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Multi-scale environmental accounting: Methodological lessons from the application of NAMEA at sub-national levels

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ABSTRACT

Extending the application of integrated environmental and economic accounts from the national to the local level of government serves several purposes. They can be used not only as an instrument for communicating on the state of the environment and reporting the results of policies, but also as an operational tool – for setting the objectives and designing policies – if made available to the local authorities who have responsibility over the administration of natural resources, land use and conservation policies. The aim of the paper is to test the feasibility of applying hybrid flow accounts at the intermediate and local government levels. As an illustration, NAMEA for air emissions and wastes is applied to a Region, a Province and a Municipality, thus covering the three nested levels of local government in Italy. The study identifies the main issues raised by multi-scale environmental accounting and provides an applied discussion of feasible solutions.

1. Introduction

Environmental accounting applications and the concomitant debate focus, at present, on three different levels: the macro and sectoral level of the System of Environmental and Economic Accounts (SEEA 2003), based on the international standards for national accounts (European Commission et al., 2012); the green budgeting level that concentrates on the accountancy of public local units; and the micro level that relates to the internal accounts of private firms and enterprises. What is still missing is a standardized, rigorous framework that keeps count of natural resource use and emissions, in line with the international standards defined by SEEA 2003 and implementable also at the level of local governments. This would provide decision makers in charge of local environmental policies with instruments comparable, in terms of methodological rigour and depth of information, with those increasingly available at the level of central governments: a macroeconomic framework on the linkages between the economy and the environment applied at a local government scale.

The Millennium Ecosystem Assessment (MA, 2005), which focuses on the impact of environmental change on human well-being, forcefully stresses the significance of multi-scale assessment. Ecosystem change is increasingly understood to have causes and effects that span multiple scales, and the multi-faceted attributes of sustainability (environment, society and economy) have each a characteristic scale that varies in duration and extent. One of MA's innovations compared to other recent international assessments, typically focussing on global phenomena, is indeed the inclusion of a set of nested, interlinked assessments undertaken at local, watershed, national, regional and global scales. As a consequence the Assessment also involves different sets of institutions and stakeholders. The nested design is 'part of the overall design of the MA to analyse the importance of scale on ecosystem services

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and human well-being and to study cross-scale interactions' (MA, 2005; vol. 4:2). Conditions and trends of natural assets (e.g. water provisioning, biodiversity, pollution), it is shown, often differ between global and sub-global analyses, and some of the drivers appear to be best observed at the local scale. In several cases a relation can be identified between spatial and temporal scales, with drivers operating over large areas often associated with slower processes of change and local processes tending to take place more rapidly.

The MA experience thus conveys an important lesson for environmental accounting: assessing and monitoring natural assets at only one (typically national) scale may lead us to miss precious information and even to send misleading signals to the decision-makers who control natural assets at a different scale and have the responsibility to select the responses.

A comprehensive multi-scale assessment incorporates at least two nested levels of complete, interacting assessments allowing for cross-scale comparisons, and ought to ensure information flows across scales. And it is precisely cross-scale comparisons and flows of information between government levels that are hindered in the disjoint, non-interacting systems generated by today's diffused adoption of the SEEA 2003 accounting standard at the national level and of green budgeting procedures at the local government level.

Multi-scale assessments also pose methodological and analytical challenges, that call for substantial further studies. This paper is an analysis of the feasibility of applying a multi-scale approach to integrated environmental and economic accounting, that is to the design of systematic environmental accounting held at multiple, nested levels of government.

Even though, due to the variety of situations and capacity constraints, it may not be feasible to immediately pursue the adoption by all local governments of a rigorous unique standard of environmental accounting as is done at the national level, it should nonetheless be possible to define consistent methodological guidelines to help local authorities gradually proceed in a harmonized way both horizontally (among governments at the same level) and vertically (among governments at different levels).

The present paper argues that applying integrated environmental and economic accounts, and specifically the National Accounting Matrix including Environmental Accounts (NAMEA, one of the most widely implemented SEEA 2003 modules) at local government levels is feasible. This would allow rigorous and systematic information on the environment to become available there where an important share of the management and implementation of environmental policies takes place. We illustrate our arguments with a case study connecting the productivity and employment capacity of different economic sectors to their emissions of pollutants and production of waste. Data pertain to the Piedmont Region, the Province of Turin and the Municipality of Turin – this involving the three nested levels of local government existing in Italy. We illustrate the procedures with a level of detail which, although somewhat cumbersome, is necessary to enable replication to other contexts and identification of criticalities and possible solutions.

The paper (a) explicitly discusses the significance of extending hybrid accounts to the local government level in terms of multi-scale assessment (Section 1); (b) discusses the different objectives that can be served by hybrid environmental accounting based on the SEEA international standard with respect to the existing green budgeting approaches adopted by local governments (Section 2); (c) shows, with an actual, replicable case, the feasibility of developing rigorous hybrid environmental accounts at a local government level (Section 3); (c) highlights the main methodological differences between the compilation of environmental accounting at the national and at the local level (Section 3 and 4); (d) discusses the policy uses and the potential for further research (Section 5).

2. Integration of environmental and economic accounts at different government levels

Integrated environmental and economic accounts provide descriptive statistics that help policy makers monitor economy–environment interactions and the impact of implemented policies. The information made available by the accounting modules is also an important tool of strategic planning and policy analysis for governments pursuing sustainable development paths.[1] Among the accounting modules proposed by the SEEA 2003 framework, we choose to develop the National Accounting Matrix including Environmental Accounts, that has become the standard in the international harmonization of environmental accounting (de Haan and Keuning, 1996; de Haan, 1999). NAMEA allows analysts to investigate the individual industries' absolute and relative direct contributions to environmental pressures (and hence identify the targets of environmental policies). It does not attempt measuring economic welfare, for example trying to include benefits of ecosystem services for human well-being, but it rather assesses the environmental sustainability of economic activity as the cost of natural capital consumption (Bartelmus, 2009; Marin et al., 2012). Integrated environmental-economic accounts of the NAMEA type can also be used to evaluate the economic impact of sustainability in different environmental policy areas (Fiorillo et al., 2007).

By providing economic and environmental data in a consistent Leontief-type framework, the NAMEA is particularly suited for analytical purposes (de Haan and Kee, 2004). It can be used to reconstruct the set of pressures generated indirectly by any final product through the environmental impact embedded in upstream production processes. 'This is done by means of a computational reclassification of the activities, which are assigned to final output by product group according to their contribution (both direct and indirect) to its production. This information provides the answer to the question: the use of and demand for which goods and services causes exchange flows with nature, and in what quantity?' (Femia and Panfili, 2005:58).[2]

A significant share of environmental and natural resources policies is in most countries designed and implemented at sub-central levels of government. Municipalities, for instance, are often in charge of urban pollution control policies, and the power over land uses and protected areas is often assigned at intermediate levels (regional/provincial). Integrated environmental and economic accounts, however, until now have been developed only at the national level and are only recently starting to be extended, in isolated cases, to local governments. A few countries have tested episodic applications, on one resource or another, at one

[1] The significance of integrated environmental and economic accounting and the process by which its international standard SEEA 2003 reached its current form are described in detail for example in Smith (2007). Lange (2003) provides an in depth discussion of the policy uses.

[2] Sub-national environmental input–output analyses encounter however a limit in the availability of data, whose main feasible solution consists in regionalizing commodity-by-industry accounts from national industry-by-industry or commodity-by-commodity input–output tables, or from national supply and use tables. Several methods have been proposed for regionalizing input–output tables, discussed for example in Jackson (1998) and in Comer and Jackson (2003). Turner et al. (2007) and Wiedmann et al. (2007) review single- and multi-region input–output models used to assess environmental impacts of internationally traded goods and services.