophistication and scientific rigor. At one of the extreme ends – clearly the one where we can locate the somewhat euphoric attitudes toward ESS – we find formulations such as Pitman's (2005: 138-139), who states that "Earth System Science is the study of the Earth as a single, integrated physical and social system" and, with obvious excitement, boldly claims that the "expectation is that Earth System Science will provide solutions to major world problems because it moves away from reductionist approaches and does not recognize discipline boundaries" (Ibid: 140). At the other end, we find the stoicist formulations of Schellnhuber (1999: C20) who simply defines the Earth system as:

$$E = (N,H)$$

where $N = (a,b,c,\dots)$ and $H = (A,S)$. According to Schellnhuber, this formula expresses "the elementary insight that the overall system contains two main components, namely the ecosphere *N* and the human factor *H*" (Ibid). At a lower level of abstraction, N would consist of a number of planetary sub-spheres (atmosphere, biosphere, cryosphere, etc.) and H would consist of "'the physical sub-component *A* ('anthroposphere' as the aggregate of all human lives, actions and products) and the 'metaphysical' sub-component *S* reflecting the emergence of a 'global subject'" (Ibid).[3]

Schellnhuber's definition, albeit questionable and strange looking from a social-theoretical perspective, is typical for the ontology inherent in ESS, and very expressive since it in a very clear-cut manner identifies everything existing on planet Earth as converging into a whole, at least on the highest level of abstraction the ESS practitioners with their empiricist approach to being seem to be able to imagine.

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[3] One should note that Schellnhuber usually refers to his own project as Earth system analysis, not Earth system science. However, I have not found any substantial differences between this approach and others explicitly ascribing to the Earth system science approach, especially not concerning their ontological postulates.

A prerequisite for such conflation is a notion that the different parts constituting the whole are characterized by a fundamental sameness. By defining such diverse entities and processes as the cryosphere, cloud formation, the nation-state and social movements (the last one probably being Schellnhuber's global subject) as functionally equivalent, ESS manages to conceive of all entities, physical as well as immaterial and abstract, as characterized by sameness rather than fundamental difference. This feat is accomplished by conceiving of all entities as systems. According to the systems theoretical schema, all entities are constituted by interacting parts forming an integrated whole. By generalizing this schema, all entities defined as integrated wholes at one level of abstraction can be conceived of as parts in an integrated whole at a higher level of abstraction. This abstraction is theoretically infinite, but in general the proponents of ESS seem to stop at the planetary level as the highest level of abstraction.[4]

Systems theoretical approaches do not *per se* allow everything to be defined as an ultimate totality, since it is possible to think of different systems where the components integrate in qualitatively different ways. This is also one of the main arguments I will put forth in this paper. However, ESS does not seem to make such a substantive differentiation between different systems. Instead, it defines the relation between different entities as a relation of sameness by way of postulating their operational identity.[5] And in an almost unreflective manner its proponents bluntly postulate – almost even assume – that everything at some point of abstraction converges into one single thing. This theoretical maneuver is of great interest from a social-theoretical point of view: If we make the realist assumption that society exist and that it exists on planet Earth – an assumption that is hopefully fairly uncontroversial – then, according to ESS and its inherent systems theoretical approach, society would be functionally identical to the different natural systems also occupying our planet, since all of them converge at the planetary level into a coherent whole.

However, approaching society and nature as identical does not necessarily mean that society is neglected by elevating the essence of nature as determinant for social phenomena as well, i.e. there is nothing in this argument *per se* that says that ESS defines the ways of nature as

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[4] However, every now and then, they also include a so-called exo-factor consisting of components from space.

[5] It is important to note that ESS most often does not discuss these matters and hardly ever discuss ontological issues. Hence, the postulate of social and natural identity is often implicit rather than explicit in the writings of ESS proponents.

being the ways of society as well. One could imagine, at least hypothetically that the proponents of the ESS approach could argue that it is the essence of society that migrates into nature, or that something else defines them both. But considering the origin of ESS (predominantly the broad international natural science community concerned with research on environmental change) it is rather safe to say that it is the model of nature that is used to study both nature and society in ESS. Therefore, the approach of ESS can be conceived of as an attempt at naturalizing society. This naturalization of society harbors the reason why Earth system science can apply measures, methodologies and arguments initially developed to make nature knowledgeable to say something about society as well.

To summarize, ESS is an attempt to establish a holistic super discipline that by utilizing generalized systems theoretical schema that does not differentiate between substantially different systems manages to conceive of everything at our planet as converging into a coherent whole. Further, this means that society in some respect is identical to nature, according to ESS. Put slightly differently, ESS rests upon an undifferentiated ontology that cannot distinguish between society and nature.[6] Lastly, since ESS arguably belongs to the natural-scientific tradition, in terms of the way it conceptualizes its own research objects and in terms of methodology, its proponents approach the earth system predominantly with natural-scientific techniques and therefore become responsible for a naturalization of society as they are unable to ascribe it with a unique ontological status.

3 ESS, objects of knowledge, and political practice

As noted above, ESS was launched in the 1980s as an umbrella term for NASA research. However, the ambitions surrounding the Earth system science concept was greatly expanded in 2001, when it became the overarching theme of four global change research programmes

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[6] It might also be worth mentioning very briefly that ESS is not the only approach in contemporary environmental research guilty of this kind of reductionist conceptualizations of society and the relation between society and nature. In addition to ESS, the most well-known and important example of it can be found in resilience theory. Resilience theory is in its theoretical foundations quite similar to ESS. It utilizes the same systems theoretical schema that stipulates a functional and operational equivalence between social and natural systems and therefore also approaches society and nature as ontologically identical. However, it has a more elaborate and fine-tuned conception of how complex adaptive systems function and develop (this conception is captured by the notions of adaptive cycles and panarchy, see Gunderson and Holling 2002). The main difference between resilience theory and ESS is their analytical focus. Although not necessitated by its theoretical foundation (see e.g. Holling 2004), resilience theory puts primary emphasis on local or regional social-ecological systems, while ESS obviously focuses on systems of global scale. Such differences aside, resilience theory and ESS are quite similar in terms of fundamental ontological assumptions.

(IGBP, IHDP, WCRP and DIVERSITAS)[7] who in a joint effort decided to coordinate their research agendas under the Earth System Science Partnership. As already noted ESS originates from natural-scientific disciplines but is currently taking an interest in social-scientific issues and problems, primarily related to management and government. Many of its proponents adhere to the idea of the Anthroposcene – the idea that mankind and social practice has become a major driving force in the climatic and geophysical state of the Earth, and that the current geological era is dominated by humans.[8] With such a point of departure, explicitly implying that the causes of global environmental change are social, it is no surprise that the proponents of ESS are turning to issues such as government, public policy and social conflicts in their scientific work.

Perhaps the most ambitious effort in this direction is the newly created research program on Earth System Governance. ESG is organized as a core project under IHDP, and its overarching goal is to carry out research on Earth system governance, a term defined by the project as "the interrelated and increasingly integrated system of formal and informal rules, rule-making systems, and actor-networks at all levels of human society (from local to global) that are set up to steer societies towards preventing, mitigating, and adapting to global and local environmental change and, in particular, earth system transformation, within the normative context of sustainable development" (Biermann *et al.* 2009: 3). For the sake of the argument I am developing here, the interesting part of this definition is where it says that these governance structures are set up to transform the Earth system. Echoing the logic of the Anthroposcene, ESG seems to conceive of political practice as harboring the potential to change the Earth as a whole. Although being first and foremost a scientific project, ESG also aims at laying the scientific groundwork for Earth system management, and "is also designed to assist policy responses to the pressing problems of earth system transformation" (Ibid: 5). Obviously then, the proponents of ESG want the project to keep a close relationship with the different instances of governance it sets out to study, and establish a close connection between

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[7] The International Geosphere-Biosphere Programme (IGBP) mainly focus on the natural aspects of global change, while IHDP, as previously mentioned, purports to study the social aspects. The World Climate Research Programme (WCRP) has a more narrow focus on climate change, climate predictions and human influence on the global climate system. Lastly, DIVERSITAS advances biodiversity science.

[8] When engaging with such arguments, ESS starts to show a certain proximity to the so-called Gaia hypothesis, a metaphysical and esoteric idea, initially developed by James Lovelock (2000), stating that all living beings on Earth are dependent on each other and the physical environment in a tightly integrated system. Often, the adherents of the Gaia hypothesis seem to view the earth as one single living organism. However, the hypothesis lacks the scientific rigor that some parts of the ESS framework showcases.

science and politics in which the former would provide the latter with sound advice. Hence, ESG establishes itself partly as a prince advisor – an advisor of a potentially omnipotent prince, a prince who has at least the latent possibility to shape is own and all of mankind's, and even the planet's, destiny. Although ESS, in accordance with similar contemporary approaches in environmental research, emphasizes the natural limits of social practice and argues that society at the end of the day is necessarily dependent on support delivered by ecosystems, it has clearly not entirely abandoned the modern idea of social mastery over nature.

When focusing on ESG's commitment to earth system transformation, it becomes a rather striking example of what the undifferentiated ontology of ESS can give rise to, namely efforts to developed unified political strategies and practices for the management of the Earth as a whole. In order to show how phenomena such as this can arise, a brief excursion to a Foucauldian philosophy of science and the concept of governmentality might be appropriate. Governmentality was originally introduced in the 1970s by Michel Foucault to denote a specific set of rationalities of forms of rule tied to the modern nation-state (Foucault *et al.* 2007; Foucault 2008). However, today the concept has developed into a general mode of analysis in social science. According to Lövbrand *et al.* (2009: 8) the analytical concept of governmentality has two components corresponding to two aspects of governing: *i)* the representation and knowing of a phenomenon, *ii)* the acting upon the same phenomenon so as to transform it. The first aspect, what Miller and Rose have called "rationalities of government" (2008: 15), specifies the principles of government and identifies the nature of the object to be governed. The second aspect, defined by Miller and Rose as "technologies of government" (Ibid), denotes the specific strategies and practices rendered possible by specific rationalities of government.

This conceptualization of governmentality clearly resonates with the well known Foucauldian fusion of power and knowledge: the one who has legitimate claims to truth can also exercise power in situations where such truth claims are relevant. Hence, social practice and political intervention is reliant upon specific systems of though in order to be carried out and even

made thinkable. Specific objects of knowledge – the entities perceived as real by a specific system of thought – are reliant upon specific techniques of government, and vice versa.[9]

From this perspective, the systems of thought that produce certain objects of knowledge and define them as real become interesting, even central, to the study of politics. As already shown by Lövbrand *et al*, the implications for the social-theoretical study of ESS derived from this perspective are obvious:

> By advancing the 'coupled human and ecological system' as a new analytical category, Earth System Science is not only offering a novel way of seeing and conceptualizing the interplay between nature and society. A new political space for government intervention is also in the making. In governmentality studies the representation of and acting upon a phenomenon constitutes two sides of the same coin. Objects can only be governed when they are represented and conceptualized in a way that can enter the sphere of conscious political calculation (Ibid: 11).

Hence, ESS not only produces new scientific knowledge, it also has the potential to serve as the cognitive basis for new political strategies and governmental techniques. At the heart of this nexus of scientific knowledge production and politics lies the ontological assumption of the Earth as being one. By reducing society to a functional and operational equivalent to nature, ESS manages to fit both nature and society into one coherent object of knowledge and thereby making them approachable using one single set of political strategies. This is true both in terms of its scientific exercises and the political agendas it might pave the way for. Considering its own scientific activities, the reduction means that ESS becomes something in the line of a contemporary revival of the positivist efforts to establish an all-embracing scientific methodology. Although, it might seemingly be in favor of methodological pluralism and a flagship activity for interdisciplinary research, one could argue that ESS implies methodological monism founded upon the principles of natural science. When society is bracketed out of the analysis, there is obviously no need for the methods of social science that has been developed to account for society's unique ontological status.

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[9] By making use of the concept of object of knowledge, I somewhat distance myself from the general Foucauldian discourse on governmentality, and move in a direction toward a tradition in French philosophy and epistemology associated primarily with Louis Althusser and to some extent British philosopher Roy Bhaskar. In general, in this tradition the concept of object of knowledge denotes an idea that reality is mediated in some way before entering the realm of thought and knowledge. Foucault might be considered at least closely related to this tradition, especially when emphasizing his ideas about the concepts of *episteme* and *archeology* (Brante 2007). In my line of argument, such objects of knowledge would consist of the cognitive basis for political practice.

Although, the arguments about methodological reductionism are quite interesting, I would like to emphasize the potential effects the ontological reductionism of ESS has on environmental policy and political practice. As noted by Lövbrand *et al*, ESS is in the process of creating a new space for political intervention with political ideals and strategies originally derived from its ontological framework. This means that, if the proponents of ESS become successful in translating their ideas about the Earth as one, the future environmental politics might be infused by a way of thinking that cannot conceive of society as unique compared to nature, that cannot differentiate between say a cultural community and the carbon cycle or a social movement and a flock of sheep. In the remainder of this paper, I will outline the premises for a critique of the phenomenon making such political practice a real possibility, namely the ontological reductionism of ESS.

Given the central role of the undifferentiated ontology inherent in ESS, it is appropriate to critically analyze it. I have already argued that the ESS ontology lacks a distinction between social and ecological systems and therefore might be problematic, most importantly since it seems to be able to pave the way for questionable policy paradigms. In the next section, by turning to the social theory of Niklas Luhmann in order to provide a definition of society I show that there are obvious shortcomings associated with the ESS ontology.

4 Society as a system of meaningful symbolic communication

If it is possible to outline a competing theory about society and its relation to nature, a theory that is theoretically more nuanced than the theoretical foundations of ESS, it will also be possible to show the shortcomings of ESS. Further, if it is possible to articulate arguments implying that there are considerable reasons to question the validity of ESS' reductionist view about the Earth as one, and therefore question the ontological foundations of ESS, it will also be possible to put question marks around the political strategies it gives rise to and support.

In order to show the shortcomings of the undifferentiated ontology of ESS, I utilize the critical strategy of outside intervention. By turning to a theory that explicitly deals with the distinction between society and nature and takes the definition of society seriously, I will show that the theoretical foundations of ESS is most likely fundamentally flawed due to their overly simplistic take on the ontological sameness of society and nature. My general

argument is that when defining the concept of society in any way with considerable depths, it becomes obvious that society is substantively different from nature and can never be a component of a larger whole where nature also is a component. As an example if this way of reasoning I have chosen to outline the sociological systems theory of Niklas Luhmann.[10] Luhmann's theory is not the only theory that can be utilized in this way; it is merely one good example of how such theoretical differentiation can be achieved. But, as previously mentioned, Luhmann's theory is most certainly of interest for contemporary research on environmental issues, primarily since it provides society with a substantial definition of nature in relation to its natural environment and provides a theoretical explanation as to why modern society seems to be unable to deal with unsustainable environmental change.

With elaborate connections to a general theory of complex, self-referential and autopoietic systems – a part of Luhmann's work I will not be able to outline here – Luhmann defines society as a system of communication. More precisely, society is a system of pure meaningful communication, differentiated into a set of functionally autonomous subsystems defined by specific forms of binary codified communication.[11] According to Luhmann, communication consists of three components: message, information, and understanding. In short, information denotes the substantive content of communication, while message denotes the actual event of communication and the elements associated with a particular instance of communication. Both messages and information can exist in other realms of being than the social (e.g. biotic and mechanical). Take for instance, the process of reproduction for a species of birds and its constitutive communicative elements: During mating, female and male birds make calls to each other with the obvious reason for getting together and mate. The actions of the birds, most importantly their calls, would constitute the message in this situation, and reproduction would be the information.

However, understanding – the fact that communication always takes place in a context of meaning – is confined to humans engaging with each other in a society. Meaning is a constitutive characteristic of social systems, and only of social systems, not because of

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[10] My depiction of Luhmann's theory will be very short and only focus on the parts of the theory that are important for my argument. For a lengthy introduction to Luhmann see Jönhill (1997)

[11] Society's differentiation into subsystems is an important aspect of Luhmann's theory of the history of modernity, as well as his arguments about why society seems unable to handle environmental problems (see Luhmann 1989). However, I will just briefly mention these parts of the theory here.

humans' essence as a species, but because of the specific level of complexity inherent in social relations. In short, meaning presupposes processes of consciousness, the ability of the subject to transcend the immediate experience of the self and of others in a process of distinguishing between meaning and information while still relating them to each other.[12] [13] Therefore, no communication exists outside of social systems.[14] Neither the human body as such, nor the external systems of surrounding physical reality harbor communication.

Two further clarifications of Luhmann's concept of communication might be necessary: First of all, language is a medium of communication and does not exhaust the potential forms a message can take in processes of communication. Language is only one contingent medium for transferring a message of information and understanding between the actors engaged in communication. Second, Luhmann does not exclude actions from the social system, but defines them as specific forms of communication related to specific actors. When a person is communicating, i.e. when he or she is carrying out a message in order to transmit communication in a context of meaning, that person is, according to the Luhmannian approach, performing what Habermas calls communicative action (see Habermas 1984).

Of course, there are other significant differences between society and nature in addition to communicative capacity. Most importantly, I would say, human beings engaging with each other in society have the ability to construct moral frameworks for determining the right way of acting and determining which social orders are desirable. Such moral constructs establish the normative principles underlying social life, such as democracy, equality, justice and

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[12] Put in this way, it becomes fairly obvious that Luhmann is quite indebted to the phenomenological tradition in philosophy for the development of his concept of meaning. Specifically, Luhmann engages with Edmund Husserl when laying out the foundations of this concept of meaning.

[13] This is a very brief depiction of Luhmann's conception of meaning, and perhaps it presupposes previous knowledge of the issue since is basically just states the arguments without showing the theoretical logic underlying them. However, for now I must confine myself to this distilled format.

[14] I am very well aware of the fact that the statement that no communication exists outside of social systems might seem controversial. Can we really exclude the possibility that other species communicate with each other in a meaningful way? Obviously, these are not questions suitable for social science to answer, and my statement that no communication exists in natural systems is perhaps somewhat speculative. However, and this is of great importance, if it turns out that meaningful communication occur between non-human species, this would not do falsify my argument. In fact, it would only demand it to be slightly corrected. If it can be showed that meaningful communication exist between non-human species, I would argue that such species no longer can be thought of as belonging to nature. Instead, they would have to be considered as either a part of society (if they can communicate in a meaningful way with humans in society) or as constituting a unique ontological form of being (if they can only communicate meaningfully with members of their own species). Instead of falsifying the theory of an ontological distinction between society and nature, such findings would only demand the extension of society to other species. The fundamental difference between systems of communication and other systems would still apply, but the dividing line between the two would have to be redrawn.

private property rights, just to mention a few.[15] However, I would like to go out on a limb and argue that, in some respect, these are all derivatives of meaningful communication. Unless we would resort to religious beliefs about an eternal divine law, we cannot imagine how such moral constructs and normative principles would come about, get reproduced and changed without the ability to communicate in a meaningful way.[16]

One important intermediate conclusion can be drawn from the theoretical argument that society is ontologically a system of communication, namely that society is distinct from both the human organism and its external extrasocial environment.[17] Since no communication exist in nature, and in fact cannot exist in nature, and since society is a pure system of communication we end up with a very important insight: No communication between society and nature can exist. Put differently, society and nature are not systemically interconnected. Because of the operative closure of society as a social system of communication, society can never be functionally integrated with nature. Instead, and because of the nature of society as a system of communication, society can only relate to nature via internal communication. Put in somewhat theatrical terms, this means that we – we as in vessels of social communication, meaningfully communicatively constituted as individuals – can only talk about nature, never with nature.

This clear-cut distinction between society and nature does not question or deny the overwhelming evidence of contemporary environmental problems and changes in local and global ecosystems.[18] Nor does it imply that society is independent of its material environment.[19] Actually, it does not even change the focus of the analysis. It is still the nexus of society and nature that is of interest here, and it is still their relationship that is seen as a crucial aspect of ecological change and environmental problems. But instead of trying to

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[15] This might seem like an oversimplified conceptualization of the relation between moral constructs, normative ideals and social practice and order, mostly because it seemingly deduces the latter from the former. However, the model does not stipulate *how* these different entities are related, only *that* they are related.

[16] Another important difference, often analyzed by analytical philosophy (see e.g. Searle 1983), is that human experience is characterized by intentionality, which is not a characteristic we find in any natural entities. However, I will not delve into this issue here.

[17] A conclusion that actually means that human beings are not part of society

[18] In fact, social theory has no tools for even engaging in discussions about ecological issues.

[19] Quite the contrary actually, since the Luhmannian approach to systems theory defines systems as dependent of their environment. A system can establish itself only via a differentiation between itself and an extrasystemic environment. Hence, society is existentially (but not functionally) dependent on other systems such as the psychic system and natural systems (see Luhmann 1995)

approach such problems of ecological change by conflating society and nature into a whole, it emphasizes their difference.

5 Nature resonating in society

Although society and nature are ontologically distinct according to Luhmannian systems theory, they are still factually related. But this relation is not one of components of a system. Instead, Luhmann introduces the concept of resonance (Luhmann 1989) in order to capture nature's effects on society. As in physics and music, resonance in this respect refers to oscillations. Resonance only occurs when an external force is in harmony with the fundamental natural frequency of the system being perturbed. This means that it is the intersystemic conditions of the system that determine whether or not events in the system's environment will have any impacts on the system. Resonance is always limited by structural characteristics. This means that it is the structural characteristics of society as a social system that determine if changes in the natural environment will have any effects on society, as meaningfully perceived environmental problems.

It is also herein that we find Luhmann's own explanation as to why modern society seems to lack the ability to handle ecological change and manage environmental problems in a satisfactory (i.e. sustainable) way. According to Luhmann, modern society is differentiated into a set of subsystems that follow their own logic of communication (the binary codes of communication are unique to each subsystem) and therefore cannot communicate with each other. E.g. the scientific subsystem handles environmental problems as environmental research; the economic subsystem handles them as environmentally adapted production, "green markets", etc; the legal subsystem handles them as environmental law; the political subsystem handles them as environmental policy; the educational subsystem handles them as a practical understanding of environmental issues, etc (Jönhill 1997: 390). Since there is no form of communication that can coordinate these subsystems – i.e. there is no intersystemic communication, or a form of communication situated above individual subsystems tying them together – they cannot coordinate their different strategies for handling environmental problems.[20] And since most contemporary environmental problems are not confined to separate subsystems (e.g. climate change will have an impact on many social subsystems)

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[20] For a critique of the argument that there is no, and can be no, intersystemic communication embracing all social subsystems, see (Miller 1994).

society finds itself in a situation where it is unable to react sufficiently to ecological change. Returning to the concept of resonance, this situation can be conceptualized as a situation of lack of resonance – global ecological change with potentially undesirable future effects on society, cannot create enough resonance in society as a whole and therefore society will not reorganize accordingly. Hence, according to Luhmann contemporary environmental problems are primarily problems of coordination (Luhmann 1989).

The theoretical maneuver of introducing the concept of resonance, consistent with the theory of social systems in general, makes it possible to retain the notion of society as clearly distinct from nature, yet still related to it. Hence, I would say that Luhmannian systems theory falls somewhere between the ontological stance of ESS that ultimately conflates society and nature through a process of naturalizing society, and a general vulgarized modernist standpoint that declares social independence from nature.

6 ESS and the identity of society and nature revisited

The purpose of outlining Luhmann's sociological systems theory and its associated definition of society as a system of communication clearly distinct from nature was to shed new light on the ontological foundations of ESS. By engaging with arguments from this strand of social theory it becomes clear that the undifferentiated ontology inherent in ESS and the notion of the earth as being one is highly problematic. In fact, it could even be argued that such ontology lacks any substantial supportive arguments – it just seems to be wrong.

As concluding remarks in this paper, I would like to make explicit three points implicated by my argument.

First of all, as long as it keeps adhering to an undifferentiated ontology that defines the Earth as one and views society and nature a functionally and ontologically identical, ESS cannot live up to its own claims of being a non-reductionist scientific discipline. A scientific discipline that reduces society to a functional equivalent to nature excludes such approaches that views society as ontologically unique, as a *sui generis* that deserves and even demands its own theories. And as I have shown, such theories often make a very strong case. Such a discipline can only call itself holistic only insofar as its proponents are not aware of its

exclusionary character, or if they are not aware of the existence of competing theories with substantial arguments about the ontological uniqueness of society.

Second, and this argument is primarily methodological and perhaps confined to an internal discussion to science and the philosophy of science, one might question the possibility to construct even the simplest distinction when adhering to the framework of ESS. If *all* things and phenomena existing on our planet ultimately are components of the same planetary system and in extension also are functionally equivalent, everything becomes the same at the systemic level of abstraction. As has been shown by several different strands in epistemology and social theory, the ability to make distinctions is fundamental to the very possibility of knowledge. If we cannot clearly define something, categorize it and differentiate it from other things, we cannot gain any knowledge of it. In order to cognitively navigate in its existence and in its interaction with the external world, the subject is dependent on the ability to distinguish phenomena as they are presented to it. If one pursuit the logical consequences of the ontological framework advocated by ESS, this becomes impossible since everything (at least on our own planet) is identical to everything else according to this framework. The world as it is presented by ESS is a world of complete identity with no possibility for anyone to make any distinctions between anything, a positively charged void filled with things that are the same. If the logic behind the ESS ontology is followed to its very end, one could argue that ESS cannot in fact produce any knowledge at all.

However, logical inconsistencies and the theoretical impossibility of knowledge seldom prevent further development of a scientific discipline, since such shortcomings are easily disregarded when keeping a pragmatic primary focus on empirical analysis and ignoring the theoretical underpinnings of such analyses. Nor do these inconsistencies necessarily have any major impacts in society *writ large*, outside the walls of academia. Therefore, I would like to put primary emphasis on my third and final point, namely that ESS might potentially pave the way for sets of very strange political strategies.

If my arguments about the importance of objects of knowledge for political strategies are correct, this means that the efforts of ESS might be fundamentally misguided. Given that political practice, policy principles and government intervention in some respect are all tied to specific objects of knowledge, and that ESS rests upon an ontology that conflates society and

nature into one single object of knowledge, the political strategies which can be derived from ESS might be highly questionable since such strategies would not in any essential way discriminate between humans and natural objects. To highlight my point here, I would like to return to my previous mentioning of what future environmental politics might look like if the proponents of ESS are successful in translating the implications of their scientific approach to political practice. As an example, I mentioned earlier that future environmental politics might not be able to differentiate between a social movement and a flock of sheep, since ESS cannot differentiate between such different entities on an ontological level. In fact, an ESS infused environmental politics would not even differentiate between inanimate objects such as carbon sinks and social entities such as social movements. Instead, such an environmental politics might actually approach a social movement and a carbon sink with the same strategy. What this strategy might look like is something we can only speculate about, but intuitively and theoretically something seems fundamentally wrong with such a picture.

I would like to end this paper with a humble yet important suggestion. In order to correct the theoretical weaknesses of ESS and avoid both theoretical inconsistencies and logical contradictions, as well as the more important question of highly questionable politics, I would argue that ESS ought to change direction and instead of delving deeper into the ontology of identity, try to develop better definitions or their core concepts, including the concept of society. Even though the notion of the Earth as One takes a central place in ESS, I do believe there are potential for change. If there would be a theoretical reconceptualization in which the notion of ontological identity between society and nature would be transformed into a notion of ontological difference between society and nature without letting go of the idea that environmental problems cannot be conceptualized without both of these entities being part of the theoretical framework, ESS would be developing in a different direction better equipped with dealing with issues traditionally belonging to the social sciences. One way of achieving such a reconceptualization would be to put greater efforts on trying to introduce social theory to the ESS framework and approaching society with the humility and theoretical sensitivity it clearly deserves.

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