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Natural capital accounting perspectives: a pragmatic way forward

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ABSTRACT

Introduction: Recent debates surrounding the application of natural capital accounting (NCA) have produced several approaches to further develop this system, as well as highlighted a number of conceptual and methodological issues that need to be resolved before mainstreaming NCA into policy and decision making. We argue that prolonged debate over the value concepts (i.e., exchange versus other values) underpinning different modifications to NCA has slowed progress in experimentation and uptake by policymakers.

Outcomes: Consequently we propose three broad approaches which can be progressed in parallel to reinvigorate experimentation with the NCA principles and practice, while at the same time generating policy relevant tools and evidence bases for decision support. The three approaches are; extended SNA accounting anchored to the use of exchange values; a complementary accounts network (CAN) that utilizes plural values as supplementary accounts to the SNA system; and wealth accounting that focuses on measures of welfare and wellbeing. The three approaches are complementary and data developed in any one can inform the other two.

Conclusions: We contend that CAN offers the most flexibility and opportunities to progress short term support for decision making on environmental issues which are now becoming urgent.

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National income accounting is an established and coherent method of collecting, organizing and reporting information on economic activity. But what it does not do is fully measure changes in human welfare/wellbeing (Daly and Cobb 1989; Landefeld and McCulla 2000; Costanza et al. 2014; Kenny et al. 2019), nor does it include a comprehensive assessment of the impacts on the environment linked to the economic activity (El Serafy 1999; Stiglitz 2013). In their historical evolution, national accounts have always included a degree of pragmatism. So what is included or excluded from the national accounts is to some extent a matter of choice (e.g., Lepenies 2016). The ways in which natural capital can be incorporated into national accounts is, we would argue, also a choice and one in which a degree of pragmatism is required in order to allow for experimentation and mainstreaming into the policy process.

In 2012 the UN adopted the System of Environmental-Economic Accounting (SEEA) Central Framework (SEEA CF¹) as an official statistical standard; and the SEEA Experimental Ecosystem Accounting (SEEA EEA²) as a state-of-art review of progress in ecosystem accounting. The latter is currently under revision. While the SEEA approach is the dominant approach guiding many of the international efforts in environmental accounting, other approaches are also under test (e.g., WAVES 2018;

Lange, Wodon, and Carey 2018; Managi and Kumar 2018). One key difference between the different accounting approaches is related to the valuation concepts (exchange versus welfare values) used in the construction of the accounts.

We believe that the technical and contested debates between environmental economists and national accountants regarding the incorporation of exchange and/or welfare value-based methods into ecosystem services valuation and national accounting have been very useful and have highlighted some important conceptual difficulties. However, we also believe that this highly focused debate has also slowed progress and experimentation with NCAs and restricted policy applications. This is due to two reasons. Firstly, the primary argument for using exchange value methods (e.g., resource rent, cost based approaches etc.) is their compatibility with existing SNA data. While fully integrated accounting is an important line of work, its completion is a medium to long term exercise. However, ecosystem protection and management are key to supporting many components of human wellbeing (e.g., food security, human health, cultural heritage) that need to be safeguarded in the short-term. Further, it is impossible to reflect the value of all nature based benefits in exchange value terms. Given the pressing need for environmental

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¹SEEA CF hereafter refers to UN et al. (2014a).

²SEEA EEA hereafter refers to UN et al. (2014b).

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protection, we propose that more effort should be put into the short run development of a pragmatic pluralistic value-based approach. We believe that it is useful to distinguish three broad approaches to NCA:

- (1) *"Extended SNA Accounting"*: Accounts that are compatible with the System of National Accounts (SNA). This approach is currently the most dominant and is represented to a greater or lesser extent by the SEEA CF and SEEA EEA. Its primary objective is to integrate ecosystem benefits into the SNA system and by doing so enumerate their contribution to economic activities. Valuation is focused on monetary terms and it relies strictly on exchange values.
- (2) *"Complementary Accounts Network (CAN)"*: Accounts that are constructed on a fit-for-purpose basis, in order to address specific policy targets, strategic goals and information needs. This approach would reflect the data structure of the SNA system, however it is not constrained by the need for full compatibility with the SNA data, nor does it need to focus solely on valuation in monetary terms or exchange values. Some work combining different types of so-called "satellite" accounts into a national matrix is on-going and our proposal builds on this. The main characteristic of this approach is flexibility, as it can accommodate a range of different data, plural values, purposes and methods.
- (3) *"Wealth Accounting"*: Accounts that aim to measure changes in total wealth. This approach is the most data intensive in valuation terms as it requires understanding of the marginal contribution of all forms of capital to human well-being. It is reflected in work led by the World Bank (World Bank 2006, 2011; Lange, Wodon, and Carey 2018) and by UNU-IHDP and UNEP (UNU-IHDP and UNEP 2014; Managi and Kumar 2018). There is also a spectrum of work by ecological economists seeking to construct well-being and "genuine progress" accounts in order to meet sustainable development goals (Costanza et al. 2016; Fox and Erickson 2018).

While the three approaches have their pros and cons and overlap to some extent (e.g., SNA-compatible data is often used for Wealth accounting), we believe that using these three broad categories can facilitate

consensus and speed up future progress. As discussed in more detail elsewhere (e.g., SEEA EEA TR³, Obst, Hein, and Edens 2016, Badura et al. 2017) only market pricing (exchange value) methods are compatible with approach 1 (SNA/SEEA). But nature's value is a multidimensional concept and to fully capture its contribution requires the elicitation of plural values (monetary and non-monetary).

Approach 2 (CAN) offers a more pragmatic way forward as it allows wider experimentation with valuation methods, including non-monetary methods that are of increasing interest to both policy and conservation communities (Barton et al. 2017; Turner, Badura, and Ferrini 2019). It can also represent an intermediate state of NCA development toward more integrated accounts (Approach 1). Non-monetary methods can help to provide additional information on the importance (or value) of ecosystems and their services alongside the standard set of accounts via, e.g., biophysical indicators (e.g., Indicators for EU Biodiversity Strategy; information on protection status, etc.) or socio-cultural indicators related to health, equity or justice (e.g., GINI coefficient, Human Development Index etc.). The challenge will be to provide valid and reliable indicators and to systematically standardize the complementary accounts/data to sit alongside the conventional accounts. Wealth accounting takes a different conceptual approach and seeks to provide aggregated measure of the different dimensions of human development and the sustainability of societal progress over time. However, despite some progress the various competing indexes (e.g., Inclusive Wealth; Sustainable Economic Welfare; Genuine Progress Indicator, (Kenny et al. 2019)) that have been constructed remain somewhat controversial.

The choice made between the three NCA approaches can determine the form and extent of any new accounting system and appropriate economic valuation methods used within it. But the approaches are not mutually exclusive and are at times overlapping. For example, ecosystem services data collected for Approach 2 can inform Approach 1 or 3 as knowledge improves and/or changes in accounting practices are agreed. This highlights the importance of complementary information that CAN might provide for relevant natural capital management questions. In particular, the SEEA system – Approach 1 – can be complemented by more wellbeing indicator-based Approach 2, including non-monetary valuation measures. This possibility is explicitly mentioned in the SEEA EEA TR.⁴

³SEEA EEA TR hereafter refers to United Nations (2017).

⁴[i]t would be possible to design complementary ecosystem accounts to those described here, for example by adopting different valuation concepts, to suit particular policy and analytical purposes while still applying the same basic accounting framework portrayed in [SEEA EEA]. Such complementary accounts are not discussed here but may be an area for further discussion and research." United Nations (2017) par. 2.13

"Depending on the policy or decision-making context there may therefore be a need for the estimation of both exchange-based and welfare-based values." United Nations (2017) par. 6.22

"... one area for further discussion and investigation is whether a complementary set of ecosystem accounts in monetary terms might be compiled using non-exchange value concepts. The starting logic would be that complementary accounts could be based on the same biophysical accounts (for ecosystem extent, condition and service flows) and then alternative valuation concepts could be applied to support particular policy contexts." United Nations (2017) par. 6.24.

To date, partly because of the contested debates and value plurality, the plethora of accounting activity has not been reflected in a wholesale take-up of the resulting information in real decisions. As Vardon, Burnett, and Dovers (2016) have put it, recent decades have seen a substantial “accounting push” but much less of a “policy pull”. The underpinning concept of ecosystem service values has received even more academic attention but its adoption in policy circles has also been the focus of debate and controversy. Laurans et al. (2013) found that only a minimal amount of ecosystem values research was utilized in policy decisions. But more recently ecosystem service valuation approaches have been gaining more traction in some policy circles (e.g., UK National Ecosystem Assessment 2011, 2014). A study surveying policy makers in Finland (Primmer, Saarikoski, and Vatn 2018) found that the position that a particular individual held within a policy network in an organization or economic sector, influenced their perception of which aspects of ecosystem service valuation were significant in terms of an evidence based policy. The study concluded that valuation does not provide a magic bullet solution to distributional debates or conflicts over rights, but it does contribute important foundational knowledge to an evidence base. In our view, natural capital accounting can play a key role in this knowledge base expansion for decision support systems. The

advantages of such a move include but are not limited to the following:

- Accounting can contribute to a more systematic compilation of an evidence base and identification of key data gaps to underpin policy making;
- Accounting can help to provide “boundary” information to guide sustainable progress to a low carbon future and “Green New Deal” investments via, for example, an expanded “Circular Economy” strategy (see Box 1 below);
- Accounting (e.g., ecosystem services supply and use tables, capital asset checks and risk registers, Mace et al. 2015) can provide a basis for the continual quantitative monitoring of progress toward sustainability and other national policy objectives;
- In its most comprehensive form accounting can produce evidence about human progress in terms of welfare, well-being and equality trends over time.

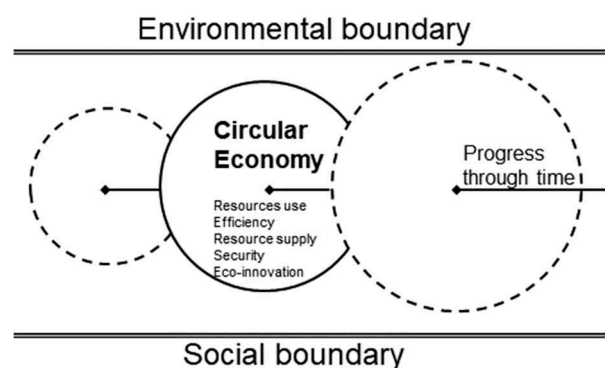
The three NCA approaches can be seen as part of a much more comprehensive information/evidence base for policymaking. National and environmental accounting brings different sources of information into a coherent and comparable statistical framework that can be used for multiple purposes – i.e., for purely accounting purposes (e.g., accounting tables, balance sheets, wealth indices etc.) or as a standardized data

Box 1. Circular economy – an expanded framework.

The Circular Economy (CiE) Post-Keynesian metaphor signals a move from a linear approach to economic progress to one in which resources are kept in circulation for as long as possible. This strategic policy switch is expected to create new economic and employment opportunities alongside a range of environmental benefits (e.g., CO₂ emissions reduction). While the ideas behind the CiE are decades and more old (Pearce and Turner 1990, chp2), there has been a renewed interest in this approach in policy circles in recent years. Much of the focus has been on the efficiency and productivity gains with waste management and recycling and most recently with problematic rebound effects (Figge and Thorpe 2019).

The further development of natural capital accounting and value plurality can help to provide an expanded version of the CiE that encompasses not just waste management and recycling across product chains, but also natural capital enhancement and maintenance in the wider environment. An expanded CiE system is constrained by two ‘boundary’ conditions; an outer environmental boundary (known in the literature as Planetary Boundaries, PBs, see Rockström et al. 2009; Steffen et al. 2015), and a lower ‘social floor’ boundary linked to minimum acceptable levels of wealth (broadly defined) inequality and deprivation. The CiE sits between these boundaries, see Figure 1, in thermodynamic terms this is an ‘open system’ which inevitably stresses the environmental boundaries and risks the crossing of thresholds and tipping points (Giampietro 2019). Society therefore needs to learn to adapt and to anticipate future risks, public investments will need to be assessed to enable a transition to a low carbon economy. The Complementary Accounts Network can provide the complementary sets of accounting data/indicators to assess green projects and warn society about the unregulated growth in macro-economic physical scale and associated externalities that risk breaching both environmental and societal thresholds or tipping points that may threaten global systems resilience. The social inequality boundary which can be monitored through CAN and wealth accounting, also has an economic dimension. There is a strong case to argue that gross inequality carries an economic price in terms of inefficiency and lower values for environmental public goods investments (Stiglitz 2013, Drupp et al. 2018).

Figure 1. Circular economy.



Accounting provides the ideal framework and tools to better assess the state of the capital stocks (physical/manufactured, human, social and natural capital assets) and flows of benefits over time.

source for modeling, indicators, impact assessment and valuation/cost benefit analysis. Accounting therefore can enable and/or provide incentives for basic data collection, assist in scoping and agenda setting as well as interpretation, analysis and monitoring policy response. Indeed, the broad scope of how the data that are put into a standardized framework through accounting, and can be subsequently used in other applications is one of accounting's greatest strengths.

We believe that in order to halt the increasing degradation of the natural environment a broad range of experimentation with the different accounting approaches – and related plural valuation approaches – should be encouraged, and that Approach2 (Complementary Accounts Network) offers increased inclusivity across stakeholders and other policy relevant gains.

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No potential conflict of interest was reported by the authors.

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References

- Badura, T., S. Ferrini, M. Agarwala, and K. Turner. 2017. "Valuation for Natural Capital and Ecosystem Accounting." *Synthesis report for the European Commission*. Norwich: Centre for Social and Economic Research on the Global Environment, University of East Anglia.
- Barton, D., S. Jacobs, I. I. Arandia, H. Saarikoski, M. Termansen, M. Pérez Soba, and E. Kelemen. 2017. "Integrated Valuation of Ecosystem Services." *Guidelines and Experiences*. OpenNESS brief - no. 5 - May 2017.
- Costanza, R., Hart M, Kubiszewski I, Talberth J. 2014. "A Short History of GDP: Moving Towards Better Measures of Human Wellbeing." *Solutions* 5: 91–92.
- Costanza, R., L. Daly, L. Fioramonti, E. Giovannini, I. Kubiszewski, L. F. Mortensen, K. E. Pickett, et al. 2016. "Modelling and Measuring Sustainable Wellbeing in Connection with the UN Sustainable Development Goals." *Ecological Economics* 130: 350–355. doi:10.1016/j.ecolecon.2016.07.009.
- Daly, H. E., and J. B. Cobb. 1989. *For the Common Good*. Boston: Beacon Press.
- Drupp, M. A., J. N. Meyra, S. Baumgärtner, and M. F. Quaas. 2018. "Economic Inequality and the Value of Nature." *Ecological Economics* 150: 340–345. doi:10.1016/J.ECOLECON.2018.03.029.
- El Serafy, S. 1999. "Natural Capital Accounting Chapter 77." In *Handbook of Environmental and Resource Economics*, edited by J. Van Den Burgh, 1191–1206. Cheltenham: Edward Elgar.
- EU directive 691/2011.
- Figge, F., and A. S. Thorpe. 2019. "The Symbiotic Rebound Effect in the Circular Economy." *Ecological Economics* 163: 61–69. doi:10.1016/j.ecolecon.2019.04.028.
- Fox, M. J. V., and J. D. Erickson. 2018. "Genuine Economic Progress in the United States: A Fifty State Study and Comparative Assessment." *Ecological Economics* 147: 29–35. doi:10.1016/j.ecolecon.2018.01.002.
- Giampietro, M. 2019. "On the Circular Bioeconomy and Decoupling: Implications for Sustainable Growth." *Ecological Economics* 162: 143–156. doi:10.1016/j.ecolecon.2019.05.001.
- Kenny, D. C., R. Costanza, T. Dowsley, N. Jackson, J. Josol, I. Kubiszewski, H. Narulla, et al. 2019. "Australia's Genuine Progress Indicator Revisited 1962–2013." *Ecological Economics* 158: 1–10. doi:10.1016/j.ecolecon.2018.11.025.
- Landefeld, S., and S. H. McCulla. 2000. "Accounting for Nonmarket: Household Production within a National Accounts Framework." *Review of Income and Wealth* 46 (3): 289–307. doi:10.1111/j.1475-4991.2000.tb00844.x.
- Lange, G.-M., Q. Wodon, and K. Carey. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future*. Washington, DC: World Bank.
- Laurans, Y., A. Rankovic, R. Billé, R. Pirard, and L. Mermet. 2013. "Use of Ecosystem Services Economic Valuation for Decision Making: Questioning a Literature Blindspot." *Journal of Environmental Management* 119: 208–219. doi:10.1016/j.jenvman.2013.01.008.
- Lepenies, P. 2016. *The Power of a Single Number: A Political History of Gdp*. New York, United States: Columbia University Press.
- Mace, G. M., R. S. Hails, P. Cryle, J. Harlow, S. J. Clarke, and P. Manning. 2015. "Towards a Risk Register for Natural Capital." *Journal of Applied Ecology* 52: 641–653. doi:10.1111/1365-2664.12431.
- Managi, S., and P. Kumar, Eds. 2018. *Inclusive Wealth Report 2018 : Measuring Progress Towards Sustainability*. London: Routledge.
- Obst, C., L. Hein, and B. Edens. 2016. "National Accounting and the Valuation of Ecosystem Assets and Their Services." *Environmental and Resource Economics* 64: 1–23. doi:10.1007/s10640-015-9921-1.
- Pearce, D., and R. K. Turner. 1990. *Economics of Natural Resources and the Environment*. London: Harvester Wheatsheaf.
- Primmer, E., H. Saarikoski, and A. Vatn. 2018. "An Empirical Analysis of Institutional Demand for Valuation Knowledge." *Ecological Economics* 152: 152–160. doi:10.1016/J.ECOLECON.2018.05.017.
- Rockström, J., W. Steffen, K. Noone, A. Persson, F. S. Chapin, E. F. Lambin, ... J. A. Foley. 2009. "A Safe Operating Space for Humanity." *Nature* 461 (7263): 472–475. doi:10.1038/461472a.
- Steffen, W., K. Richardson, J. Rockstrom, S. E. Cornell, I. Fetzer, E. M. Bennett, ... S. Sorlin. 2015. "Planetary Boundaries: Guiding Human Development on a Changing Planet." *Science* 347: science.1259855. doi:10.1126/science.1259855.
- Stiglitz, J. E. 2013. *The Price of Inequality*. London: Penguin Books.
- Turner, K., T. Badura, and S. Ferrini. 2019. *Valuation, Natural Capital Accounting and Decision-Support Systems: Process,*

- Tools and Methods*. Norwich: CSERGE, University of East Anglia.
- UK National Ecosystem Assessment. 2011. *UK National Ecosystem Assessment Synthesis of the Key Findings*. Cambridge: Unep-Wcmc, 87. doi:10.1177/004057368303900411.
- UK National Ecosystem Assessment. 2014. *The UK National Ecosystem Assessment Follow-on: Synthesis of the Key Findings*. Cambridge, UK: UNEP-WCMC.
- United Nations. 2017. *Technical Recommendations in Support of the System of Environmental-Economic Accounting 2012–Experimental Ecosystem Accounting*. New York, United Nations.
- United Nations, European Commission, Food and Agricultural Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development, The World Bank. 2014a. *System of Environmental-Economic Accounting 2012 – Central Framework*. New York: United Nations.
- United Nations, European Commission, Food and Agricultural Organization of the United Nations, Organisation for Economic Co-operation and Development, The World Bank. 2014b. *System of Environmental-Economic Accounting 2012 – Experimental Ecosystem Accounting*. New York: United Nations.
- UNU-IHDP and UNEP (2014) Inclusive Wealth Report. 2014. *Measuring progress toward sustainability*. Cambridge: Cambridge University Press.
- Vardon, M., P. Burnett, and S. Dovers. 2016. “The Accounting Push and the Policy Pull: Balancing Environment and Economic Decisions.” *Ecological Economics* 124: 145–152. doi:10.1016/j.ecolecon.2016.01.021.
- WAVES. 2018. *WAVES Annual Report 2018*.
- World Bank. 2006. *Where Is the Wealth of Nations?* Washington, DC: World Bank.
- World Bank. 2011. *The Changing Wealth of Nations*. Washington, DC: World Bank.