Can Social Ecological Economics of Water Reinforce the "Big "Tent"?

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Abstract: This paper seeks to characterise the importance of the social and political dimensions of the literature dedicated to water in the field of ecological economics. More precisely, it attempts to assess the relevance of C. L. Spash's recent division of the ecological economic community into three "camps", namely "new resource economists", "social ecological economists" and "new environmental pragmatists" through the literature focusing on water issues published in a number of leading scientific journals in ecological economics. We begin with an analysis of the main ontological, epistemological and methodological tenets of the three "camps" mentioned, and identify their link to water-related issues. We analyse the relevance and limits of such categorisation for water research through papers published in *Ecological Economics*. We next explore the field of ecological economics of water through textual statistics obtained from a corpus of research abstracts published in five selected journals since the late 1980s. Our results raise questions regarding the relevance of the regrouping of the ecological economics community thanks to a Venn diagram that presents limited overlaps, and by promoting an inclusive representation of the "big tent" of ecological economics applied to water issues, thus presenting new perspectives on the debate on methodological pluralism in *Ecological Economics*. To conclude, we present a series of recommendations to promote water social ecological economics, and strengthen pluralism within the community.
Key-words: social ecological economics, 'big tent', water, methodological pluralism.

1. Introduction

Research on water topics in the social sciences has burgeoned over the last decades, a very welcome evolution since fresh insights on key issues have been developed, helping for example to build a more holistic vision of the water scarcity predicament. Approaches regarding the subject of water in the field of social sciences are highly diverse, and even, at times, antagonistic. Ecological economics, like economics itself, is no different from other disciplines in this respect. However, while mainstream water economists share a broad framework and a number of basic principles about efficiency regarding the water sector (which helps to explain their greater leverage on water policies), water ecological economists are arguably much more diverse in their methods, theories and even sometimes epistemologies or ontologies. Even though this may simply reflect a situation prevalent in the broader ecological economics community, it is worth determining to what extent the community of water ecological economists displays unity and what the current cleavages are.

The aim of this paper is to gain better understanding of the social and political dimensions within the large literature dedicated to water in this area of study. Since the economic/market dimensions of water are already largely addressed in mainstream economic literature dedicated to water issues, one of the specificities of ecological economics is perhaps to be found in its focus on the social and political dimensions.

These aspects can be addressed through an analysis of the relative importance of the papers dedicated to water management issues and belonging more or less explicitly to what Spash calls a "social ecological economics" (Spash, 2017).

Since the institutionalization of the ecological economics (hereafter EE)[1] community in the late 1980s, the objective of establishing a coherent and collectively accepted set of principles (a common paradigm) has remained a subject of considerable debate (Özkaynak et al., 2012; Martínez-Alier and Muradian, 2015; Spash, 2012, 2013b, 2017). For Røpke (2005) this situation is partly due to the great diversity of disciplines and scientific backgrounds from which the early founders originated. Socio-economists, mainstream economists and ecologists were all attracted by this emerging field, in addition to an eclectic group of people influenced by parallel fields and societies (e.g. International Association for the Study of Common Property). Nowadays, the *Ecological Economics* journal (*EE* hereafter) is still considered a forum for diverse (even competing) approaches. Since Gowdy and Erickson (2005) claimed that mainstream economic theory was close to surrender, ecological economics, at a crossroads, has had to decide whether "we can embrace the revolution in economic theory –inspired by recent empirical tests of the core assumptions of neo-Walrasian theory– or [whether] we can turn our backs to both the turning tide of the mainstream and our own roots in the social and psychological critique" (2005: 20). Far from being a structural flaw, this situation is indicative of the community's aptitude for debate. Indeed, some members of the community claim for ecological economics as a post-normal science (Funtowicz and Ravetz, 1994; Müller, 2003), whereas others promote "institutional ecological economics" (Paavola and Adger, 2005; Vatn, 2009), a "deliberative ecological economics" (Howarth and Zografos, 2008) or "coevolutionary ecological economics" (Kallis and Norgaard, 2010), among many other options (Remig, 2017).

The pluralism expressed within the community is evidenced by the recent debate between Remig (2015; 2017) and Söderbaum (2015) on the unified and radical nature of ecological economics with regard to mainstream economics. The latter denounces the attempt at "mainstreaming" the "big tent" of ecological economics (Howarth, 2008: 469)[2], while the former considers that sustainability economics, as it is shaped, cannot claim to found a radical branch of ecological economics. Among attempts to define trends in the community (see Luzadis et al., 2010 for a content analysis of 200 randomly sampled articles published in *EE*), Spash (2013b) is probably the most advanced in his identification of three "camps", namely "new resource economists", "social ecological economists" and "new environmental pragmatists". Surprisingly, these delineations seem to have generated little publicly disclosed debate within the community.

As shown by Spash and Ryan (2012), the delineation between new resource economists and social ecological economists seems fairly obvious, since both approaches had already been identified (albeit not named in the same way) in the ecological economics discourse 30 years ago (Røpke, 2005). Nevertheless, contrary

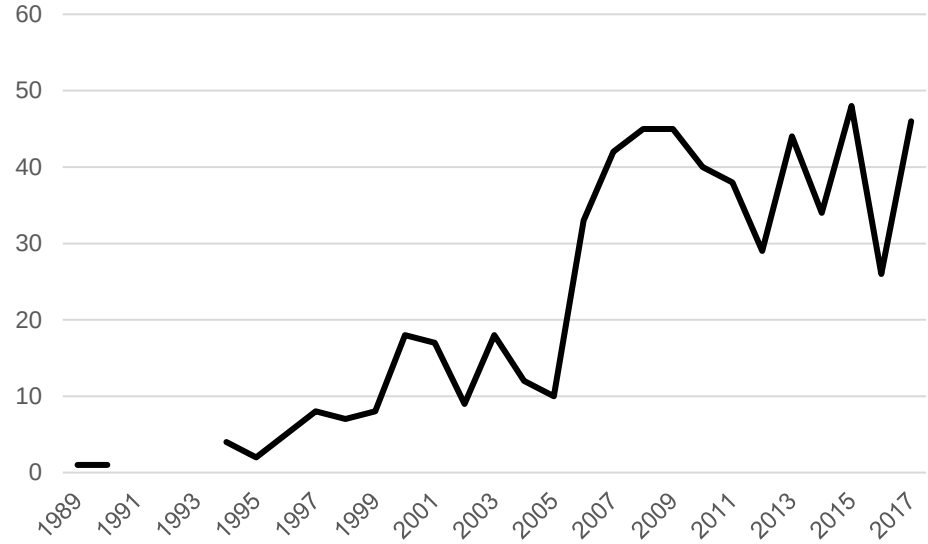
[1] In this paper, EE (non-italicized) refers to the field of ecological economics, whereas *EE* (italicized) refers to the journal *Ecological Economics*. Symmetrically, ERE refers to the field of environmental and resource economics, whereas *ERE* refers to the journal *Environmental and Resource Economics.*

[2] The expression "big tent" sums up the view according to which the field of ecological economics should be open to various disciplines, approaches, methodologies etc. and should not harbour any kind of orthodoxy since it "is a transdisciplinary field that is defined by a set of concrete problems rather than a particular epistemology or methodology" (Howarth, 2008: 469).

to Spash (2013b), we consider that the third approach, spearhead of the fast-increasing interest in the valuation of ecosystem services (Plumecocq, 2014), is probably more difficult to delineate precisely since its boundaries regarding the other two camps seem to be fuzzy.

The aim of the paper is to question such a division with regard to water-related issues, since they are addressed in an important number of contributions in the *Ecological Economics* journal and refer to distinct (even competing) approaches (Fig. 1).

Figure 1: Number of publications on the topic of water in *Ecological Economics* (1989-2017)



Source: *Web of Science* (*WoS*) [search retrieved on June 21st, 2018: TOPIC: (water) AND PUBLICATION NAME: (Ecological Economics); Timespan: 1989-2017].

More precisely, this paper questions the degree of pluralism within the EE community on the specific topic of water. As such, the paper focuses on the group identified as social ecological economists and raises the question as to whether social ecological economics of water (SEEW hereafter) can be identified in the literature. If so, what are the criteria to be considered when delineating the existing literature? This focus on social ecological economics is premised on our own scientific leanings (particularly the necessity to anchor ecological economics in social sciences) and on our past and present research in the field (Petit et al., 2015; Buchs, 2016; Calvo-Mendieta et al., 2017; Roman, 2017).

In order to address these issues and assess the appropriacy of the categories identified by Spash and the literature published on the ecological economics of water, we develop two parallel methodological approaches detailed in section 2. The results are presented and applied to the field of water resources (sections 3 and 4). Finally, we question the relevance of partitioning the field along clear-cut lines. We show that for pluralism to be effective for water studies, the SEE (social ecological economics) pole of the “big tent” should be reinforced, a position based on the affirmation of the specificity of the SEEW compared to the two other approaches (section 5).

2. Content analysis of ecological economics of water

The aim of the paper is not to delineate the field but merely to understand the dynamics of the paradigmatic quest within the community (Kuhn, 1962). Questioning the hypothesis of the existence of a SEEW consists first in finely exploring the field within

which it could flourish. Indeed, scientific discourse is not simply about valid knowledge "but also a means to control commonly accepted representations of the world" (Plumecocq, 2014: 458). As such, in order to sketch out the various competing approaches used to address water-related issues, we first proceed with a content analysis (Luzadis et al., 2010) by combining two methods, the first qualitative and the latter based on textual statistics.

Firstly, we synthesize the main ontological, epistemological and methodological tenets of Spash's "three camps", and identify how they could be specified for water-related issues. Then we illustrate the relevance and limits of such a categorization for water research by selecting papers published in *EE* that we deem characteristic of each camp's approach. Secondly, we explore the field on the basis of a corpus of research article abstracts published since the late 1980s. Abstracts and keywords are considered to be a relevant means of grasping scientific discourses as they synthesize the main purpose of articles and clearly present the debates involved.

Abstracts were collected in two sub-corpora, ecological economics (EE) and environmental and resource economics (ERE)[3]. According to Plumecocq (2014: 457), "*EE* articles can be used as representative of the discourse prevailing in the field because *EE* has institutional rules and organizational structures ensuring that the articles published, in addition to meeting academic standards, are also consistent with the paradigms prevailing in the field". Nevertheless, since the author assumes that the ecological economic discourse is not circumscribed to the eponymous journal, we also collected abstracts from two other journals with close connections to the EE community, *Environmental Policy and Governance* (*EPG*) and *Environmental Values* (*EV*). The second sub-corpus (ERE) refers to the two most rated journals by the *Journal Citation Report* in terms of impact factor in environmental and resource economics and are the two top journals promoted by the neoclassical economists during the survey conducted by Spash and Ryan (2012), *Journal of Environmental Economics and Management* and *Environmental and Resource Economics* (respectively *JEEM* and *ERE* hereafter). This sub-corpus is particularly relevant with regard to the level of pluralism in the EE publications and the specificities and differences between the ERE and the EE discourses since the latter field has been largely developed as an alternative to the former.

For the period 1989-2017, 962 abstracts that refer to the topic "water" were collected through the *Web of Science* (*WoS*) database[4]. A double-check to ensure accuracy of data collected was conducted by performing a manual search with several keywords related to water (e.g. "groundwater", "lake", "rivers", etc.) on each journal website (e.g. *EPG* is referenced in the *WoS* database only since 2010).

To explore this large corpus and identify trends, we made use of the textual statistics freeware IRAMUTEQ, characterized by low researcher prior intervention, except for "cleaning" (e.g. erasing illustrations), corpus formatting (e.g. each abstract is preceded

[3] We sought to avoid Spash's (2013a) criticism about Hoepner et al.'s (2012) research on influential publications. The author denounces the process of data collection that results in combining ecological and environmental economics together, thus "giving a heavier weight to mainstream environmental economics, as more such journals were included" (Costanza et al., 2016: 69).

[4] Request: TOPIC: (water) AND PUBLICATION NAME: (ecological economics; environmental policy and governance; environmental values; journal of environmental economics and management; environmental and resource economics); Refined by: [excluding] DOCUMENT TYPES: (BOOK REVIEW); Timespan: 1989-2017. The lower bound was fixed in 1989, when *Ecological Economics* was launched.

by four stars) and tagging variables such as publication year (PY), source (So), field (Type) and first author (auth). This freeware, used in recently published papers in *EE* (Plumecocq, 2014; Del Corso et al., 2015., Delattre et al., 2015) as an auxiliary to discourse analysis, is consistent with our overall methodology, i.e. for exploratory purposes rather than hypothesis validation ones. As such, it is complementary to a finer qualitative approach. Its general objective is to study the statistical distribution of "full-words" (meaning-carrying words distinct from syntax-related "tool-words") in a given corpus. It does not "count" words but reveals their distribution within "elementary units of speech" of equivalent size (abstract segments) also called "utterances" (Habermas, 1976: 26) that constitute the overall discourse (for a finer description of the software, see Appendix A).

We proceeded step by step: we began with the whole corpus (5 journals), and then analyzed the EE sub-corpus (3 journals) compared to *EE* alone. We used two methods, correspondence analysis and hierarchical classification. Correspondence analysis is based on linear algebra and, more precisely, on calculations of inertia (variance) (Lebart and Salem, 1994). It proceeds from a contingency table that crosses lexemes obtained from lemmatized full-words and the modalities of variables. Statistical associations are assessed by a specificity calculation of the probability the event occurs as we effectively observe it in the part or even more frequently as limited by the size of the part (following the hypergeometric rule) (Pullin, 2018). Hierarchical classification is an iterative procedure aiming at differentiating several partition levels to identify classes of units with contrasted profiles.

Before presenting the results obtained from these two methods (section 4), we would like to test the relevance of Spash's typology by present the results of our qualitative analysis of the field of water in *EE* (section 3).

3. Testing the relevance of Spash's typology for water issues in *Ecological Economics*

In a series of recent papers, clear-cut boundaries (albeit with some overlap) were drawn between three broad families within the EE community. Spash and Ryan (2012: 1101) summarized the three camps in their survey carried out in three international conferences and which resulted in a self-positioning of researchers:

> "*New Resource Economics*: We should base our efforts upon the basic tenets of accepted economic theory, such as the axioms of consumer choice and model of the individual as a rational agent. The *most important* role for research is to inform policy makers as to the efficient use of scarce resources.
>
> *New Environmental Pragmatism*: The natural sciences provide objective information that should be the primary basis for informing policy, but we face a communication problem. The *most important* role for research is to be pragmatic and employ whatever approaches are effective to inform the policy community about environmental problems and their solution.
>
> *Social Ecological Economics*: Environmental problems are complex, can be viewed from multiple perspectives and involve values that are often incompatible. The *most important* role for research is to understand different disciplinary perspectives and develop institutional approaches and social processes to address the interface between economics, science and policy".

The main features of the three approaches as described in Spash (2013b, 2017) and in Spash and Aslaksen (2015) are summarized in Table 1.

Table 1: Main features of the three approaches in ecological economics according to Spash

	NEP (New Environmental Pragmatism)	NRE (New Resource Economics)	SEE (Social Ecological Economics)
Origins	• Mainly outside economics, within natural sciences	• Sub-field of neoclassical economics • Mainstream interpretation of concepts originating in scientific ecology and ecological economics (resilience, non-linearity, critical natural capital, multiple equilibria…)	• Heterodox economic schools of thought (critical institutionalism, evolutionary economics) • Back to the basics of ecological economics (Georgescu-Roegen, limits to growth, Kapp, Polanyi…)
Ontology	• Need for urgent action • Usefulness of knowledge outweighs epistemological/theoretical/methodological consistency • Environmentalism as a practical problem-solving activity, not a fundamental critique of dominant structures • Simple explanations with political credibility are needed to reach policy impact	• Achieving allocative efficiency; uncovering the conditions for sustainability • Ecological economics develops the science needed to understand, model and predict the dynamics of coupled ecological–economic systems • The political economy of environmental issues is not regarded as requiring explicit attention	• A paradigm shift is needed • Need for a transformation in human understanding and relationship with the natural world toward a sense of care and respect instead of exploitation • Transformative approach • Recognition of value pluralism
Epistemology	• Pragmatism (generic sense) → No common epistemology but a common goal: science for raising awareness and prompting policy shifts • Weak transdisciplinarity	• Positivism, reductionism, methodological individualism • Theoretical resource modelling is emphasized; theoretical consistency important and expansionism of a slightly modified neoclassical framework • Multidisciplinarity	• Critical realism and constructivism (but no relativism) • Understanding complex and value-plural realities of the-economy-in-society-in-ecosystems • Need for a coherent social theory • Interdisciplinarity: linking economics with other social sciences and humanities • Post-normal science
Tools and methods	• Plural (results-oriented) • Quantification and monetary valuation (there is no current alternative, talking money is useful) • Monetary and biophysical metrics (ecosystem services and natural capital) • Stated/revealed preferences; benefit transfer • Resilience and adaptive management • Ecological footprinting	• Utilitarian approach • Atomistic reductionism • Monetary metrics • Methodology of verificationism (using models for prediction), mathematical formalism and market-based reasoning • Monetary valuation of natural capital and ecosystem services • Value transfer • Getting the prices “right”	• Incommensurability, (radical) uncertainty and unpredictability • Plural methods • Multiple-criteria analysis and metrics; biophysical, economic, social • Participatory democracy; discursive, deliberative and inclusive ethics • Co-evolutionary, institutional and historical approaches • Grounded theory

Source: the authors, based on Spash (2013b, 2017) and Spash and Aslaksen (2015).

To investigate whether these approaches appear in related scientific literature, we qualitatively assessed articles related to water issues in *EE*. While familiarity with papers on water published in *EE* makes it apparent that only a small minority of papers belong to the SEE category, assessing the relative importance of features and hard-to-categorize papers is far from being straightforward[5]. Therefore, we preferred to focus on ideal-typical cases that help stress differences.

Some articles clearly exemplify the Social Ecological Economics (SEE) approach on water issues. It is particularly the case of papers that address the issue of the social construction of water scarcity. For example, Aguilera-Klink et al. (2000) question the way water resources are defined, and consequently challenge their ontological nature. They question the naturalistic narrative of water scarcity, showing how it was socially constructed in Tenerife (Canary Islands). While their approach is, generally-speaking, rooted in the social sciences, it relies on critical institutionalism and co-evolutionary economics. They acknowledge that a transformative approach is needed if scarcity is to be faced on a long-term basis. Furthermore, they put power relationships at the heart of their analysis. As such, the paper endorses the ontological, epistemological and theoretical premises of the SEE approach. Kallis (2010) provides a co-evolutionary account of water resource development as well. He challenges the usual narrative of water development as a response to a technical problem in Athens. Likewise, Otero et al. (2011) also challenge the narrative of heroic hydraulic engineering fighting water scarcity, putting the emphasis on political and power struggles and making use of political ecology and environmental history. In addition, recent work on the "patrimonial" approach to water (Calvo-Mendieta et al., 2017) explicitly relates to SEEW as they highlight the place-based socio-political dynamics of watersheds to understand the tenets of sustainability in the water sector beyond narrow economic perspectives and capital-based approaches to sustainability.

To sum up, these papers all highlight the need for deep transformation if radical change is to be sought, adopting a historical approach to their object. Eschewing purely deductive or inductive methods, they prefer grounded theorizing or abduction (Mirowski, 1987)[6], emphasizing the political dimensions and social construction of policy issues.

Ontological, epistemological and theoretical features that echo New Resource Economics (NRE) are easy to identify. There are a number of papers which present ecological-economic modelling of water issues from mainstream market perspectives. For instance, Dellink et al. (2011) build a neoclassical computable general equilibrium model coupled with a national water quality model (integrated bio-economic modelling) to assess the consequences of water quality improvement policies on both the economy and the ecological status of river basins. Uchida et al. (2018), another example, perform a field experiment to demonstrate the virtues of a market approach for water quality improvements. The authors integrate a supply-side auction for improving water quality with a demand-side auction to fund local water quality improvements to draw supply and demand curves.

[5] Although we undertook the task of categorizing the whole set of relevant papers in an attempt to obtain clear-cut proportions, complications soon arose due to the porosity between families of EE and the high numbers of papers crossing the divide or escaping it, resulting in fuzzy quantitative results.

[6] "Abduction is the process of forming an explanatory hypothesis. It is the only logical operation which introduces any new idea; for induction does nothing but determine a value, and deduction merely evolves the necessary consequences of a pure hypothesis" (Peirce, 1934: 106).

Articles that could be representative of New Environmental Pragmatism (NEP) are not easy to identify. All the papers referring to physical metrics may be included in this category, but at the same time, research applying standard monetary valuation to "demonstrate" the value of a given water-related asset may also be included. To take just one example, Peng and Oleson (2017) assess the economic benefits of improving the water quality and associated environmental attributes of the coastal zone in Hawaii. They make use of choice experiment to derive beach recreationalists' preferences along with willingness to pay (WTP) for environmental attributes at varying levels of quality. Such work is heavily oriented toward policymaking and problem-solving and "it is all the more important that decision makers recognize the significant value of the coastline and the serious harm to the economy that takes place when natural resources are poorly managed and neglected. […] further studies should attempt to ascertain the economic costs of our impact on the coastal zone, and together use these studies to set management priorities and allocate budgets" (p. 50). A substantial number of papers in *Ecological Economics* tread the same path, attributing monetary values to water rights, improved water access, irregular water supply or other water-related goods or risks.

Nevertheless, a whole set of papers is clearly difficult to categorize. Questions rise, for example, for approaches that refer to water footprint and virtual water (e.g. Chapagain and Hoekstra, 2011), as well as for the numerous papers dealing with governance issues (e.g. Thiel, 2014). One can, for instance, find papers which do not relate at all to the literature published in *EE* but which propose new avenues for research in the field of water management based on an interdisciplinary approach. Such is the case of the paper published by Bark et al. (2016), which is methodologically related to the field of socio-hydrology and presented as a means to address water issues through sustainability science in the Anthropocene (Sivapalan et al., 2014). The paper is clearly distinct from NRE, since it addresses the social dimensions of water management in the Colorado river basin without implementing the theoretical and methodological tenets of NRE. The qualitative methodology (media analysis) and the issues addressed in the paper (understanding the conflicts between stakeholders and the social values at stake) bring it closer to a SEE framework even if power relationships are not addressed... Finally, to what extent does the paper relate to the so-called NEP camp? It explicitly addresses the role of ecosystem services but their monetary value is not addressed by the authors and consequently their methodological approach fails to fit in with the NEP approach.

An article by Le Blanc and Perez (2008) which analyzes the relationship between rainfall and human density in Sub-Saharan Africa is another case. It combines climate change scenarios with data on density and rainfall presented in a Geographical Information System. The authors do not position their research in terms of ontological and epistemological issues regarding ecological economics or water resources management issues. Water scarcity is not presented as a social construct, but it is defined through statistical data. The mainstream economic toolbox is not mobilized when identifying "tense zones" which combine high levels of demographic pressure and reduced rainfalls due to climate change. However, as mentioned by the authors in their conclusion, "In cases of gross imbalances between water supply and demand, one of the two must adjust in the long run. Thus, either supply has to be augmented through technological investments (…), or densities have to adjust downwards by virtue of migrations from tense zones." (Le Blanc and Perez, 2008: 335). Such considerations do not segue with a strictly SEE approach.

To underline the difficulties of categorizing the research published in *EE* on the topic of water, one last example is the article by Skurray (2015) which mobilizes a methodology inspired by E. Ostrom's research. The topic of the paper is collective action and institutional analysis of groundwater governance in Western Australia. The focus on collective action and institutions is clearly similar to the approach developed by SEE. However, as in most papers mobilizing Ostrom's framework, there is a rejection of market-based solutions to govern common-pool resources even though the author refers to the costs and benefits of an institutional choice, and takes into account the norms and discount rates of appropriators which determine how "individuals weight their own assessments of benefits and costs" (Ostrom, 1990: 205). This kind of work is thus heavily marked by methodological individualism, far from the methodologies adopted by the heterodox schools of thought, which are at the heart of the theoretical consistency claimed by Spash when he deals with SEE.

As a preliminary conclusion, it may consequently be affirmed that Spash's three camps are not easily distinguishable in the sub-field of the ecological economics of water. Some methods (e.g. elicitation of WTP) or concepts (e.g. water footprint, virtual water) cannot be directly affiliated with any of the three categories. Some articles can be singled out as archetypes of each approach, but others are either at the intersection of several approaches or not even within the scope of categorization. This explains why we need to complement purposeful selection with statistical analysis of what the most salient themes and approaches are. Limiting the investigation to *Ecological Economics* suffices to show the diversity of approaches, find exemplifications of the three camps and identify a mass of papers that cross or challenge boundaries. However, if the ecological economics of water are to be characterized in a richer and more accurate way which allows us to scrutinize differences and overlaps with mainstream economics of water, we need to broaden the scope of enquiry to other academic journals related to EE and ERE.

4. Mapping the field of ecological economics of water

In order to compare the EE and the ERE discourses in the field of water and bring to light their respective specificity, we used specificity calculation and correspondence analysis.

The specificity calculation of the whole corpus reveals that the two types of discourse are significantly distinct (grey cells in Table 2). The three most specific forms characterizing the EE discourse on water marked by stars ("governance", "sustainability", "ecosystem services") appear to be some of the less specific forms in the two ERE journals. Conversely, the three most specific forms characterizing ERE discourse marked by double-stars ("choice", "price", "optimal") appear to be some of the less specific forms for the three EE journals. This first opposition having been brought to light, the analysis reveals a strong homogeneity in the ERE discourse and confirms the results of Spash and Ryan (2012), in contrast to the ecological economics discourse which appears more heterogeneous regarding sources. The scores of forms associated to each source consolidate this first assertion (Tab. 1): the metric dimension ("water_footprint", "cubic_meters" for instance) is associated to *EE* whereas *EPG* and *EV* are more policy oriented (for example, the form "governance", highly specific to the EE discourse, appears to be one of the less specific forms for the *EE* journal).

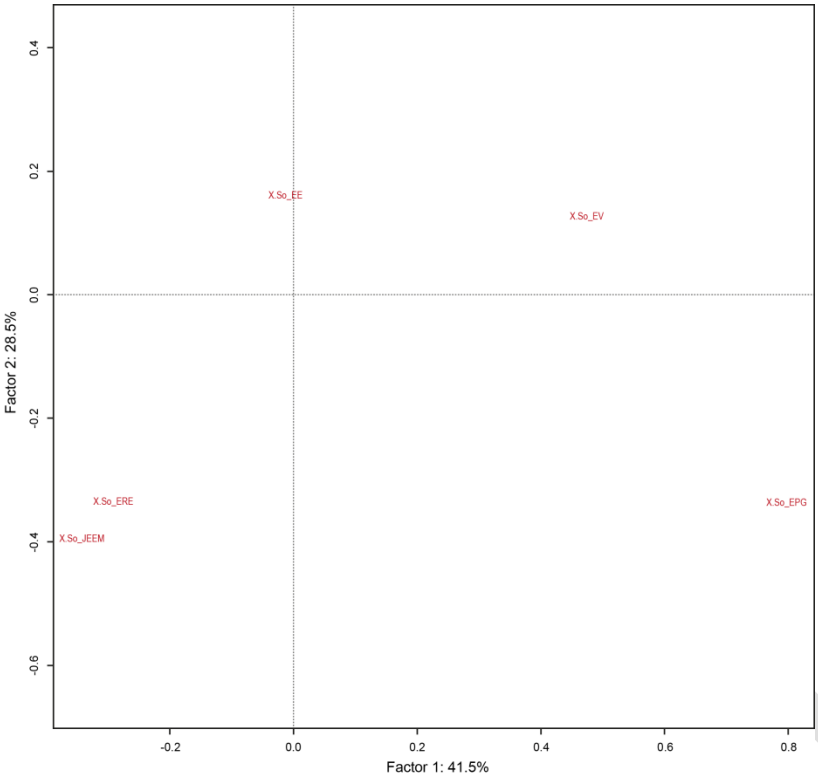


Figure 2: Mapping the corpus. Correspondence analysis displays the distance of the sub-variables (journals' title acronym) for the variable "source" (So).

The relative homogeneity of the ERE discourse and the heterogeneity of EE appears quite clearly thanks to correspondence analysis that reveals the relative position of each source regarding their respective significant terminology (Fig. 2). Statistical associations of forms and sources are expressed considering the two main factors that explain the inertia in percentage (here, factor 1= 41,5%; factor 2= 28,5%, *i.e.* 70% of the variance is explained). The meaning of factors should not be accorded too much consideration as it would be somewhat reductive to synthetize information of almost one thousand abstracts by two terms. Nevertheless, we assume that factor 1 discriminates between sources from quantitative and metric approaches (left) and more qualitative and policy-oriented ones (right). Factor 2 seems to discriminate ecological approaches (top) from more generic ones (bottom).

EE is at the crossroads of the two axes and thus the journal would appear to stand in an intermediate position between standard environmental approaches (*ERE* and *JEEM*) and the two other journals of the EE field which appear to be more qualitative and policy-oriented (*EPG*), even more radical regarding heterodoxy (*EV*). This result is consistent with research that reveals the heterogeneity of EE discourse, and its relative proximity to environmental economics when considering only the *EE* journal (Plumecocq, 2014).

Ecological economics		Journals EE		EPG		EV		Environmental economics		Journals JEEM		ERE	
governance*	21.2	ecosystem_serv.	25.7	governance	74.3	nature	34	choice**	45	plant	15.6	choice	30.9
sustainability*	18	economic	20.1	eu_wfd	47.5	moral	14.9	price**	37.1	demand	12.2	price	25.7
ecosystem_serv.*	15.8	land	17	implementation	46.9	ethic	12.4	optimal**	24.8	pollution	11.6	optimal	15
economic	14.4	food	15.2	directive	46.1	aware	9.9	market	24.2	treatment	11.5	abatement	13.9
plan	13.1	water_footprint	15.1	participation	40.1	expert	8.4	pollution	22.3	technology	9.8	experiment	13.3
sustainable	11.6	ecosystem	14.7	european_union	37.3	concept	7.2	experiment	18.9	market	9.4	tariff	12.7
energy	10.5	agricultural	14.1	policy	31	place	6.3	abatement	16.8	pump	8.6	market	11.9
virtual_water	10.5	service	11	process	30.4	claim	5.9	preference	13.8	evidence	8.2	preference	11.6
land	9.7	farm	12.2	european	29.3	discourse	5.7	welfare	13	compliance	8	pipe	11.2
water_footprint	9.6	input_output	11.4	plan	27.9	acceptance	5.6	demand	12.6	violation	7.9	wtp	10
ecosystem	9.5	soil	11	actor	27.5	argue	5.4	game	11.1	choice	7.8	transfer	9.6
watershed	9.3	ecological	10.7	integrated_water	23.1	science	5.3	effect	10.8	drinking_water	7.8	error	9.2
development	8.5	wetland	10.4	resources_manage.	23.1	normative	4.8	tax	10.6	regulator	7.5	welfare	9.1
participation	8.3	production	10.2	learn	21.2	landscape	4.8	marginal	10.6	price	7.3	manufacture	9.1
food	8.3	watershed	8.5	management	16.3	gas	4.7	permit	9.9	groundwater	7.1	pollution	9
management	7.9	energy	8.4	participatory	12.2	think	4.6	specification	9.9	inspection	6.9	selection	8.6
perspective	7.4	cubic_meters	8.3	adaptive	12.1	development	4.4	information	9.8	partnership	6.9	specification	8.4
socio	7.3	sustainability	8.3	collaboration	11.7	emerge	4.4	test	9.7	information	6.8	estimate	8.3
ecological	7.2	restoration	8.2	collaborative	11.6	community	4.2	model	9.7	arsenic	6.7	permit	7.4
landscape	7.1	choice_experiment	8.1	river	11	phase	4.1	groundwater	9.7	effect	6.4	sample	7.3
participatory	6.8	virtual_water	7.8	multi_level	10.5	virtual_water	4	tariff	9.6	solution	6.3	attendance	7.3
social	6.7	water_scarcity	7.7	challenge	10.2	paradigm	3.9	tradable	9.6	behavioural	6.3	congestion	7.3
restoration	6.7	area	7.6	charge	9.4	perspective	3.9	estimate	9.5	spend	6.3	tap	7.2
wetland	6.7	agriculture	7.3	social_learning	9.3	PES	3.6	selection	9.2	externality	6.2	trip	7.1
farm	6.5	consumption	7.3	practice	9.3	success	3.5	household	8.9	optimal	6.1	heterogeneity	7
actor	6.5	scenario	7.2	nitrate	8.4	act	3.5	water_quality	8.9	neighbor	5.5	game	6.8
implementation	6.5	socio	7.1	basin	8.4	technological	3.5	manufacture	8.8	clean_water_act	5.5	marginal	6.8
agricultural	6.5	sustainable	7	Integration	8.1	trade_off	3.2	pipe	8.4	corn	5.5	bias	6.7
analysis	6.3	dollar	6.8	relation	8.1	policy	3.1	discrete	8	enforcement	5.3	meter	6.6
integrate	6.2	crop	6.6	legislation	7.9	material	3	risk	8	response	5.2	model	6.5
framework	6.1	optimal**	-13.5	cost	-8.6	cost	-1.7	heterogeneity	7.9	plan	-4.8	water_footprint	-6.1
input_output	6	pollution	-13.7	trade	-8.8	household	-1.7	empirical	7.8	eu_wfd	-5.3	virtual_water	-6.7
soil	5.8	implementation	-13.9	price**	-10.3	market	-1.8	cancer	7.8	farm	-5.3	development	-7.4
case_study	5.7	european	-14.1	household	-10.7	wtp	-2	corn	7.7	sustainability*	-5.3	sustainable	-7.5
stakeholder	5.5	price**	-16.1	production	-10.8	production	-2.1	tap	7.7	forest	-5.6	plan	-7.9
basin	5.5	directive	-18.3	benefit	-11	result	-2.4	evidence	7.5	service	-5.8	ecosystem_serv.*	-7.9
institutional	5.4	eu_wfd	-18.5	value	-12.3	price**	-2.7	treatment	7.5	economic	-5.8	economic	-8.2
process	5.3	governance	-19.2	wtp	-12.4	pollution	-2.9	sample	7.2	wetland	-6.2	energy	-9.4
cubic_meters	5.3	european_union	-27.6	estimate	-15	estimate	-2.9	elasticity	7.1	governance*	-6.2	sustainability*	-12
practice	5.3	choice**	-28.8	model	-20.4	model	-4.2	externality	7	ecosystem_serv.*	-8	governance*	-14

Table 2: Specificity scores of forms. The scores indicate the most specific forms for the two types of discourse (ecological economics and environmental economics) and detail the most (and less) specific forms for each source. The stars help to identify major cross oppositions between the two sub-corpus.

This statement becomes more obvious when the discourse contained in *EE* (Table 3) is compared with the discourse of the EE sub-corpus (Table 4). This is possible thanks to a descending hierarchical classification method that differentiates several partition levels to identify contrasted profiles of semantic classes, (also called "lexical worlds"), of meaning-carrying words (full-words) (Reinert, 1995) (see Appendix A). Table 3 presents the chi-square ($\chi 2$) that assesses the significance of co-occurrences between a full-word and a semantic class. The most significant class (class 1, 33.3% of utterances, i.e. segments of abstracts) is related to water management and policy whereas the second most significant class (class 3, 31.6% of utterances) is dedicated to water use and pollution, mainly in the agricultural sector. These two classes are more topical whereas the two other classes refer more directly to methods and more particularly to valuation: classes 2 (14.4% of utterances) is mainly related to physical metrics ("volumes traded", "water footprint", "blue" and "green water"), whereas class 4 (20.6% of utterances) is related to modeling and monetary valuation (here, value refers to economic value). Tab. 4 confirms the affirmation that among the three journals, *EE* (-465.6) appears to be relatively less associated to terminology linked to management, policy and institutional dynamics (class 1), contrary to *EPG* (363.4) and *EV* (87.6). For the three other classes, the rank is the same and *EE* scores first. Class 2 refers to agricultural water use and pollution. Note that the form "cost" is mainly related to soil degradation and eutrophication linked to pollution related to agricultural activity. The last two classes refer to metrics: monetary valuation for class 3, physical metrics for class 4.

At this stage, three interim results may be presented. Firstly, whereas economics journals (either ERE journals or core economics journals) have declined in the cited and citing *EE* lists (Costanza et al., 2016), the discourse related to the standard approach, or NRE, appears clearly as a component of the EE discourse. Specific forms that clearly echo ERE ("willingness to pay", "contingent valuation", "preference", "valuation", etc.) are well scored in EE discourse (Tab. 4). Note that this kind of discourse is mainly to be found in the *EE* journal (Tab. 3). Secondly, the analysis reveals that the language of NEP is ubiquitous within the EE field (class 4 in Tab. 4). *EE* largely contributes to this specific discourse related to metrics (class 2 in Tab. 3). Nevertheless, a look at typical forms associated to this kind of approach reveals that this discourse cannot be limited to a specific class: "ecosystem services" is attached to class 1 (18.9) and to class 4 (15.5), as well as "payment for environmental services" (21.9 in class 4). This reinforces the idea that this approach, though predominant, is nevertheless particularly difficult to delineate. And finally, it is difficult to clearly identify a SEE discourse, as flag forms which could illustrate this approach are not well scored within the community's discourse. A finer-grained exploration of the complete table reveals that forms such as "social", "multi-criteria", "conflict", "equity", "socio/social ecological economics", "political ecology", etc., are characteristic of the same classes (class 1 in table 3; class 1 in table 4). A look at the encoded variable related to the first author of papers (*auth_) confirms this statement: the modality *auth_Spash (i.e. author Clive Spash) is relatively more attached to the same class of the EE sub-corpus. For the case of *EE*, first authors such as Giorgos Kallis, Ray Ison and Iratxe Calvo-Mendieta are also associated with the first class. We may thus assume that the SEE specific discourse has to be found here. Nevertheless, as this class is topical and refers to management and policy, it could also refer to other approaches, and particularly to NEP.

Class 1 (33.3%)		Class 2 (14.4%)		Class 3 (31.6%)		Class 4 (20.6%)	
Forms	**χ2**	**Forms**	**χ2**	**Forms**	**χ2**	**Forms**	**χ2**
management	169.4	input_output	484.8	crop	108.3	wtp	428.7
policy	148.7	water_footprint	386.5	increase	103.6	contingent_valuation	259.2
stakeholder	104.2	virtual_water	361.2	agriculture	93.8	benefit	215.0
governance	100.9	consumption	333.6	soil	86.9	preference	189.7
action	97.6	Trade	305.9	water	74.9	value	183.3
plan	91.2	footprint	187.9	emission	74.1	choice_experiment	150.8
decision_making	88.5	Export	180.8	production	68.1	valuation	142.0
transaction_costs	78.9	Import	175.6	nitrogen	66.4	transfer	139.8
process	77.8	Energy	160.4	income	63.1	meta	118.8
framework	77.8	Product	159.7	million	58.8	fish	118.7
decision	77.4	international_trade	141.7	irrigation	56.9	survey	114.3
social	74.9	ecological_footprint	139.9	productivity	55.9	estimate	103.7
eu_water_framework	71.1	Embody	117.7	phosphorus	55.3	respondent	101.7
design	65.2	water_scarcity	114.7	agricultural	53.4	invasive	87.2
research	61.9	blue_water	107.3	water_demand	52.9	recreational	85.0
collective	61.6	Chain	105.3	climate_change	50.2	water_quality	84.9
provide	60.0	Volume	105.3	industry	47.0	specie	81.2
common_pool	58.6	Global	98.5	growth	46.8	lake	80.4
institutional	58.4	Food	92.0	continue	45.5	angler	77.3
evaluation	56.1	Account	90.8	pollution	43.5	habitat	72.5
participatory	55.0	domestic	83.8	low	42.8	random	71.8
uncertainty	54.0	Unequal	83.4	urban	42.2	sample	68.7
participation	53.9	green_water	81.9	loss	41.5	marine	67.5
context	52.0	Coffee	77.4	area	41.4	attitude	66.9
multiple	51.5	Spanish	77.3	wastewater	41.3	recreation	57.8

Table 3: Descending hierarchical classification for the *EE* journal (592 abstracts). The percentages indicate the weight of each class. The chi-square (χ2) assesses the significance of co-occurrences between a full-word and a semantic class (the significance threshold is set to 3.84, i.e. there is a 0.05% chance of random association).

Class 1 (37.1%)		Class 2 (28.9%)		Class 3 (15.5%)		Class 4 (18.5%)	
Forms	**χ2**	**Forms**	**χ2**	**Forms**	**χ2**	**Forms**	**χ2**
management	209.9	Cost	157.6	wtp	419.4	consumption	453.4
governance	184.6	Farm	125.8	contingent_valuation	247.7	input_output	347.9
policy	157.0	Crop	110.4	value	223.0	energy	320.3
process	118.8	Soil	103.8	fish	205.4	trade	296.6
social	108.3	Agricultural	93.0	specie	183.8	virtual_water	293.2
framework	107.0	Nitrogen	92.4	meta	183.1	water_footprint	285.2
action	87.7	Irrigation	87.0	choice_experiment	170.7	product	168.3
research	81.5	Nutrient	82.5	transfer	165.0	food	148.4
decision_making	79.1	Reduction	81.6	preference	143.5	export	144.7
approach	74.0	Increase	76.6	valuation	137.3	import	134.6
context	73.9	High	70.2	benefit	135.8	economy	107.5
collective	70.1	Phosphorus	69.9	estimate	132.8	global	99.3
plan	69.1	Loss	67.2	recreational	123.5	final	98.2
stakeholder	66.3	Subsidy	65.1	dollar	120.1	material	94.7
institutional	64.1	Farmer	64.6	marine	113.6	sector	91.0
institution	63.7	Load	63.6	hedonic	111.6	country	90.4
political	63.5	Land	63.1	random	97.1	volume	88.9
actor	63.3	climate_change	59.6	lake	96.8	embody	86.9
learn	63.3	Dynamic	58.4	invasive	96.1	water_scarcity	86.8
concept	62.3	Irrigate	55.4	angler	91.6	production	85.0
environmental	62.0	groundwater	55.4	recreation	85.2	domestic	82.2
participatory	59.7	Agriculture	55.0	water_quality	84.1	blue_water	79.7
common_pool	59.7	non_point	53.0	logit	79.8	footprint	76.9
transaction_costs	58.6	Low	51.7	non_market	75.5	international_trade	75.9
nature	57.5	Model	51.5	survey	74.5	growth	74.3
dollar	-45.7	management	-30.9	energy	-21.9	farmer	-25.6
agricultural	-57.3	virtual_water	-31.9	development	-22.2	governance	-25.8
crop	-58.0	consumption	-33.8	crop	-22.2	valuation	-28.0
household	-59.5	input_output	-34.2	cost	-24.7	ecosystem_services	-29.0
total	-61.2	Analysis	-35.1	production	-24.9	wtp	-31.4
trade	-70.2	contingent_valuation	-36.2	trade	-25.6	cost	-31.5
consumption	-74.9	Valuation	-36.8	environmental	-31.9	value	-41.3
increase	-75.6	Wtp	-36.9	policy	-34.7	policy	-46.5
production	-75.9	Process	-41.9	agricultural	-34.9	benefit	-50.7
estimate	-79.4	Governance	-42.4	water	-44.1	management	-55.8
***So_EPG**	**363.4**	***So_EE**	**111.5**	***So_EE**	**58.4**	***So_EE**	**54.7**
***So_EV**	**87.6**	***So_EV**	**-28.1**	***So_EV**	**-14.0**	***So_EV**	**-3.9**
***So_EE**	**-465.6**	***So_EPG**	**-79.5**	***So_EPG**	**-42.4**	***So_EPG**	**-52.4**

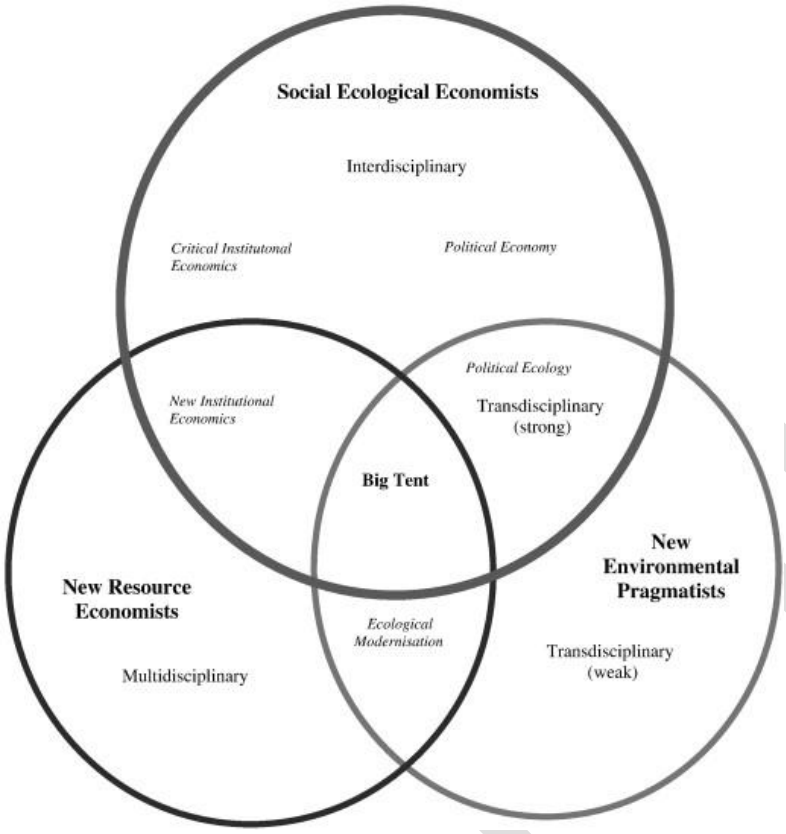
Table 4: Descending hierarchical classification for ecological economics discourse (*EE*, *EPG*, *EV*). (701 abstracts). The percentages indicate the weight of each class. The chi-square (χ2) asses the significance of co-occurrences between a full-word or a source (*So) and a semantic class (the significance threshold is set to 3.84, i.e. there is a 0.05% chance of random association).

5. Discussion: strengthening pluralism in ecological economics of water

5.1. Reconsidering clear-cut partitions

The results presented in the two previous sections lead to discussion as to the relevance of the partition of the ecological economics community as framed by Spash (2013b). Furthermore, the comparison of discourse in the literature dedicated to water resources issues in the EE publications, on the one hand, and in ERE journals, on the other hand, raises several questions regarding the potential mainstreaming of ecological economics discourse. In this respect, it is useful to come back to the diagram presenting the three camps within the EE community (Spash, 2013b).

Figure 3: Ecological economics in three camps

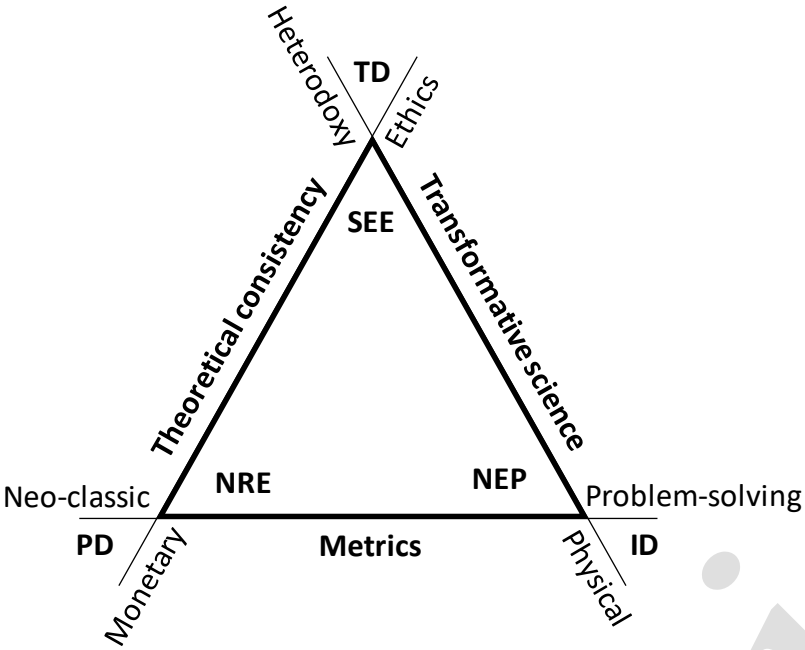


Source: Spash, 2013b: 354.

We consider Spash's attempt to define and circumscribe approaches within the field as particularly relevant, due to its focus on theoretical and methodological consistency of research. Nevertheless, in his diagram (Fig. 3), the three "camps" are represented by three interconnected circles which present the various options but, paradoxically, there are also several overlaps between the three camps and these overlaps seem to represent only a small share of research. Our study of the water resources field suggests a rather different picture, since a majority of the papers studied tend to come under these overlaps while relatively few papers can be stamped as pure SEE, NRE or NEP, which can be considered as ideal types (Weber, 1949) (see Section 3).

These elements suggest that, instead of depicting the community through a Venn diagram with small overlaps (suggesting limited common denominators), an alternative option would be to represent the ecological economics community, in the field of water at least, as a "big tent" (Howarth, 2008: 269) with three poles. We propose to represent the EE community as a triangle (Fig. 4), by keeping the three approaches well identified but nuancing their frontiers to insist on the pluralistic feature of the EE community. Admittedly, currently the tent appears too unbalanced to be stable. We advocate a rebalancing of its center of gravity by intensifying the attraction towards the SEE by densifying the third tent pole, as shown in the figure below:

Figure 4: An alternative representation of the "big tent" of ecological economists



These poles are rarely referred to in published articles. If it seems easy to distinguish SEE from NRE (particularly linked to their core theoretical foundations, neoclassical microeconomics and mainstream macroeconomics vs. heterodox economics), one may legitimately ask whether there is a clear demarcation line between NEP and NRE. This explains why this partitioning of the field (Spash, 2013b) is probably more a confrontation between various ideal types and, as already evidenced by Spash and Ryan (2012), is based on economists' self-classifications. Most of the EE community develops arguments situated between these poles, without adhering strictly to one camp which appears to be more exceptional.

Each criterion (theoretical consistency, transformative component of science, preponderance of metrics) allows us to distinguish approaches two by two along a continuum that refers to a specific criterion. For example, the nature of metrics can help distinguish pure NRE from pure NEP and reveal that most of the research that refers to metrics articulates monetary and physical metrics. Symmetrically, the transformative component of science mainly concerns SEE and NEP. While the latter addresses the urgency to solve environmental problems, the former fundamentally promotes a paradigm shift that insists on the recognition of value pluralism, "to address issues of ethics, injustice and social inequity inherent in current environmental problems with a recognised need for fundamental changes in the structure of economic systems and human behaviour, not merely problem solving" (Spash, 2013b: 358).

From an epistemological point of view, we differ from Spash and advocate distinguishing pluridisciplinarity (PD) or multidsiciplinarity (an approach that refers to several disciplines), interdisciplinarity (ID) (shaping concepts and identifying issues at the crossroads of several disciplines) and transdisciplinarity (TD) (shaping concepts and identifying issues at the crossroads of academic and citizen spheres) (Borderon et al., 2015). These three epistemological propositions are respectively attached to the ideal types of NRE, NEP and SEE. Even though interdisciplinarity and transdisciplinarity are both polysemic terms, even interchangeable at times, particularly in environmental publications (Flipo, 2017), these definitions serve to reveal a gradation of the integration of different kinds of knowledge, from purely

academic knowledge to a recognition of vernacular knowledge, from “in-vitro” to “in-vivo” science (Nicolescu, 2002)[7].

This situation calls for a new look at the debate on methodological pluralism in EE (Spash, 2012; 2013b; Lo, 2014). From a methodological point of view, the core elements mobilized by ecological economists in the field of water are at the interface between qualitative and quantitative methods, modelling and stakeholder participation, monetary and non-monetary valuation, etc. In our view, beyond the discussion on the relevance of methodological pluralism as a core foundation of EE (Lo, 2014), the coexistence of various and sometimes even diametrically opposed discourses raises the issue of the future direction of EE, particularly with regard to questions as to the dominant pole of attraction in the literature dedicated to water and whether ecological economists still have specific worldviews compared to neoclassical economists. Fig. 2 shows explicitly that environmental and resources economics journals (*ERE* and *JEEM*) present very analogous discourses. In contrast, the discourses contained in the articles published in *EPG* and *EV* (representing mostly the EE discourses) break away from mainstream economics. The *EE* journal, however, occupies an intermediate position between mainstream ERE and EE, thus suggesting that these two camps – EE on the one hand, and ERE on the other– operate as magnets to the EE community.

We consider that there is a need to ascertain the specificity of a non-neoclassical and social-sciences-oriented approach to water issues by identifying possible foundations for a social ecological economics of water (SEEW) that could help strengthen pluralism within the field of ecological economics of water.

5.2. Shaping a social ecological economics of water

Recognizing the ontological particularity of water

A SEEW should consider at least four components of water: territorial, ecological, social (institutional and political contexts), technical/infrastructural. Water has to be seen as an “eco-social asset” (Aguilera-Klink et al., 2000) which is part of a “hydrosocial cycle” (Swyngedouw, 2009). Indeed, water and society are not only interlinked but also hybrid components of a socio-natural process by which they “make and remake each other over space and time” (Linton and Budds, 2014: 175). The concept of a hydrosocial cycle reflects the desire to to adopt a holistic perspective by considering the hydrological water cycle and the social dimensions attached to it as a closely imbricated whole. This perspective strengthens the need to analyze power struggles inevitable in any decision-making process given that the natural dimension and social dynamics are an entangled whole. In line with its ontological nature, water is also considered as a common heritage, a patrimony viewed as “a mixture of *being* and *having* in common” (Calvo-Mendieta et al., 2017: 127). In view of which identity-based interactions between the actors and the space involved take on considerable importance.

“Valuations are always with us” (Myrdal, 1978: 778): theoretical foundations

A SEEW should assume value pluralism. As environmental values refer to ethics, they are most often incommensurable (Vatn, 2005). Merging the historical institutionalism with the sociological one helps grasp the cognitive dimension of value-articulating

[7] These definitions are in line with the “Charter of transdisciplinarity” written by Edgar Morin and Basarab Nicolescu in 1994 (De Freitas et al., 2014).

institutions (Vatn, 2009) and the need to find deliberation mechanisms to address the value of natural assets from a pluralistic viewpoint (Howarth and Zografos, 2008): the projected intentions (which echo Commons' "futurity" principle)[8] regarding identified objects are linked to (individual and collective) actors' "regime of justification" (Boltanski and Thévenot, 2006). Even if discussion of arguments invoked by the various protagonists involved in coordination processes does not occult power relations, it is a first step towards bringing them into the open. As such, Douai and Montalban (2012) advocate greater consideration of power relations, interests and political compromises. Hence, it is possible to envisage that ecological change may eventually result from a change in the balance of power in favor of groups who promote action on ecological issues. Change must necessarily result from a collective action (Commons, 2005 [1934]), and thus from a struggle.

Some methodological guidelines

The methodology in line with such ontological and theoretical milestones should be pluralistic, interdisciplinary and reflexive (Seawright, 2016; De Marchi et al., 2000). Water as an eco-social construct (situated in time and in space) cannot be correctly understood by monistic approaches (e.g. price-quantity). Alongside methods from the domain of economics, methodological tools borrowed from hydrology, geography, psychology, sociology, political ecology, etc. serve to underscore the nature of water as a complex object (Schulz et al., 2017). A SEEW should not restrain itself to qualitative or quantitative analyses, nor should it be obliged to choose between methodologically individualistic or holistic approaches as both scales proceed from two different temporalities. Quantitative analysis is essential to identify trends in water withdrawal and consumption over a certain territory and at a certain level of the hydrosocial cycle. It may also help characterize water extractions, the dynamics of supply and demand, the share of different uses in total water use, etc. It also serves to sketch the water metabolism of a territory or a political entity (Madrid et al., 2013, Madrid-López and Giampietro, 2015). However, quantitative analysis, whether monetary or not, is clearly not self-sufficient in the light of SEEW's principles. Water footprint analyses are relevant only if they are connected to more qualitative and dense descriptions of local/regional realities and if they are placed in their institutional and political context. Qualitative work is primordial to gaining insight into the meaning actors give to their choices and actions, understanding norms and conventions, grasping the cognitive dimensions of their relation to water, and disentangling the complex interplay between all these factors. In sum, to unveil the justification regimes that drive claims for certain compromises and/or distribution of power related to water (Buchs, 2018; Crow-Miller, 2015). Furthermore, a SEEW implies articulating theory and in-depth field-work to gain grounded insights on the reality under study. The different tools used by geographers, sociologists and anthropologists are all indispensable towards this end (Boelens, 2014; Lorrain and Poupeau, 2014; Nelson and Finan, 2009). Inspired by philosophical pragmatism (Peirce, 1934), abduction offers an alternative to inductive or deductive methods and transcends the traditional opposition between experimental and normative science, on the one hand, and holism and individualism, on the other (Dupuy et al., 2015). It enables greater articulation between theoretical and empirical moments during the investigation. One way to articulate quantitative analysis with institutional descriptions, while at the same time taking into account field work and historical depth and is to construct "stylized facts"

[8] Futurity can be briefly summarized by the idea that "man lives in the future but acts in the present" (Commons, 2005 [1934]: 58).

from a regulationist perspective (Zuindeau, 2007; Chester, 2010; Buchs, 2016) In other words, analyse what the regulation modes (institutions) and growth regimes within which specific hydro-social configurations take place. In which case, long term quantification of economic and ecological data may prove to be useful.

6. Conclusions: equilibrating the poles

In this paper, we have developed a two-pronged strategy to explore the literature on water in the field of ecological economics in order to put to test Spash's (2013b) delineation of the discipline between new resource economics, new environmental pragmatism and social ecological economics. More specifically, we have sought to identify the place occupied by the latter current, which is more in line with our own approach to ecological economics. Two major results emerge from the analysis, the first one related to the field of water studies and the second to the field of ecological economics as a whole and a discussion as to its characterization.

Regarding the field of water, it would appear that, while publications in *Ecological Economics* show articles clearly relating to new resource economics and social ecological economics, the identification of work pertaining to new environmental pragmatism is proves to be more complex. Furthermore, most articles published in this journal positions themselves at the intersection between these currents, or even outside their clear-cut boundaries. The textual analysis carried out on a corpus spanning articles published in several academic journals in the fields of ecological economics (*EE*, *EPG* and *EV*) on the one hand, and environmental and resource economics on the other hand (*JEEM* et *ERE*), reveals a degree of relative homogeneity in the way water issues are addressed in these two mainstream journals, but great heterogeneity as far as the three ecological economics journals are concerned. *Ecological Economics* appears, from this standpoint, as positioned at the interface between standard approaches and more critical visions of the ecological economics of water. A more detailed analysis of the several classes of articles, grouped by keywords, demonstrates that four classes are identifiable and that some of them largely cross the divide devised by Spash.

Taking the field of water as a heuristic device, the results we obtained allow us to draw some conclusions regarding the broader field of ecological economics. Indeed, our exploration of the ecological economics of water warrants a slightly different representation of the field of ecological economics from the one representing the field through three secant circles, implying that the three currents encompass the virtual entirety of work in the field of ecological economics and that intersections between approaches are less important quantitatively than the common denominator (the intersection between the three circles stamped as the "Big Tent"). While Spash and Ryan's (2012) investigation relies upon self-stated categorizations and, in a way, narrows down the scope of classes through explicit statement of the three "camps", our approach (which we consider to a large extent complementary to Spash and Ryan's) focuses on published peer-reviewed papers and actual rather than declared practices in the field. Though our work confirms some of their results (the field of ecological economics is highly heterogeneous compared to the corresponding mainstream, and a significant number of works cross boundaries), we advocate an alternative representation of the field. We judge it preferable to consider that Spash's currents are ideal-types, attraction poles that put diverging visions of ecological economics (and beyond) into tension but to which authors in the field of water seldom refer to in an exclusive way. We thus propose to represent the field of ecological economics in the form of a triangle where each current constitutes a pole, and where

what distinguishes currents in pairwise comparisons is (1) the kind of metrics used, (2) the transformative nature of science, and (3) theoretical consistency. All this leads us to recognize methodological pluralism as a defining feature of the field of ecological economics, at least with regard to the domain of water. Nevertheless, pluralism is no advocacy for *status quo*; on the contrary, it is an invitation to strengthen the social ecological economics pole of the triangle in order to counter dominant "mainstreaming" tendencies in the field. We have, as such, made some recommendations in this direction in the hope that other ecological economists, whatever their specific line of enquiry, will also tread the same path.

Mindful of the preliminary nature of our findings, we advocate complementary work in several directions. Firstly, we encourage further work in the field of ecological economics through the perspective of other research topics and alternative sets of academic journals to gather further insights into topical specificities in ecological economics and more nuanced views of the field. Secondly, more work is also needed to craft a theoretically consistent social ecological economics of water to enable the 'pole' to acquire firm foundations. And finally, we would like to express the hope that inter-camp ontological, epistemological and methodological discussion will advance fruitful and respectful pluralism in the field of ecological economics.

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Appendix A. Methodology of statistical textual analysis

The open-source textual statistics software IRAMUTEQ is an exploratory method characterized by a low researcher prior intervention (except "cleaning" and corpus formatting). Among the several methods of text mining it couples, in this paper we mainly refer to the Alceste algorithm (Max Reinert's method). Its general objective is to study the statistical distribution of "full-words" (meaning-carrying words distinct from syntax-related "tool-words") in a given corpus. It is based on a descending hierarchical classification method, an iterative procedure aiming at differentiating several partition levels to identify classes of units with contrasted profiles. These classes are called "lexical worlds" (Reinert, 2003). This method is in line with the pragmatist Charles Sanders Peirce since the selection of full-words leads to focus on the relation of the sign to the object (Defalvard, 2005). It states that meaning lies by the co-occurrence of the full-words and by the resonance effect between them due to the content (associative aspect) (Reinert, 2003).

Starting from the identification of the initial contextual units (ICUs) which are the natural divisions of the corpus (here, the abstracts), the software segments the corpus into "elementary contextual units" (ECUs) of equivalent size. These "elementary units of speech" that gives the discourse its meaning, also called "utterances" (Habermas, 1976: 26), constitute the essential statistical units. The software will then construct a "complete lexical table", i.e. a contingency table, by crossing these utterances (ECUs) and lexemes obtained from lemmatized full-words (operation which consists in replacing a textual form by its standardized reduced form). The lexical table, filled with "0" and "1", function of the absence or presence of the full-word in the ECU considered, is the result of a disjunctive partition of UCE that maximizes inter-class variance considering the lexemes contained in these UCEs (Jenny, 1999) (see Table 1). Finally, context units (UC) or classes are calculated by concatenating ECUs (see Table 3).

Indeed, the terminology of a class appears specific only insofar as it opposes another terminology (Defalvard, 2005: 385). Each terminal class refers to the most characteristic full-words whose repetition in the UC draws an ideal-typical "lexical world". Indeed, the simultaneous presence of full words in the same EC is the possible trace of content (Reinert, 2003: 403). A chi-square test measures the significance of the association between a full-word and a semantic class (a chi-squared value of 3.84 corresponds to a probability of 0.05% that the association of a word to a certain class occurred randomly) (DelCorso et al., 2015: 95).

Table 1. Complete lexical table

	Full-word1	…	FWi	…	FWn
ECU1	α11		α1i		α1n
…					
ECUj	αj1		αji		αjn
…					
ECUm	αm1		αmi		αmn

Note: αij = {0,1} $\forall$ j = 1,…, m et $\forall$ i = 1,…, n.
Source: based on Defalvard (2005 : 385).

Table 2. Corpus partitioning

ICUs					
ECU1	ECU2	ECU3	ECU4	ECU5	ECU6
UC1		UC2			UC3

Source: Image (2006 : 3).

Appendix B. Corpus formatting

Figure 1. Preview of the formatted corpus (962 abstracts)

**** *PY_2006 *So_EE *Type_ecolo *auth_Iovanna_R
-*title
Clean water, ecological benefits, and benefits transfer: A work in progress at the US environmental_protection_agency
-*abstract
Economists at the United_states environmental_protection_agency (EPA) are regularly called upon to assess the anticipated benefits and costs of rules proposed to implement environmental legislation.

These laws reflect a concern for both human and ecological health, and the increased flow of ecosystem_services is a significant source of benefit. This is particularly true for the Clean_water_act (CWA), one goal of which is to safeguard aquatic habitat. Because the cost_benefit analyses must be completed within mandated deadlines, the approaches taken to assess benefits are often expedient ones that have already survived the gauntlet of review both within and outside the agency. This engenders a strong bias toward the benefits transfer approach and particular variants of it. In this paper, we review how ecological benefits have been assessed for and benefits transfer applied to seven environmental_protection_agency rules issued under the Clean_water_act. We highlight common themes and point out recurring concerns. Some concerns relate to agency decisions regarding the treatment of a particular benefit category and could be dealt with relatively easily. Other concerns will require the support of an engaged research community to improve the fit of valuation studies to policy contexts and to ensure that the changes in ecological response to which benefit estimates are being transferred are accurately measured.
-*kw
benefits transfer; ecosystem_services; cost_benefit analysis; water_policy

Table 1. Encoded variables

Variable	Signification	Modalities
*PY	Publication year	All years from 1989 to 2017
*So	Source	EE; EV; EPG; JEEM; ERE
*Type	Communities or field	ecolo (ecological eco.); env (environmental eco.)
*auth	1st author's name	1st author's name

Table 2. Examples of encoded forms

Form as found in abstracts	**Encoded form**
blue water	blue_water
common pool	common_pool
cost benefit; benefit cost	cost_benefit
ecosystem services	ecosystem_services
European water framework directive; WFD	eu_wfd
m3	cubic_meters
transaction costs	transaction_costs
water footprint	water_footprint
willingness to pay	WTP