Brief for GSDR 2015

Humanity's growing Ecological Footprint: sustainable development implications

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The recently proposed sustainable development goals (SDGs) include promoting inclusive and sustainable economic growth as well as well-being for all. Economic activities ultimately depend on ecological assets and their capacity for provisioning primary resources and life-supporting ecological services (Costanza et al., 2014; Georgescu-Roegen, 1971); managing the latter is becoming a central issue for decision-makers worldwide (CBD, 2010; UN et al., 2014). Thus, living within the limits of the biosphere's ecological assets is a necessary condition for global sustainability, which can be quantitatively measured and must be met to achieve SDGs. This brief highlights global and national ecological asset balances and discusses their implications for sustainable development.

Introduction

Recent and ongoing research suggests that human demands on our planet's systems are increasing, possibly beyond sustainable operating limits (Rockström et al., 2009, Wackernagel et al., 2002). This suggests the need for systemic, crosscutting assessments, which can address and compare the competing demands on the planet's finite biosphere. Built upon this concept, Ecological Footprint Accounting (Wackernagel et al., 2002) identifies a specific ecological budget – biocapacity – and the extent to which human demands for biocapacity approach or exceed this budget – the Ecological Footprint[1].

Humanity's Ecological Footprint

From 1961 to 2010, Ecological Footprint accounts indicate that human demand for renewable resources and ecological services increased by nearly 140% (from 7.6 to 18.1 billion global hectares[2]), reaching a point where the planet's bioproductive area (increased from 9.9 to 12 billion global hectares) is no longer sufficient to support the competing demands. In 2010, humanity demanded the equivalent of approximately 1.54 Earths worth of provisioning and regulatory services (WWF et al., 2014).

At the global level, the increase in anthropogenic demands was most prominent for the carbon Footprint (+260% due to the growing use of fossil fuels, electricity and energy-intensive commodities) and the cropland Footprint (+125%) components (WWF et al., 2014). However, Footprints vary by income groups (Galli et al., 2012) (Figure 1). Per capita Footprint increased in only high-income countries (indicating life-style improvements) but decreased in low-income countries, which experienced a noticeable population increase. The carbon Footprint grew from 31% (in 1965) to 63% (in 2005), and the cropland Footprint decreased from 37% (in 1965) to 18% (in 2005) in high-income countries. Middle-income countries followed a similar pattern. Conversely, cropland represented the main Footprint component in low-income countries in 2005, although its contribution decreased from 62% to 44% from 1965 to 2005. Galli et al. (2012) argue that middle- and low-income

[1] Biocapacity covers five components: cropland for the provision of plant-based food and fiber products; grazing land and cropland for animal products; built-up surface for shelter and other urban infrastructure, fishing grounds (marine and inland) for fish products; forests which provide for two competing demands: timber and other forest products as well as for sequestration of carbon waste (CO_2, primarily from fossil fuel burning) thus regulating the climate. A detailed explanation of Ecological Footprint Accounting's methodology is provided in (Borucke et al., 2013).

[2] A global hectare, the accounting unit in the biocapacity and Footprint metric, is a biologically productive hectare with world average productivity (Borucke et al., 2013).

countries are following the same development path as high-income countries, characterized by a shift from agrarian (biomass-based) to industrialized (fossil-fuel-based) societies.

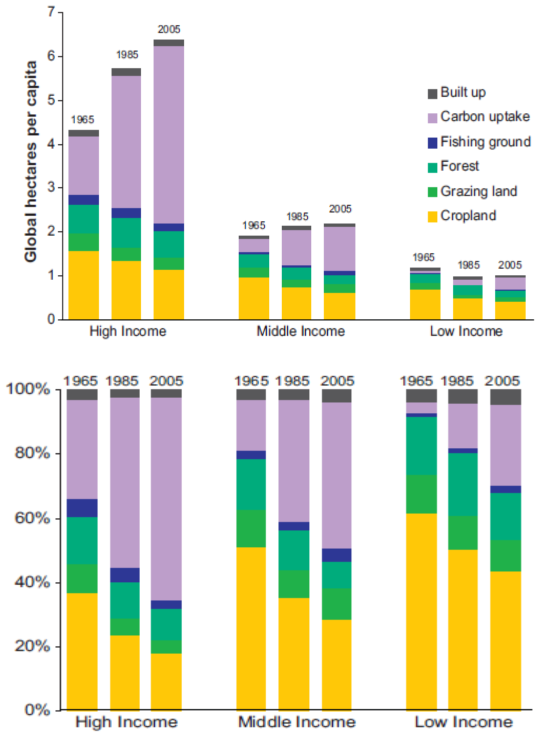

Fig. 1. Per capita Ecological Footprint (top) and percentage composition (bottom) for high, middle and low income countries, by land type in 1965, 1985 and 2005. Source: Galli et al., (2012).

Significant biocapacity deficits exist in many countries and a distinction can be made between countries that are driving global displacement of human-induced pressure and countries where such pressure displacement is taking place (Galli et al., 2014). Moreover, Canada, Argentina, Brazil, Australia and Indonesia are the top five net exporters[3] of biocapacity, altogether totaling nearly 0.5 billion global hectares worth of renewable resources and ecological services. Japan, Mexico, Italy, United Kingdom and Egypt are the top five net importers of biocapacity, with a cumulative import of nearly 0.6 billion gha (Figure 2).

[3] Net exporting countries export more biocapacity than they import and have an Ecological Footprint of consumption lower than their Ecological Footprint of production. The opposite is true for net importing countries.

Under widely accepted consumption and population projections, global ecological overshoot[4] is expected to increase (Moore et al., 2012): continuing on a business-as-usual path, humanity would demand the equivalent to 2.6 planet's worth of ecological resources and services by 2050 – which may be physically unattainable.

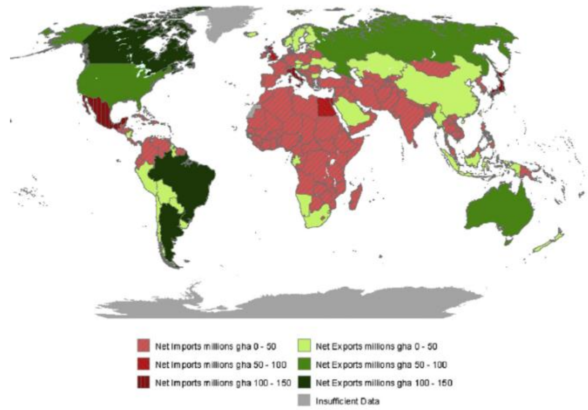

Fig. 2. Net biocapacity importing (red) and exporting (green) countries, in 2008. Source: Galli et al., (2014).

Sustainable development implications

The growing human pressure on Earth's ecosystems measured by Footprint assessments confirms other scientific findings (e.g., Vitousek et al., 1997; Krausmann et al., 2009).

Biodiversity is declining at an exceptional rate, driven in part by human pressure on ecosystems (Butchart et al., 2010; Tittensor et al., 2014). Galli et al., (2014) have linked human demand on the biosphere, tracked through the Ecological Footprint, to direct threats to biodiversity, concluding that current actions to reduce biodiversity decline may be insufficient because they focus on addressing the symptoms rather than the causes. Thus, traditional conservation measures (protected areas, biodiversity-related aids, etc.) must be coupled with measures targeting the human

[4] Overshoot refers to the situation where a population's demands exceed its environment's ability to support those demands (its carrying capacity). Global overshoot means that global demands exceed global regeneration (Monfreda et al., 2004).

drivers of pressures on biodiversity[5] (e.g., green economy policies and incentives to favor SCP[6] patterns).

Science-based benchmarks and quantitative tracking can help bring focus to the debate on sustainable economics and well-being. Boutaud (2002) and Moran et al. (2008) have proposed combining Ecological Footprint and UNDP's Human Development Index (HDI)[7] (Anand and Sen, 1992) to monitor whether nations' progress toward advancing human well-being stays within the ecological budget limit – biocapacity – of the biosphere.

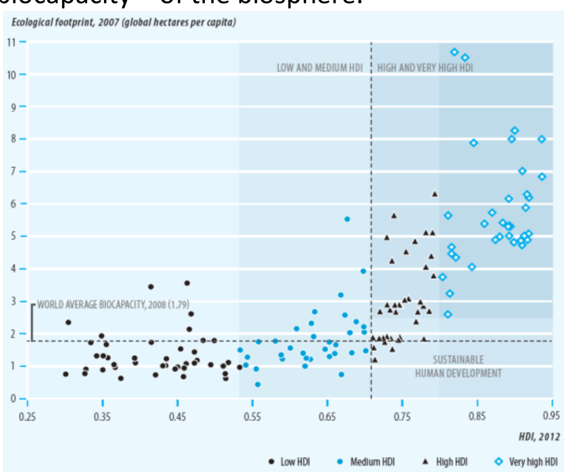

Fig. 3. HDI (x-axis) and per capita Ecological Footprint (y-axis) for world countries. UNDP considers an HDI of more than 0.67 to be "high human development". The biocapacity available per person in 2007 was 1.79 global hectares. Source: UNDP (2013).

The bottom-right quadrant of Figure 3 (UNDP, 2013) indicates that very few countries are achieving high human development (HDI 0.67 or higher) within a globally replicable level of biocapacity demand (per capita Footprints lower than 1.79 global hectares for 2007). According to Moran et al., (2008), as countries improved their citizens' well-being, their resource use grew. Beyond a certain level, small HDI gains are likely only obtainable via large Ecological Footprint increases[8].

These results highlight the challenge of achieving a globally reproducible high level of human well-being without overtaxing the planet's ecological assets following a business-as-usual development path. According to UNDP (2013), this situation *"does not bode well for the world,"* and *"over time, the situation is becoming more dire."* Technological innovations (e.g., better product quality and durability, resource efficiency, etc.) and a shift in consumption (and production) patterns are thus needed to ease the transition towards high human development within the Earth's safe operating space. According to Kubiszewski et al., (2013) *"if we hope to achieve a sustainable and desirable future, we need to rapidly shift our policy focus away from maximizing production and consumption (GDP) and towards improving genuine human well-being."*

Issues for further consideration

Ecological Footprint findings show how far humanity is from a *safe and just operating space* (Dearing et al., 2014) as a result of overusing natural resources and ecological services. This has immediate relevance as an early warning for sustainability policies and strategies exist to apply Ecological Footprint findings to achieve SDGs, including:

- Engage public actors in transforming Footprint diagnoses into sector-specific policy prescriptions.
- Promote the incorporation of the risk of global ecological overshoot into economic decision-making.
- Develop sector-level Footprint assessments to reduce the gap between awareness and implementation of solutions; closing this gap is essential for achieving the SDG goals and aligning the human economy with nature's finite budget.

[5] According to Galli et al., (2014), Ecological Footprint needs to be complemented with other indicators for a comprehensive monitoring of the whole pressure humans pose on the Earth's ecosystems and biodiversity.

[6] Sustainable Consumption and Production.

[7] According to Raudsepp-Hearne et al., (2010), HDI constitutes an adequate proxy measure of human well-being as it strongly correlates with health-adjusted life expectancy, adult and youth literacy, gender equality and other measures.

[8] This finding is consistent with the *'threshold hypothesis'* proposed by Max-Neef (1995) and strengthened by Niccolucci et al., (2007).

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