

SUSTAINABILITY IN THE PERIOD OF CONFERENCES ON THE ENVIRONMENT AND DEVELOPMENT — AN INSIGHT INTO ECOLOGY AND ECONOMICS¹

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Introduction

There has been considerable discussion about the polysemic nature of the term “sustainability”. Could it be that this concept is so wide in its scope that it becomes meaningless? Or does it open the door to interesting possibilities precisely because it is open to political disputes about its meaning? For the purpose of this article, to analyze the different proposals on sustainability means to view them from a privileged vantage point in order to understand the boundary dissolution processes between the different dimensions within current society. The inability to treat “the environment” and “development” separately was clear at the cusp of the 20th and 21st centuries. It emerges as a possibility of what was conceived as the end of the boundaries between “society” and “nature” (Beck, 2010; Latour, 1994 and 2004; Ingold, 2000; Descola, 2003). Within this context, sustainability becomes a set of proposals for responding to the proliferation of risks which emerge in late modernity. This hybrid conception of environmental dilemmas and sustainability proposals therefore eludes all the spheres which were traditionally conceived by modernity since the 18th Century.

Society and nature, science and politics, nationality and internationality become blurred in face of phenomena which make up the current environmental problematics. Within this context, debates taking place at the juncture between environmental sociology, social studies of sciences and social theory (Beck, 2010; Latour, 1994 and 2004, Yearley, 2005, 2008 and 2010) have highlighted the ambivalent nature of techno-

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scientific rationality in relation to environmental issues, either with regard to production or as a source for resolutions.

Through this tension, the different academic perspectives play a significant role in structuring possibilities, in which environmental issues are incorporated and re-established by the social amalgamations which characterize the contemporary world. If academic disciplines are extremely important in producing the elements which make up environmental issues, what is their contribution to the wide-ranging and polysemic field of sustainability, at a time when policies are established by appropriating terms? How do ecology and economy, central perspectives in discussing the “environment” and “development”, deal with the hybrid nature of sustainability proposals?

The aim of this study is to provide a sociological analysis of sustainability strategies present in academic production in the fields of ecology and economics by looking at the most influential articles in each field in order to understand the conceptual and propositive development of this term. This is particularly cogent in view of the period of compelling debates about the environment and development: this period is delimited by the two decades which link the United Nations Conference on the Environment and Development (Rio92) and the United Nations Conference on Sustainable Development (Rio+20). The aim here is to understand how ecology and economics contribute towards drafting the current repertoire on sustainability. Within this perspective, special attention will be given to the relationship between disciplinarity and interdisciplinarity and their responsibilities in relation to the transition process between scientific artefacts and political propositions.

The article is divided as follows: in the first part, we present the object of our analysis. In the second part, we draft the theoretico-methodological conditions for sociologically analyzing the academic production on sustainability. By making use of recent discussions involving the fields of environmental sociology, social theory and social studies of sciences, we will look at three aspects of each discipline being analyzed: (1) *production of (ir)regularities between the humanities and natural sciences*; (2) *definition of risks and vulnerabilities*; and (3) *a search for solutions to socio-environmental dilemmas*. The concepts of *epistemic cultures* and *epistemic symmetry* were employed so as to ensure that the theoretical basis is appropriate to this task. In the third part we analyze the articles selected. Finally, we reveal the interdisciplinary exchange between the different areas and appraise the limits and potentials relating to how ecology and economics approach a myriad of elements involving the topic of sustainability.

The object of the analysis

An analysis was carried out using fifteen out of the twenty-five most cited articles between 1990 and 2009 on the website Web of Science, in the various fields analyzed. The criteria for this research were: (1) title: “sustainab*” (so as to encompass both “sustainability” and “sustainable”); (2) category: “ecology” and “economics”; (3) document type: “article”, expanding the search on “Science Citation Index Expanded”

(SCI Expanded), “Social Sciences Citation Index” (SSCI) and “Arts and Humanities Citation Index” (AeHCI) databases. In addition to these criteria, priority was given to some qualitative guidelines in order to define articles. Firstly, the temporal perspective sought to provide an insight into the process of transformation of conceptual and methodological elements which are inherent to sustainability proposals during the period covering most of the interval between Rio92 and Rio+20. This meant “sourcing” the most cited articles for each year involved. Thus, we avoided the possibility that a general search between 1990 and 2009 would prioritize older texts in detriment of those published most recently, in particular between 2005 and 2009. Had this been the case, it would have been difficult to arrive at an understanding, however provisional, of the more recent research tendencies on this topic. The years of 2010, 2011 and 2012 were not selected because the research and the publication of analyzed articles were too close in time and, consequently, this would compromise the true relevance of citations. Secondly, opting for fifteen of the twenty-five most cited articles relates to a qualitative demand, in that priority was given to articles which made theoretico-methodological contributions instead of concentrating on localized studies. This is because it is thought that the former are more widely able to influence academic studies and environmental policies. Finally, our concern was to produce an interpretation about the directions which make up mainstream academic production. Therefore, areas such as “environmental sciences” were dismissed. The downside of this is that some very influential articles both in ecology and economics were not considered by the current research. However, our decision allows us to have an insight ranging from the *endogenous* to the *exogenous*, that is, from the internal structure of proposals within their own niches towards interdisciplinarity and political intervention. This way, their semantic and conceptual specificity is apprehended, as well as the way in which different elements are brought together epistemically in the make up of the current sustainability proposals across different academic fields. From this point onwards, the conditions are set for understanding the possible theorico-methodological exchanges, in addition to the possibility of challenging different visions of this issue.

Towards a sociological analysis of the academic discourses on sustainability

The challenge of analyzing the hybrid nature of sustainability proposals requires the ability to ensure the value symmetry conditions between them, whilst at the same time avoiding an oversimplified leveling out of the scientific artefacts produced in different academic fields. The principle used here is that, within the different narratives about sustainability, there are three basic conceptual elements: conceptualizing the patterns of (*ir*)regularity between the humanities and natural sciences; characterizing risks and situations of vulnerability within a pre-established interaction dynamics; and finally, seeking solutions for socio-environmental dilemmas. The emergence of this triad can be observed in debates about the ambivalent responsibility of techno-scientific events in relation to current environmental issues. This is evident in articles by authors who

move between environmental sociology, social theory and the social study of sciences (Yearley, 2005 and 2008; Beck, 2010), and comprises two basic considerations.

First, it focuses on the patterns of (ir)regularity between the humanities and natural sciences either implicit or explicit in sustainability proposals, as Yearley (2008) suggests. According to this author, the contribution of social studies of science to environmental issues is in apprehending ways of “getting to know nature” by recognizing that they are greatly responsible for the artefacts produced, as well as the political directions they engender. The author further argues that this is clear both in activities of forest and ecological restoration and in evaluation studies about environmental impact, where academic discourses are a decisive factor in validation. A narrative about the “original condition” therefore becomes necessary, either in terms of recovery, or to assess potential or real degradation processes. Finding an “original state of nature” does not mean assuming an innocent position with regard to this term, turning it into an autonomous ontological dimension in relation to social events. Indeed, Yearley’s proposal emerges out of the debate about the socio-cultural dimension of the conception of “nature”. Thus, finding the “original state of nature” means identifying regular patterns/processes between societies and nature which predate production and the definition of risk (Latour, 1994 and 2004; Ingold, 2000; Yearley, 2008; Beck, 2010; Descola, 2003).

Secondly, observing the processes which define risks and threats, and also solution proposals, follows Beck’s theory (2010) which highlights the centrality of the concept of risk within current society, conceiving the process of reflexive modernization as being guided by the relationship of *incompatibility* and *competition* between production/distribution of wealth and risks. Thus, the dynamics of identifying/concealing risks becomes one of the drivers of socio-political life. If risks and vulnerability are so central in contemporary society and are social in their origins and results, then it is in academia that this set of elements are brought together leading to the production of risks. This means that the responsibility of academic production is threefold: it is simultaneously a mechanism for producing and defining risks, as well as a source for finding solutions for these very same risks (Beck, 2010). This perspective allows us to observe a web of relationships between politicization, scientification and public debate.

The ambivalence of academic discourses, exposed to both internal and external criticism, has a fundamental role in defining and presenting solutions in face of these self-threats. The political sphere, which is imbued by hybrid decision-making processes – what Beck (2010) denominates sub politics – increasingly looks towards scientific authority as a source for producing lines of action. However, the scientific and political spheres are both profoundly impregnated by the public debate around environmental issues.

These two references allow us to build an analysis of the hybrid condition of sustainability proposals, by observing, as we saw, the *patterns of (ir)regularity, risk definition and formulation of solution strategies* available in each field. However, would it not be reckless to adopt the same approach in such different fields as natural and human sciences? What would be the conditions which allow this to take place?

The first supposition relates to the principle that it is not only scientific production that is impregnated with *socio-cultural and political processes*, but also that the *sciences/academia are privileged spaces for the production of socio-cultural artefacts* (Latour, 1994; Knorr-Cetina, 1999; Collins, 1985; Yearley, 2005; Pickering, 1992). Based on this perspective, we adopt Knorr-Cetina's (1999) theory in which different sciences can be understood as "epistemic cultures". In this case "culture" means a "set of potential structurations of experience capable of supporting a number of traditional contents and absorbing new ones" (Viveiros de Castro, 2002, p. 209). This perspective allows us to approach each academic field through the specific way it makes the arrangements between its internal contents and outside elements, whether scientific or not. Within this context, it is particularly important to understand how each epistemic culture deals with tensions between disciplinarity and interdisciplinarity.

A second condition for the analysis proposed in this article is the *symmetry principle*. It has advantages when concomitantly analyzing ecology and economics. The symmetric principle employed in this research transits between a "restrictive" (Bloor, 2009; 1999) and a more "generalized" form of symmetry (Latour, 1994). The former aims to equilibrate "mistakes" and "truths" within the different scientific fields. This posture restricts the analysis between discourses and propositions originating in different sciences about the same topic. The latter, on the other hand, expands the ethnographic analysis to the relationship between sociability, techniques and "natural" objects, going beyond the methodological needs of the present analysis proposal. What is interesting here is the neutral value status between scientific configurations which are usually treated as incompatible or qualitatively excluding, as in the case of relations between "natural sciences" and "social sciences". Thus, *epistemic symmetry* is appropriate in as far as it allows an understanding of the different fields as clearly distinct in the way that they manufacture scientific artefacts, but symmetrical in relation to their status as postulates for understanding the phenomena they study. This is because, as previously noted, different academic fields are the product of, and produce, the socio-cultural dynamics of reflexive modernity.

By supposing a symmetric positioning between different epistemic cultures, this analysis looks at the way in which the triad "patterns of (ir)regularity, risks and solutions strategies" appear in ecology and economics. It addresses discrepancies and similarities between the two fields and subsequently seeks possible forms of interdisciplinarity between them.

Ecology and sustainability

Ecology articles provide a wealth of material to understand the elements which permeate debates about sustainability. It is not our aim to list their main strands and the assessment of the pertinence of the potential effectiveness of each of them is also not within our remit. Sociology of sustainability would not be appropriate for such a task. Our aim is to observe how this academic field considers the issues of narratives and interface objects between human and non-human elements, since it

was established precisely in order to explain the polarity “nature” within this relationship.

The fifteen chosen texts (“Analyzed references”) seem to be divided into two basic types: normative and propositive. By “normative” we understand them as articles produced to direct research guidelines and management practices. Generally, these are “documents with principles” as is the case of Lubchenco *et. al* (1991), proposed by the Ecological Society of America (ESA) or by governmental bodies (Kessler *et al.*, 1992). By “propositive”, we refer to the set of articles which provide theorico-methodological guidance such as direct and indirect results of research experiments (Holling, 1993; Mitchell *et al.* 1995; Brown and Ulgiati, 1997; Ulgiati and Brown, 1998; Ness *et al.* 2007; van den Bergh and Verbruggen, 1999) or research programs (Costanza and Daly, 1992; Goodland and Daly, 1996; Lindenmayer *et al.*, 2000; Richter *et al.* 2003; Choi *et al.*, 2008; Termorshuizen and Opdam, 2009). It is worth mentioning the overriding concern in defining the term “sustainability” and also establishing indexes and indicators in order to turn it into an operation tool for research and policies (Brown and Ulgiati, 1997; Ulgiati and Brown, 1998; Lindenmayer *et al.*, 2000; Ness *et al.* 2007)

It was possible to identify three clearly defined phases in relation to the articles: between 1990 and 1996 there was a strong tendency to stress the theorico-methodological basis of sustainability as a topic. It was also important to define guidelines for research and environmental policies. From 1996 to 2003 articles dedicated to establishing sustainability indexes and indicators are predominant, and finally, between 2003 and 2009 selected articles tended to either conduct a review of the theoretical suppositions of the first phase or critically analyze methods for assessing sustainability proposed during the second phase.

Patterns of (ir)regularities in ecology have at least three main characteristics. First, there is a strong tendency, in the first years of analysis, to ontologically divide “natural systems” and “social systems” (Lubchenco *et al.*, 1991; Kessler *et al.*, 1992; Brown and Ulgiati, 1997; Ulgiati and Brown, 1998; Lindenmayer *et al.*, 2000). In these articles, notions of integrity and complexity are directly related to ecological systems. Secondly, in more recent articles (2000-2009) attempts to expand the use of attributes such as “complexity”, “diversity” and “integrity” from natural to social events become more prominent. Thus, ontological distinction becomes less evident (Richter *et al.*, 2003; De Groot, 2006; Choi *et al.*, 2008; Termorshuizen and Opdam, 2009). Third, alongside this process of integration between ecological and social elements, the concept of “ecosystem” becomes less central than it was previously (Lubchenco *et al.*, 1991; Kessler *et al.*, 1992; Holling, 1993; Brown and Ulgiati, 1997; Ulgiati and Brown, 1998;). This is the case when compared to the concept “community” (Choi *et al.*, 2008) and particularly in relation to the concept “landscape” in more recent articles (De Groot, 2006; Termorshuizen e Opdam, 2009).

However, these three aspects are not isolated. Among articles based on the concept of “ecosystem” there is a greater propensity to distinguish between “natural” and “social” aspects, both in the more purely ecological articles and in those more

likely to take an economic-ecological approach. In the latter the strict relationship between “ecosystem” and “natural capital” reveals a tendency to incorporate different aspects of human events into ecosystems via an economic perspective. When the concept of landscape becomes preponderant, the nature-society distinction stops being a conceptual backdrop. The emergence of the landscape concept is intimately linked to an attempt to incorporate the “social” dimension to the predominant economic-ecological discourse. Under the aegis of “landscape” we also observe a move from understanding issues of “flow” towards socio-cultural motivation issues in relation to interaction processes between human and non-human elements.

In relation to risks and threats, five fundamental characteristics are highlighted. First, environmental threats, important for the interaction between different ontological fields, are understood as elements which break up pre-established regularity, which should be rescued or at least reproduced in some way. Within this context human population growth is often a driving force for threats to ecosystems (Lubchenco *et al.*, 1991; Kessler *et al.*, 1992). Second, the concept of support capacity is commonly used to express the limits when risks become bearers of potential or manifested tragedy. However, it can be understood as “fixed” or “variable”, the latter being conditioned by its own ecosystemic dynamics or by specific geographic contexts (Mitchell *et al.*, 1995; van den Bergh and Verbruggen, 1999; Costanza and Daly, 1992; Goodland and Daly, 1996). Third, tangentially, academic knowledge itself, even when it is committed to sustainability proposals can be considered as promoting risks, particularly if it is only partially introduced and does not attend to the integrative character of environmental issues (Ness *et al.*, 2007; Van den Bergh and Verbruggen, 1999; Lindenmayer *et al.*, 2000). Fourth, risk situations can be understood as “competition” processes between “humans” and “ecosystems”, if the focus are elements such as water and biodiversity (Lindenmayer *et al.*, 2000; Richter *et al.*, 2003). Fifth, global environmental changes are presented as a field of possibilities, in which “risk” and “(ir)regularity” are indistinguishable (Choi *et al.*, 2008). These last two characteristics show a greater awareness of what are known as the unexpected consequences of interaction processes. Therefore, between 2003 and 2009 there was a tendency to understand risks and threats as inherent to the processes which constitute the complex relations between social and ecological elements. Whereas in the first years of research there was an emphasis on a unilateral perspective of threats originating in “society” and impacting on “nature” as the cause of environmental issues.

Finally, proposals for the solutions presented can be classified into seven categories. First, as adaptive management (conservation/restoration) practices (Lubchenco *et al.*, 1991; Kessler *et al.*, 1992), viewed from an essentially technical perspective which, of course, presupposes the predominance of ecological over social aspects when drafting sustainability strategies. Second, there is a tendency to strengthen interdisciplinary and transcalar research integrated to adaptive management processes (Holling, 1993). Third, as maintenance of productivity/income of ecosystems in conjunction with economic processes (Brown and Ulgiati, 1997; Ulgiati and Brown, 1998). This perspective is associated to issues of environmental accountability and

relates to an understanding of energy flows within national systems. Fourth, as compatibility processes between human and ecosystemic needs (Mitchell *et al.*, 1995; Lindenmayer *et al.*, 2000; Richter *et al.*, 2003) in relation to vital elements for both “social” and “ecological” systems, such as water and biodiversity. Fifth, the emergence of cost/benefit analyses applied to ecosystems and landscapes, as well as adaptive management linked to economic relations (Costanza and Daly, 1992; Goodland and Daly, 1996). Sixth, the maintenance of “landscape services” by merging ecological, economic, social and cultural aspects (De Groot, 2006; Termorshuizen and Opdam, 2009). And seventh, the maintenance of ecological functions within a context of man-made global environmental changes (Choi *et al.*, 2008), though without, however, establishing ecological restoration processes which could be called purist.

In general the triad “science for complexity, economic-ecological analysis and adaptive management” appear within proposals found in analyzed articles. Nevertheless we observe that in more recent years (2003-2009) there has been an attempt to incorporate sociological and anthropological aspects to the strong tendency to deal with sustainability through technical procedures in conjunction with economic analyses.

Economics and sustainability

Within the analyzed articles there are two basic types of discourse: “critical” and “propositive”. The former (Howarth and Norgaard, 1992; Asheim, 1994; Stern *et al.*, 1996; Binswanger, 2001) focus on problematizing concepts and conceptions which are very well established in the economic debate. The latter (Toman, 1994; Costanza *et al.*, 1998, Kay *et al.*, 1999; Rotmans *et al.*, 2000; Farber *et al.*, 2002; Ekins *et al.*, 2003; Robinson, 2004; Reed *et al.*, 2006; Ciegis *et al.*, 2009; Burinskiene and Rudzkiene, 2009) are concerned with presenting views of sustainability, and frequently, providing tools to make these workable. The “critical” texts are interesting because of the theoretical discussions they present. Even when they focus on specific concepts, they reveal a critical stance in relation to economic perspectives involving sustainability. “Propositive” articles are concerned with establishing the parameters of what sustainability “is” or “could be” within an analytic conceptual framework which is theoretically consistent and politically “viable”. These different poles of conception idealization - in the Weberian sense - are obviously not excluding, particularly taking into account that “propositive” articles can only have a legitimate critical impact in relation to other proposals. The merging of criticism and propositiveness can be more easily observed in Hinterberger *et al.* (1997).

In general it can be seen that the articles from the 1990s are marked by two types of discourse: the relationship between, on the one hand, “environmental economics” and “ecological economics”, and on the other, moving closer to or further away from the view of sustainability institutionalized by the Brundtland Report (1988). From 2000 onwards, a new type of debate is observed that is more restricted to ecological economics, focusing mainly on the concept of “natural capital”. As a general

characterization - and without wishing to anticipate results - we notice that the concept gains centrality and then subsequently becomes relatively less significant.

In relation to the patterns of (ir)regularity, four main characteristics can be identified. The first emerges out of a critical debate within ecological economics on significant topics within environmental economics. Underlying this tension is a critique of “linear” and “monocausal” explicative patterns. These give way to explanations relating to “multiplicity” and “complexity” (Howarth and Norgaard, 1992; Asheim, 1994; Stern *et al.*, 1996). There is a tendency to critically analyze economic action as an act restricted to an assumed rationality which is devoid of context. It also defends incorporation of more wide-ranging systemic processes, whether economic or ecological. In relation to this second characteristic, we also note an effort to integrate neoclassical and ecological perspectives by attempting to reconcile market principles with sustainability tenets (Toman, 1994). Between 1997 and 2003, a third characteristic becomes more prominent and fuels the debate within ecological economics by employing a notion of complexity with double meaning (“systemic” complexity and a conception closer to the idea of “myriad”). The use of “natural capital” also predominates (Costanza *et al.*, 1998; Kay *et al.*, 1999; Rotmans *et al.*, 2000; Binswanger, 2001; Farber *et al.*, 2002; Ekins *et al.*, 2003). In the final years of analysis, a fourth characteristic emerges, in which the concept of “scenario” appears as an alternative to the hegemonic use of the relationship between natural capital and manufactured capital (Ciegis *et al.*, 2009; Burinskiene and Rudzkiene, 2009). Attempts to introduce a social dimension within the well-established debate between ecology and economics weaken the link between natural capital and manufactured capital (Hinterberger *et al.*, 1997) and consequently, have led to a surge in the use of the concept of “scenario” (Ekins *et al.*, 2003; Robinson, 2004; Reed *et al.*, 2006; Ciegis *et al.*, 2009; Burinskiene and Rudzkiene, 2009) in relation to the economic problem of sustainable intertemporal allocation. Thus, articles employing natural capital tend to be based on a “systemic” conception of complexity, whereas those using “scenario” tend to use a “myriad” conception of complexity, although in Ciegis *et al.* (2009) their vision of systemic complexity is a backdrop to the concept of scenario. Finally, there is also a tendency of spatialization associated to the building of economic scenarios in more recent articles from the period analyzed (Ciegis *et al.*, 2009, Burinskiene and Rudzkiene, 2009).

In relation to the definition of risks and threats, four characteristics emerge. First, a generic interpretation which links “human action” as an ontological threat to nature, ecosystem or natural capital which is accompanied by an “economic-ecological” characterization of “human impacts” (for example, “prospective costs”, “irreversibility” or “sustainability deficit”) (Asheim, 1994; Stern *et al.*, 1996; Toman, 1994; Hinterberger *et al.*, 1997; Costanza *et al.*, 1998). Secondly, as negative environmental feedback on quality of life and economic production produced by economic growth (Howarth and Norgaard, 1992; Stern *et al.*, 1996; Farber *et al.*, 2002; Ekins *et al.*, 2003). Thirdly, the techno-scientific responsibility for environmental issues, both in terms of “technical” and “conceptual” inadequacy in face of the complexity of sustainability issues (Hinterberger *et al.*, 1997) and in terms of the unpredicted effects of adopting

technological models, whether these are “harmful” or “adjusted effects” (such as the “rebound effect”, that is, an unplanned increase in energy costs due to technological optimization, the purpose of which is precisely to improve energy efficiency) (Binswanger, 2001). And fourthly, understanding the emergence of “catastrophes” as inherent attributes of the complex and systemic relationship between economics and ecology (Kay *et al.*, 1999; Robinson, 2004; Reed *et al.*, 2006; Ciegis *et al.*, 2009; Burinskiene and Rudzkiene, 2009).

Finally, solutions proposals can be characterized thus: (1) a search for intergenerational equity through a process of valuing both the ecological-economic and the “social” (Howarth and Norgaard, 1992); (2) “sustainability adjustment” by combining econometrics and qualitative historical analysis (Stern *et al.*, 1996); (3) balancing socio-economic and ecological principles, by building a “minimum safety standard” (Rotmans *et al.*, 2000); (4) displacing stock maintenance (natural capital) by flow maintenance (material input per service unit) (Hinterberger *et al.*, 1997); (5) bringing together “operational” principles such as responsibility, definition of scale, precaution, adaptive management, incorporation and participation of environmental costs (Costanza *et al.*, 1998); (6) systemic governance and transcalar/transdisciplinary planning (Kay *et al.*, 1999); (7) political-financial control of the relationship between innovation technology and consumption (Binswanger, 2001, Farber *et al.*, 2002); (8) maintenance of “critical natural capital” (Ekins *et al.*, 2003); (9) the process of transcalar adaptive learning (Ekins *et al.*, 2003); (10) sustainability as territorial planning, encompassing ecological, economic and social aspects (Reed *et al.*, 2006; Ciegis *et al.*, 2009; Burinskiene and Rudzkiene, 2009).

From these perspectives we highlight three fundamental elements: the notion of “maintenance” within an intergenerational perspective; the notion of “scale”; and the notion of “planning”. The first two elements are closer to the concept of “natural capital”, whereas the latter is associated to the concept of “scenario”.

Conclusions

In general, we find in ecology articles a well-established link between complexity, economic-ecological analysis and adaptive management. The source of this triad is found in the concept of ecosystem and it is based on the ontological distinction between nature and society. In recent years, however, there is an incipient demand to incorporate socio-cultural issues within sustainability planning processes. This is accompanied by a reduction in the centrality of the “ecosystem” concept in favor of valuing others such as “landscape”, as well as the breaking down of the boundaries between nature and society. Public policies appear as a space for experimentation of ecological conservation/restoration strategies linked to academic research and the valuing of the economic-ecological dimension by employing the concept of adaptive management.

From an economic point of view, we note that initially there is a predominance of “maintenance of natural capital”. However, there is a critical tendency to relativize

the coherence and operationality of this concept and to move towards a more territorialized conception of the elements which make up the sustainability perspective. Within this context, it is important to highlight sustainable “scenarios”. Another important aspect is the concern with technological changes which may or may not contribute to environmentally correct objectives. Finally, a dominant characteristic is the tacit recognition of the need to incorporate “social issues” to analytic and propositive sustainability schemes. The tendency to territorialize, which appears in more recent articles, seems to be an attempt to introduce these issues, although they are more often mentioned than effectively incorporated.

This leads to some conclusions about the strategies drafted in the fields of ecology and economics in order to deal with the hybrid elements which make up sustainability proposals. First, the interdisciplinarity found in articles analyzed is marked by continuity: economics and ecology operate within the same epistemological “register” in that their analytic categories relate to each other without major conceptual disparities or semantic conflicts. An example is the relationship between ecological “structure” and “function”, respectively related to the economic concepts “goods” and “services”. The connection between “ecosystem” and “natural capital”, as well as between “landscape” and “scenario” is also proof of this continuity. Secondly, public policies appear within ecological and economics theories of sustainability as a space for experimentation of ecological conservation/restoration strategies linked to academic research and the valuing of the economic-ecological dimension. Thirdly, in relation to defining sustainability strategies and their openness to interdisciplinarity, patterns of (ir)regularity seem to be more significant than the definition of risks and threats. In this case, we could claim that there is an *intimate relationship between the theoretico-methodological framework and the establishment of sustainability “governance” strategies*. In the articles analyzed, a specific definition of the environmental problematic does not appear to be a decisive variable for policy-making, given the generic and speculative aspect in which it occurs. This is because policies are almost always characterized within an abstract dimension, and are not given to empirical validation.

Finally, there is a growing significance of the “landscape” concept in ecology and at the same time the “scenario” concept in economics, which apparently allows human and ecological events to come together in a more symmetric manner, as for example, in attempts to incorporate social activities “within” ecosystems. This tendency is closer to more “phenomenological” explicative schemes than “heuristic” perspectives, such as those based on Systems Theory (Kay *et al.*, 1999). However, in the articles analyzed, the incorporation of “social issues” is constantly mentioned while dialogue with the social sciences is rare.

How should we understand the absence, or at most, the paucity of interaction between an economic-ecological point of view and a sociological perspective, despite the fact that the former assents to the need to incorporate “social issues” within sustainability? We suggest that the intense relationship between ecology and economics appears to point to the existence of a “disciplinary interdisciplinarity”. That is, by sharing epistemological suppositions both perspectives find wide scope for “interaction”

without having to plunge into processes for overcoming discursive, topical and theoretico-methodological differences. The nature of continuity between ecology and economics makes it possible to employ a model to analyze interactions between human and non-human elements without surrendering to a degree of homogeneity in empirical understanding and conceptual formulation, and diluting theories and methodologies. Thus, interdisciplinarity is promoted without breaking with the disciplinary dynamics of each academic field. According to some important authors in relation to this topic (Daly and Farley, 2010), this seems to fall short of the wish for an economic-ecological perspective as a transdisciplinary experience. This model of interdisciplinarity, however, does not occur in a symmetrical way, but through an ecological overspill into the elements which make up the economic analysis, becoming a metonymic procedure of interdisciplinary incorporation (Santos, 2002). Both within an ecosystemic perspective and through a landscape stance, ecological discursivity structures the possibilities of interaction between these two disciplines, incorporating economic and ecological elements. Ecology and economics are understood here as epistemic cultures (Knorr-Cetina, 1999), that is, they are structured by specific dynamics which cannot be dissociated from endogenous and exogenous phenomena (Viveiros de Castro, 2002). From the articles analyzed, the interdisciplinarity established between ecology and economics seems to emerge from an “epistemophagic” process of one over another. This facilitates connections and operations, but hampers the introduction of socio-cultural elements to the debate, as the discussion about social issues does not translate into an interaction with *sociological* topics.

Given the qualitative differences between economics-ecological and sociological discursivities (Silva Junior, 2012), a non-metonymic dialogue presents great challenges. As the analyzed articles suggest, it is difficult for interdisciplinarity to actually occur when academic fields are very disparate in their discourse. Thus, the “dialogue” metaphor carries both the image of the sort of interdisciplinarity which has commonly taken place and the representation of the limits this type of collaboration comes up against when problematizing and classifying solution proposals to environmental issues. Therefore, how can interdisciplinarity occur without having to appeal to “epistemophagic” processes of one academic field over another? How to promote “dialogue without neglecting discursive disparities and discontinuities and therefore not lay to waste the profound theoretical-methodological knowledge which was built over the years in distinct disciplines? Would an interdisciplinarity based on “confrontation” and “separation” between distinct epistemic cultures be possible? Does the diversity in social and sociological topics related to sustainability meet the requirements for establishing interdisciplinary “dialogues” or do their specificity require epistemological models of interaction which go beyond the limits of a “disciplinary interdisciplinarity”?

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SUSTAINABILITY IN THE PERIOD OF CONFERENCES ON THE ENVIRONMENT AND DEVELOPMENT — AN INSIGHT INTO ECOLOGY AND ECONOMICS¹

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Resumo: O objetivo é oferecer uma análise da produção científica sobre sustentabilidade em ecologia e economia, nas décadas marcadas pelo intervalo entre Rio92 e Rio+20. Pretende-se observar as transformações conceituais do termo nas ciências que alimentam, de forma hegemônica, o debate sobre meio ambiente e desenvolvimento. O foco está na tensão entre disciplinaridade e interdisciplinaridade no contexto de estabelecimento da relação entre artefato científico e propositividade política. Assim, foram analisados quinze dentre os vinte e cinco artigos mais citados no sítio *web of science* em cada ciência, sobre os temas “sustainability” e “sustainable”, entre 1990 e 2009. A análise fundamentou-se na teoria da modernização reflexiva e nos estudos sociais da ciência. Como resultado geral, sugere-se a existência de uma “interdisciplinaridade disciplinar” entre economia e ecologia, o que facilita suas conexões e operacionalidades, mas dificulta a inserção de elementos socioculturais no debate.

Palavras-chave: ecologia; economia; estudos sociais das ciências; sustentabilidade; teoria social.

Abstract: This work presents an analysis of the scientific production about sustainability in the areas of ecology and economy in the period between Rio92 and Rio+20. It focuses on the tension between disciplinarity and interdisciplinarity in the context of establishing a relation between scientific artifacts and political propositiveness. This study analyzed fifteen from among the twenty-five most cited articles on ecology and economics from the website “Web of Science” between 1990 and 2009, in relation to “sustainability” and “sustainable”. The analysis is founded on the theory of reflexive modernization and on social studies of science. The research suggests the existence of a “disciplinary interdisciplinarity” between economics and ecology that facilitates its connections and operations, though it also hampers the introduction of socio-cultural elements to the debate.

Key words: ecology; economics; social studies of science; sustainability; social theory.

Resumen: El objetivo es ofrecer un análisis de producción científica sobre sustentabilidad en ecología y economía, entre Río92 y Río+20. El propósito es observar su transmutación conceptual en las ciencias que alimentan, hegémicamente, el debate público sobre medio ambiente y desarrollo. El enfoque está en la tensión entre disciplinariedad e interdisciplinariedad en el contexto de establecimiento de la relación entre artefacto científico y propositividad política. Por lo tanto, se analizaron quince de los veinticinco artículos más citados en la página web “*web of science*” tanto en ecología como en economía, sobre los temas “*sustainability*” y “*sustainable*” entre 1990 y 2009. El análisis fue fundamentado en la teoría de la modernización reflexiva y en los estudios sociales de la ciencia. Como resultado, se sugiere que existe una “interdisciplinariedad disciplinar” entre economía y ecología, que facilita sus conexiones y operaciones, sin embargo, también dificulta la inserción de elemento socioculturales al debate.

Palabras clave: ecología; economía; estudios sociales de las ciencias; sustentabilidad; teoría social.
