Towards Integrating SNA, SEEA and SDGs – A Simplified Excel-Based Sustainability Accounting Tool for Cities

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The SDGs represent a major milestone for the global development agenda as they have emerged from a global multi-stakeholder process driven by the United Nations. Compared to the preceding Venn-diagram definition comprising economy, society and environment, the weight of the economy in the SDGs may still be around one third. The Global Indicator Framework after the 2021 refinement (https://unstats.un.org/sdgs/indicators/indicators-list/) shows that the list of 231 unique SDG indicators contains 17 indicators referring to the GDP, two indicators referring to value-added, eight indicators referring to income, including three to GNI, and around 60 to public spending. For the remaining SDG indicators, the coherent integration into, or link with, the SNA and SEEA frameworks remains to be made explicit by research and analysis. SEEA has been applied to two APEC cities, see endnotes in https://www.apec.org/Publications/2019/04/APEC-Sustainable-Urban-Development-Report---From-Models-to-Results. The present tool is expected to be tested first in a city of the APEC region.

This paper proposes an innovative holistic approach how the link between SNA, SEEA and SDGs can be made for cities or local communities. The target group of cities and local communities is a focal point for SDG implementation and has, therefore, a high demand in tools for setting targets for carbon neutrality or other SDGs but may have limited skills in keeping sophisticated accounts of the SNA or SEEA type. Cities are, however, not the main addressees of SDGs, hence only a subset of SDG indicators is relevant to them, including obviously those of SDG 11 (see https://www.apec.org/Publications/2021/03/APEC-Integrated-Urban-Planning-Report). To be useful for cities and local communities, the proposed system should be simple and easy to understand. The core of the system is a symmetric input-output table (SIOT) in which cities can easily recognize their main aggregate sectors or stakeholders. While for purely macroeconomic analysis a minimum disaggregation might be sufficient, the introduction of SDGs requires higher disaggregation. The minimum disaggregation for economic analysis distinguishes only between primary, secondary and tertiary sectors, government, households and rest of the world. After adding gross formation of fix capital, the tool allows defining the local GDP in its three well-known approaches (expenditure approach, income approach, value-added approach), all yielding numerically equal results.

For further analysis, the tool integrates SEEA terms. These are added in the same way as fix capital, simply by generalizing the latter. The tool accounts for variations in natural capital comprising assets from the lithosphere (land, soil resources such as construction materials, soil nutrients such as N, P, K and soil carbon, and mineral energy resources such as fossil energies and metals), assets

from the hydrosphere (surface water, ground water, soil water), assets from the atmosphere (not yet listed in the SEEA: oxygen, nitrogen, CO2), and assets from the biosphere (timber, aquatic resources, and other biological resources). Each of these assets is depreciated by specific pollution forms (e.g. for the atmosphere by emissions of CO2, CH4, N2O, NOx, HFC, PFCs, SF6, CO, non-methane VOC, SO2, NH3, heavy metals, POP, particulates such as PM10, PM2.5 and dust). Besides variations in natural capital, the tool also considers variations of human capital (not in SEEA) defined as stock of knowledge, skills and other personal characteristics embodied in people that helps them to be productive. Human capital is depreciated by impairment of health and by death. In practice, human capital of a city is a function of jobs. Lastly, the tool accounts for variations of financial assets (cash including bank deposits, equity and receivables including loan receivables or trade receivables) and financial liabilities (trade payables, bank borrowings, issued bonds).

Integration of SDG indicators is achieved by disaggregating the aggregate sectors (e.g. separating renewable energy from the energy industry, manufacturing industry from the secondary sector etc.). SDGs describe a relatively large number of different household types mostly differentiated by binary categories, e.g. having or not having an employment, electricity access, internet, mobile phones, access to clean fuels, to sanitation, to WASH (Water, Sanitation and Hygiene), or similar services. With n such binary categories, the theoretical number of household categories is 2n. Whereas in developed cities such fine differentiation may not be necessary as the households lacking any one of these services are in minority, this may be different in the less developed cities that will, however, rarely have the required cross-information to fill in all categories. The tool can be adapted to these circumstances as required.

Used for theoretical analysis, the tool allows, surprisingly, making new theoretical discoveries on macroeconomic accounting. Firstly, the generalization of the GDP by including all capital forms as described above allows defining a "generalized GDP", defined in the same three ways as the classical GDP is defined when only manufactured capital is taken. It is convenient to call this generalized GDP "holistic GDP" or Holistic Domestic Product (HDP) which can be shown to be always greater than GDP. Secondly, it can be shown that neither of both, GDP and HDP, represents the general measure of sustainability. Instead, such measure is given by the Net Holistic Capital Formation (NHCF), comprising all information of both, trade and holistic investment, and which can also be calculated in three ways. NHCF can, however, be positive or negative. For each city as well as each sector, the tool can in theory determine whether it is strongly sustainable, weakly sustainable, weakly unsustainable or strongly unsustainable. In practice, the estimation of HDP and NHCF requires data that will only become available in future decades.