Exploring Futures for Amazonia’s Sierra del Divisor: An Environmental Valuation Triadics Approach to Analyzing Ecological Economic Decision Choices in the Context of Major Shifts in Boundary Conditions

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A B S T R A C T

This text presents a new methodological approach to ecological economic analysis, employing Georgescu-Roegen’s flow-fund theory of economic process. It offers an alternative to monetary valuation based analyses and aims to contribute toward advancing work concerned with addressing complex ecological economic questions as complete wholes. The methodology is demonstrated through reference to the empirical case of a proposed rail link between Peru and Brazil, which would cut across the Sierra del Divisor of western Amazonia, connecting the Pacific and Atlantic coasts and further opening up the Amazon commodity frontier. In order to analyze the potential impacts of the rail-link, four flow-fund representations of economic process (two at the regional and two at the local level) are developed in order to juxtapose two alternative political economy contexts that might govern the rail-link’s impacts in the region: one where conservation is prioritized over cash income and one where it is not. Our results suggest that completion of the rail-link under the current political economy context, which prioritizes cash income over conservation, is likely to have substantial negative consequences for forest conservation in both Peru and Brazil and for local livelihoods throughout the region.

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1. Introduction

One of the core methodological challenges of ecological economics was described by Costanza, in the first issue of this journal, as follows: “the need to treat integrated economic-ecologic systems with a common (but diverse) set of conceptual and analytical tools” (Costanza, 1989: 1). Both Costanza’s (1989) appeal for methodological integration and Norgaard’s (1989) complementary appeal, in that same first issue, for methodological pluralism were advanced against a particular historical backdrop, as the discourse sought to bring together ecologists and economists committed, as Nadeau (2015:106) puts it “to improving the chances for human survival.”

Early ecological economist like Boulding (1950), Georgescu-Roegen (1971) and Odum (1971), aspired to provide whole-system approaches to understanding the complex dynamics of interrelated ecological and economic processes. Whereas early contributions to the journal were almost all directly concerned with how to address that challenge, over the course of the 1990s there was a clear trend away from integration and toward specialization (Costanza and King, 1999; Costanza et al., 2004), followed in the early 2000s by a sharp increase in economics oriented contributions (Spash, 2013; Anderson and M’Gonigle, 2012). This eventually led ecological economists to revisit a long standing discussion regarding the relationship between ecological economics and environmental economics (Söllner, 1997; Spash, 1999, 2013; Ilg and Schwarze, 2009; Plumecocq, 2014; Söderbaum, 2015). The origins of that debate are well-documented (Martinez-Alier, 2010 [2002]; Røkpe, 2004; Nadeau, 2015) and it is not our intention to delve into them here. However one aspect is closely related to the work presented below: the questions if, and if so when, is it useful for ecological economic analysis to rely on monetary estimates of unpriced ecological impacts (commonly referred to as environmental externalities or social costs), which are excluded from conventional cost-benefit analyses (CBA) (Costanza et al., 1997; Nunes and van den Bergh, 2001; Farrell, 2009 [2005], 2007; O’Connor, 2006; Kallis et al., 2013). Along with this latest round of the debate there has also arisen a self-reflexive sub-discourse regarding the aims and purpose of ecological economics itself (Faber, 2008; Norgaard, 2010; Spash, 2012; Plumecocq, 2014; Söderbaum, 2015; Nadeau, 2015) and the challenges associated with developing methodologies suitable for addressing questions that are unique to ecological economics (Max-Neef, 2005; Martinez-Alier et al., 2010; Kallis et al., 2013). This has been accompanied by a re-broadening of the methodological scope of contributions to the journal in recent years. Nonetheless, monetary valuation continues to occupy a prominent position.

In keeping with the original aims that motivated the creation of this field, we understand there to be an urgent need to balance contributions
focused on monetary valuation and CBA with work that is focused specifically on improving representations of the relationships between economics and ecology. Ecological economics critiques of CBA have typically focused on its link to the logic of economic optimization, which is viewed as inappropriate for addressing certain complex ecological economics problems including climate change and biodiversity loss (Munda, 1996; Söllner, 1997; Spash, 1999, 2013; van den Bergh, 2004; O’Connor, 2006; Kallis et al., 2013; van den Bergh and Botzen, 2015; Nadeau, 2015). Here we approach the question with our attention on what we call, building on Giampietro and Mayumi (2001, 2006), the ecological economic Gestalt (the shape of the ecological economic relation, taken as a whole) by juxtaposing possible futures based on reference to alternative combinations of political economic and material boundary conditions. The new methodology we propose serves to organize the study of ecological economic metabolic patterns by combining representations of systems of value articulation (Farrell and Vatn, 2004; Farrell, 2009 [2005], 2007; Vatn, 2005) and physical accounting of societal metabolism.

In order to illustrate the proposed method, we calculate estimates for likely changes in societal metabolism related to a complex ecological economic question that might also be evaluated using CBA – estimating the potential impacts associated with building a major infrastructure project, the Transcontinental Brazil-Peru, Atlantic-Pacific Railway (Ferrovía Transcontinental Brasil-Perú, Atlántico-Pacifico [FETAB] in Spanish), that would literally cut the Amazon Forest in two by connecting the Atlantic port of Santos (Sao Pablo, Brazil) and the Pacific port of Bayovar (Piura, Peru). In place of attempting to calculate potential costs based on estimating the ‘right price’ for externalities, we calculate ecological economic estimates of the likely impacts that this radical shift in boundary conditions can be expected to have on societal metabolism. We compare four alternatives, reflecting two regional and two local manifestations of how societal metabolism in the region can be expected to change, as a consequence of the project, under two alternative sets of political economy boundary conditions: (i) prioritization of conservation and (ii) prioritization of cash income (see Table 1). In this way we employ Georgescu-Roegen’s (1971; Mayumi et al., 1998; Nadeau, 2015) critique of optimization theory to develop an ecological economic alternative to CBA, in which economic Anschauung (intuition, perspective, or purposive gaze; Georgescu-Roegen, 1971:362) rather than optimization, is taken to be the appropriate reference for predicting how an economic process will respond to changes in its context (Farrell and Mayumi, 2009; Silva-Macher and Farrell, 2014).

Table 1
Four stylized alternatives for the future of Sierra del Divisor. Source: Own elaboration based on primary and secondary data. (1) The local communities of Sierra del Divisor are subdivided in four types of economic processes: (a) the alluvial mining of some communities in the Abajúa River; (b) the fishing of Galleria indigenous community; (c) the rice production of Santa Sofia farmer community; and (d) the hunting and gathering of Isonahuas indigenous people living in voluntary isolation.

<table>
<thead>
<tr>
<th>Conservation is prioritized</th>
<th>Regional Alternative 1</th>
<th>Regional Alternative 2</th>
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<tbody>
<tr>
<td>Soybean production industry</td>
<td>Local communities of Sierra del Divisor in Peru (1)</td>
<td>Local Alternative 1 (conservation is prioritized over cash income)</td>
</tr>
<tr>
<td>Cash income is prioritized</td>
<td>The government promise of progress</td>
<td>The local communities of Sierra del Divisor continue more or less as before</td>
</tr>
<tr>
<td></td>
<td>Increased production, increased trade to China, no forest damage</td>
<td>No significant change in the structure and functions of local communities, while conservation</td>
</tr>
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<td>Regional Alternative 2 (cash income is prioritized over conservation)</td>
<td>Local Alternative 2 (cash income is prioritized over conservation)</td>
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<td></td>
<td>Amazon land degradation, increased production, trade to China and in the region, expansion of soybean production in Acre, Brazil, massive forest destruction.</td>
<td>The local communities of Sierra del Divisor have changed into Madre de Dios II</td>
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<tr>
<td></td>
<td></td>
<td>Radical expansion of alluvial mining, massive forest destruction and rivers contamination, significant changes in the structure and functions of local communities.</td>
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Although, the final route for FETAB is not yet determined (DAR, 2016), the project, should it be realized, could include connecting the Brazilian city of Cruzeiro do Sul (Acre State) and the Peruvian city of Pucallpa (Ucayali Region) via the IIRSA (Integration of the Regional Infrastructure of South America) sub-project AMA28, called Land Link (Interconexión Terrestre) Pucallpa-Cruzeiro do Sul (IIRSA, 2017), which would cross directly through the Sierra del Divisor, a large, still intact, region of the Amazon Forest. FETAB would connect Mato Grosso State, which has both the highest soybean production in Brazil (Pacheco, 2011; Salin, 2015) and a commensurately high area of deforestation (WWF, 2013) not only with Peru but also with China, the world’s top soybean importer (USDA, 2016). Soybean from Mato Grosso is currently shipped to Santos and from there, via the Atlantic and Indian oceans, to China. FETAB would make direct shipment via the Pacific possible. The national governments of China, Brazil, and Peru all support the project, which is expected to facilitate trade between the three countries (Global Times, 2015), reducing transportation costs for commodity exports to China, consisting of soybean and iron ore from Brazil, and minerals concentrates of copper and gold from Peru (International Business Times, 2015). While FETAB proposes a new route, to the north, in Peru, links between the Pacific coast and the city of Pucallpa are already well established. In Brazil, the city of Cruzeiro do Sul is linked by a poor but operational road to Mato Grosso, which is well linked to the Atlantic coast via a stable transport route to Santos.

The alternatives explored below are identified based on the likely consequences of an extreme shift in the external physical constraints (Giampietro and Mayumi, 2009) facing the actors who envision and realize the economic processes already underway in the region. While our results are highly case specific and provisional, we intend for the methodology to be more widely applicable. Whether the radical shift in boundary conditions is due to technological change, climate change or natural disaster, we may expect, in the short term, the combination of a comparatively steady set of economic purpose referents, depicted here using Farrell’s (2007) concept of environmental valuation triadics, combined with a major shift in what is materially possible, traced here over space and time using a simplified version of Giampietro and Mayumi’s (2000a, 2000b, 2009; Giampietro, 2003; Giampietro and Bukkens, 2015) accounting tool MuSIASEM (Multi-scale integrated Analysis of Societal and Ecosystem Metabolism). We anticipate that the method could also be applied in reverse, in order to explore how local collective action, by changing realized economic processes, could eventually lead to positive changes in ecological and economic boundary conditions (see e.g. Pelenc et al., 2015).
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