

From gross domestic product to wellbeing: How alternative indicators can help connect the new economy with the Sustainable Development Goals [AQ: 1]

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Abstract

In a 2014 issue of *Nature*, members of our research group called for abandoning the gross domestic product as the key indicator in economic policymaking. In this new article, we argue that a new post-gross domestic product economy focusing on wellbeing rather than material output is already emerging in the Anthropocene, thanks to the convergence of policy reforms and economic shifts. At the policy level, the Sustainable Development Goals require policymakers to protect ecosystems, promote greater equality, and focus on long-term equitable development. At the economy level, the provision of services has outpaced industrial production as the key driver of prosperity, with innovative business models optimizing the match between supply and demand and giving rise to a burgeoning “sharing economy,” which produces value to people while reducing output and costs. The economic transformation already underway is, however, delayed by an obsolete system of measurement of economic performance still dominated by the gross domestic product-based national accounts, which rewards the incumbent and disincentives the new. We show that a different approach to measuring wellbeing and prosperity is the “missing link” we need to connect recent evolutions in policy and the economy with a view to activating a sustainable development paradigm for a good Anthropocene.

Keywords

Beyond GDP, circular economy, prosumers, service economy, social capital, sustainable business, sustainable finance, Sustainable Wellbeing Index, Wellbeing Economy Alliance

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Beyond GDP: connecting policy reform with the new economy

There is growing agreement among scientists and experts about the need to abandon gross domestic product (GDP) as the primary indicator for national prosperity. It has been reiterated by academics from various disciplines, from ecological economics (Costanza et al., 2014a; Daly, 1990) to political science and sociology (Fioramonti, 2013, 2017; Wilkinson and Pickett, 2009, 2018), by Nobel Prize-winning economists (e.g. Krugman, 2018; Stiglitz et al., 2010), and by renewed economics journals and newspapers (e.g. Colebrook, 2018; *The Financial Times*, 2018; *The Guardian*, 2018). In a 2014 issue of the world's leading scientific journal *Nature*, members of our research group called for dethroning GDP, given that its measurement framework encourages policies that increase industrial output, disregards the importance of healthy ecosystems, and pays no attention to social dynamics and inequalities (Costanza et al., 2014a; Fioramonti, 2013; Ragnarsdottir et al., 2014). Moreover, it attributes no value to forms of economic activity that are informal, community based, and driven by collaboration and sharing.

GDP is not simply used as an economic metric, but also as a performance assessment tool for society (Fioramonti, 2014). Countries are ranked in terms of GDP, international organizations and investors vet governments' policies through GDP, and politicians and businesses are rated on their success at promoting GDP growth. This statistic has acquired a profound institutional power, providing the econometric backing for an economic model driven by industrial production, large corporations, and mass consumption, which is now increasingly being questioned. For example, Reichel and Perey (2018) argue that the social imaginary of the Anthropocene is resting on unchecked growth, and we need to move beyond "growth at all cost" to end up in a *good* Anthropocene where humans make decisive action to prosper within the planetary boundaries (Autin, 2016; Dalby, 2015; Kunnas, 2017; Rockström et al., 2009). **[AQ: 2]**

The supremacy of GDP is being eroded not only in the scientific community, but also in policy circles, public debate, and the European and global agenda. At the global level, the climate change negotiations resulting in the Paris Agreement and, in particular, the UN 2030 Agenda and the Sustainable Development Goals (SDGs) provide a "roadmap" for development, which relies on the interconnectedness of social, environmental, and economic dynamics and points toward the indivisibility of human and ecosystem wellbeing. The UN member states agree to commit to protect ecosystems, promote greater equality, and focus on sustainable development.

The "Beyond GDP" initiative by the European Commission (2019) calls for developing indicators that are more inclusive of environmental and social aspects of progress. Many international organizations, including the UN, the Organisation for Economic Co-operation and Development (OECD; 2007, 2015), and the World Bank, are actively engaged in this, as are a number of national governments, which have launched post-GDP commissions and review panels (Fioramonti et al., 2015). In September 2018, Members of the European Parliament, together with several institutions and organizations, called on the European Union and its institutions and member states to incorporate alternative indicators into their macroeconomic framework (Orzanna, 2018). **[AQ: 3][AQ: 4]**

The economy is changing too. Not only have services long outpaced industrial production in value creation, but the digital revolution has now reduced marginal costs in a variety of areas, thus generating economic value while reducing output. Many services, from telecommunication to entertainment, are now provided almost for free, through dedicated platforms, apps, and online portals. Grumbach and Hamant (2017) describe this digital revolution as an "Anthropocenic" feedback, as resource scarcity in the Anthropocene promotes the rapid rise of digital platforms. The so-called sharing economy, from for-profit ventures like Airbnb, Uber, and WhatsApp, to non-profits like Wikipedia, has significantly reduced the prices that people have to pay to access hospitality, temporary accommodation, mobility, communication, and knowledge. This has generated a

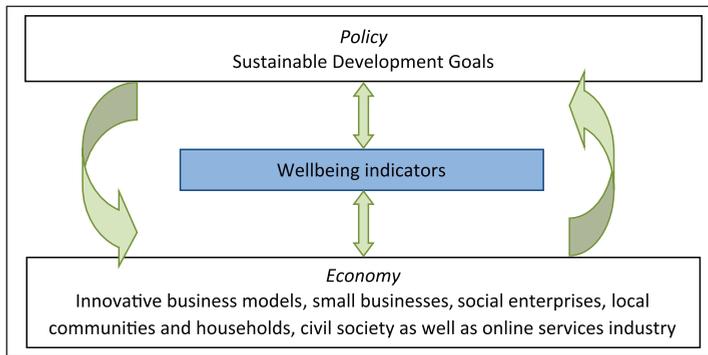


Figure 1. How wellbeing indicators connect global policy with the new economy.

“productivity paradox”: our economies increase value, utility, and consumer surplus, but GDP is unable to capture this new form of prosperity, giving wrong signals to policymakers. GDP is also unfit to measure the contribution of new and innovative business models based on self-production and co-production, because it only registers transactions occurring between clearly separated producers and consumers. With the growth of additive technology, including open hardware and three-dimensional (3D) printers, GDP is becoming increasingly obsolete to account for the value created in the collaborative economy not only in the field of services but also in manufacturing (Rifkin, 2014).

Moving beyond an increasingly obsolete GDP-based framework of measurement in favor of wellbeing indicators would allow us to better connect recent evolutions in global governance with shifts in the economy (Figure 1). This would ultimately provide a more up-to-date picture of prosperity, inform policymaking and incentive mechanisms accordingly, as well as give more central stage to those economic actors leading the way in this economic transformation, while weakening the social and economic acceptability of polluting and destructive forms of production.

The list of beneficiaries of a shift to wellbeing indicators includes families, communities, cooperatives, informal and small businesses, organic farmers, fair trade networks, and many other groups. Even high-tech companies, especially those providing online services, have much to gain in terms of reputation and social status, given that their positive contributions largely exceed their material output.

As more actors become aware of how a shift from GDP to wellbeing indicators can assist their causes, it is to be expected that grassroots social mobilization will also grow, connecting bottom-up pressures for change with top-down policies. The misuse of GDP has traditionally relegated families, communities, and civil society to the margins of the “productive” world, thus limiting their influence on policy. At the same time, it has exaggerated the contribution of large corporations by hiding the social and environmental costs of their systems of production and distribution. We contend that a new system of accounting based on wellbeing indicators can level the playing field, with a range of potential applications in socio-political disputes. For instance, opponents of the fossil fuel industries and social groups combating climate change may strengthen their moral and ethical arguments with a new array of data and indicators showing the unproductive nature of many polluting companies (Benatar et al., 2018). Similarly, governments, cities, regions, and municipalities may use wellbeing metrics to revisit their tax incentives and reformulate growth policies, thus supporting new businesses at the expense of the old (Costanza et al., 2014a). The recent convergence of scientific research, policy reforms, and economic shifts has prepared the “conceptual ground”

for a post-GDP economy focusing on wellbeing rather than material output. In this vein, the introduction of new indicators is essential to influence social perceptions, public policies, and support (rather than impair, as GDP does) those actors in society that promote the economic transformation. In the following sections, we describe those new and innovative business models that are the engines of this new economy, and then argue how wellbeing indicators are suitable for measuring the benefits these business models provide.

A typology of innovative business models

We begin by characterizing a hypothetical post-GDP economy for a good Anthropocene that is service based, sharing based, and more circular (European Environment Agency (EEA), 2016), with reduced pressure on the environment and climate, healthy relationships, more sustainable lifestyles, and ability to provide employment opportunities at all societal levels. Service economies based on new technologies and innovative business models are driving prosperity faster than industrial economies, as recently documented in a dedicated issue of *The Economist* (2016) and by an official review of the UK government (Bean, 2016).

New and innovative business models are contributing to wellbeing along the whole value chain of production, consumption, and end of life, sometimes extending the role of producers and consumers, blurring the boundaries between them in the Anthropocene (Figure 2). Despite their increasing diffusion with focus on all the stages of product life cycle, there is a lack of definition of business models supporting sustainable living and an absence of understanding of such models among policymakers.

Early in the production phase, innovative product design is focusing on new forms of production for longer use with reduced depletion of natural resources.

Designing for remanufacturing or designing for modular products, by rebuilding a product using a combination of reused, repaired, and new parts that can be independently upgraded or replaced (Johnson and McCarthy, 2014), opens up opportunities for business to save raw materials and associated costs while improving environmental performance (Ellen MacArthur Foundation, 2013; United Nations Environment Programme (UNEP)/TU Delft, 2009). Furthermore, innovative design allows lowering users' costs and increasing users' comfort (Biedenkopf et al., 2019). **[AQ: 5]**

Service offerings stem upon the insight that consumers do not need the ownership of a product per se, but to have quick and easy access to the service the product provides. For example, a consumer might not need a drill, but a hole in a wall; or she or he might not need a car, but to get efficiently from A to B. The product value lies in its utilization and benefits to customers. The provider gets its revenues from per service delivered instead of per unit of product sold. Service-oriented models often do not require substantial, or any, technological change in the production phase. Instead, as ownership plays an important role within society, a cultural transition is needed in order for these models to be mainstreamed. This transition implies new value settings positioning users within society more on the basis of the environmental and social consequences of their choices as consumers, and less on their ownership of certain types of products.

Innovative models of "prosumerism" offer a different, more flexible, viewpoint on the traditional division of production and consumption, fostering the diffusion of low-impact lifestyles (Mont, 2004). The most relevant examples in this sense are the cases of electricity produced by smart grids and food by urban gardens, where consumers become co-producers (EEA, 2014).

In addition to redefining the key actors along a producer-to-consumer continuum (Figure 2), innovative business models break the individualistic aspect of consumption through collaborative consumption models. Instead of through ownership, the consumers' benefits come through sharing, swapping, bartering, trading, or renting access to products. Most collaborative consumption

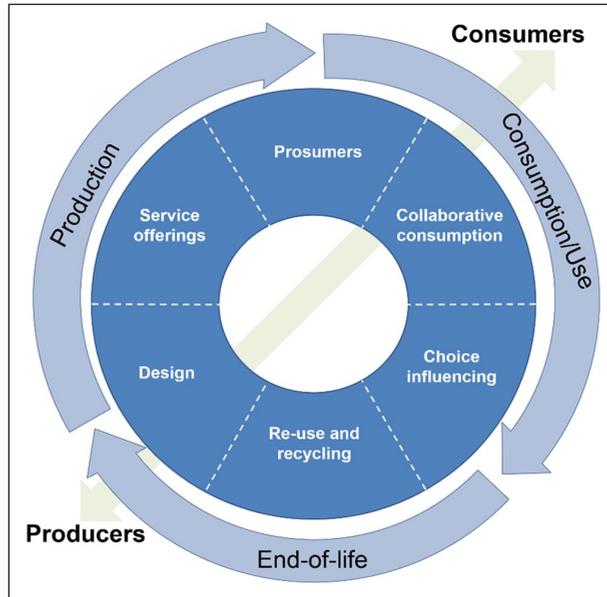


Figure 2. Innovative business models within the production, consumption/use, and end-of-life cycle are redefining the boundaries between producers and consumers.

models are growing in the accommodation, transport, tourism, and retail sectors. Consumers do not necessarily own products; instead, products are shared among users, extending the functional life of products and services via many consecutive users. The sharing of a product entails a more efficient use of financial natural resources and promotes the development of social capital by deepening connections among people. These models can operate through direct exchanges between users, or a business can facilitate the exchanges in return for payment. Diffused examples of this are the car and bike sharing systems entailing benefits such as cost savings, convenience, and guaranteed parking (World Economic Forum (WEF), 2011, 2015).

Through choice influencing, business can benefit from playing an advising role to consumers, especially during the use phase of a product. Business can influence consumers through informing about the most eco-efficient ways of using their products and providing options that fit different lifestyles and budgets, for example, through social media (Mortensen et al., 2018). From crowd-sourcing to platform-enabling dialogues between producers and consumers rating the sustainability of companies, the relationship among the actors of production and consumption can change toward building brand trust and engagement, instead of being mainly about selling more products.

In the end-of-life phase of a product, several further opportunities emerge for business through recovering and reutilizing components and materials for new products. These opportunities depend on efficient collection and sorting systems linked to commercially viable recycling strategies. Waste-as-a-resource business models have the potential for reversing market forces that typically lead to an overproduction of final waste. Examples of that are numerous in the clothing industry, with the reuse and recycle of waste materials into new, design-led products, thus closing the circle from pre-production design to end of life (Figure 2).

Innovative business models, as described above, have the potential to contribute to achieving all of the SDGs, by relieving environmental pressures (SDGs 6 on “clean water and sanitation,” 14 on “life below water,” and 15 on “life on land”), promoting low-carbon solutions (SDG 13

on “climate action”), reducing education, gender, and income inequalities (SDGs 4, 5, and 10), stimulating sustainable consumption and production practices (SDG 12), the use of sustainable energy (SDG 7), and transforming infrastructures and cities (SDGs 9 and 11). The benefits of the changes in the economy that we are observing will not become evident if national wealth keeps being assessed through GDP, as it misses the major part of improvements in environmental, social, and economic contributions to wellbeing that they are bringing in our societies.

Measuring the effects of policy and economic evolutions with wellbeing indicators

GDP is not fit for measuring the economic contributions of activities that are redefining the roles of producers and consumers in the Anthropocene, through “prosumerism,” collaboration, and sharing. These economic activities have the potential to provide simultaneous environmental, social, and economic benefits, which are systematically mismeasured or neglected in the GDP framework. In this regard, moving “Beyond GDP” is not merely a “cosmetic” or an academic task, because such indicators influence our goals as a society, and inform how policymaking on which industries are productive and thus deserve incentives and support. **[AQ: 6]** Wellbeing indicators focusing on the environment, society, and economy will thus weaken incumbent industries (by revealing their hidden costs and inefficiencies) and reinforce coherence between efforts to achieve the SDGs and the benefits of innovative business models.

As a consolidation of the various streams of “Beyond GDP” research, we have proposed a Sustainable Wellbeing Index (SWI; Costanza et al., 2016), that is, a measurement of wellbeing aligned with the SDGs, which is capable of accounting for the value generated by natural capital and ecosystems as well as the positive effects of social capital, and the *net* economic contributions of all productive activities (formal and informal). The SWI combines in a non-linear way natural capital and ecosystem service values, social capital (assessed, for example, through surveys), and net economic contribution (e.g. through the Genuine Progress Indicator (GPI)), as a function taking into account limiting factors. It is a measure of balanced prosperity, instead of infinite growth, and provides an indication of when and how a system is simultaneously approaching a sustainable scale with fair distribution and efficient allocation. In this context, the SDGs are the means for achieving wellbeing. In particular, the SDGs related to the natural environment and climate constitute the ultimate means to achieving the end of a sustainable scale, respecting planetary boundaries (Reid et al., 2017; Rockström et al., 2009). The SDGs contributing to achieve fair distribution and efficient allocation of resources and opportunities are the intermediate means between a sustainable scale and an equitable human wellbeing (Figure 3; Costanza et al., 2014b; Pulselli et al., 2015; Rockström and Sukhdev, 2016). The relationships among the environment, society, and the economy are hierarchical and ruled by physical limits. The environment provides the material and non-material inputs on which society is based (De Groot et al., 2002; Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), 2019), and the economy is one of the forms in which society organizes (Lovins et al., 2014).

While presenting multitudes of SDG indicators respects the high complexity of wellbeing, communicability and policy effectiveness are often impaired, as an overall synthesis of the results is difficult to obtain. A focus on particular sections of a dashboard gives a very different picture of the overall level of wellbeing. For example, if a country is showing significant progress toward some economic and social SDGs, but failing to achieve environmental SDGs, it will be difficult to conclude what is the overall progress of that country toward sustainability, involving a certain degree of subjectivity and assumptions. For this reason, dashboards, or long lists of indicators, are sometimes aggregated into a single index (Bertelsmann Stiftung and Sustainable Development Solutions

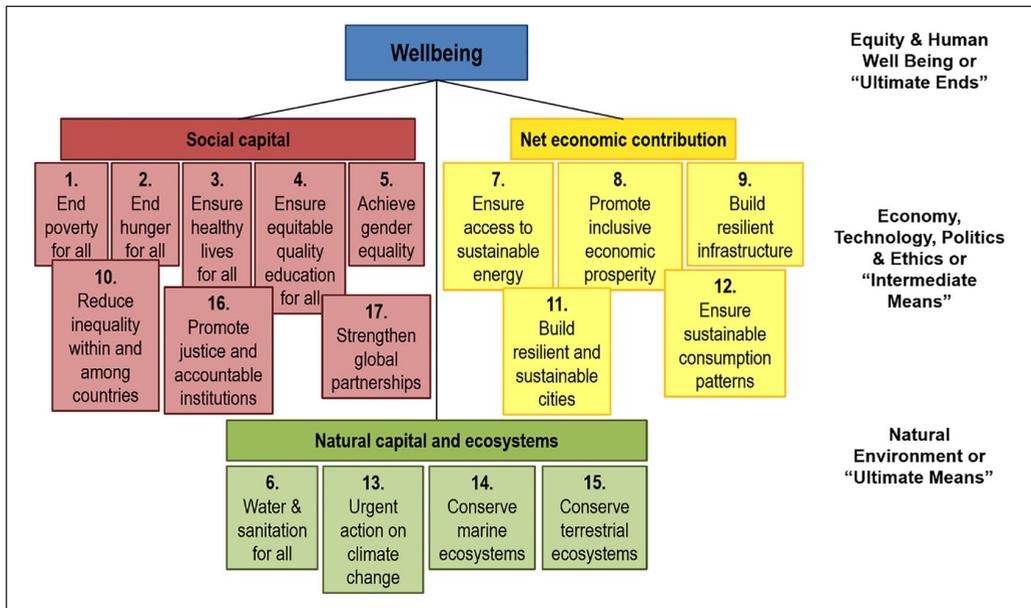


Figure 3. The Sustainable Development Goals in a hierarchy along a “means–ends” spectrum (after Costanza et al., 2014b, 2016).

Network (SDSN), 2018). At the same time, while aggregate indexes provide a picture of overall progress toward sustainability, changes in the overall number are difficult to link to the original causing factors.

The SWI can provide a synthesis of the overall level of wellbeing and, at the same time, it can be disaggregated into its various dimensions. In order to do that, we represent the terms of the SWI and their interactions considering the hierarchy of the three elements that contribute to wellbeing (Figure 4; after Pulselli et al., 2015). Contributions from natural capital/ecosystem services, social capital/community, and net economic contribution are plotted in a three-axis diagram, where each axis refers to one form of contribution (Figure 4). Each axis is divided into two (or more) domains, based on a threshold value, representing the level of progress in each form of contribution (Pulselli et al., 2015). When available, threshold values informed by policy targets are preferable to assess compliance and performance.

In cross-country comparisons, this representation (Figure 4) is able to show the interactions between the elements of wellbeing and to identify which of the elements is out of balance with the others. This allows monitoring and categorization of countries into the eight possible combinations of “good” (or above target) and “bad” (or below target) performance for each one of the forms of contribution to wellbeing (Neri et al., 2017). The ideal set of relationships with balanced good performances in natural capital and ecosystems, social capital, and net economic contribution characterizes a good Anthropocene.

Several global-scale datasets provide different measures of natural, social, and economic contributions to wellbeing that can be used to implement the SWI. Comprehensive system dynamic models exist and are in further development for supporting the SWI and assessing over space and time the interactions among its terms, including both stocks and flows, causes and effects (Boumans et al., 2002; Costanza et al., 2007). These models can be adapted to explicitly consider progresses toward the SDG targets.

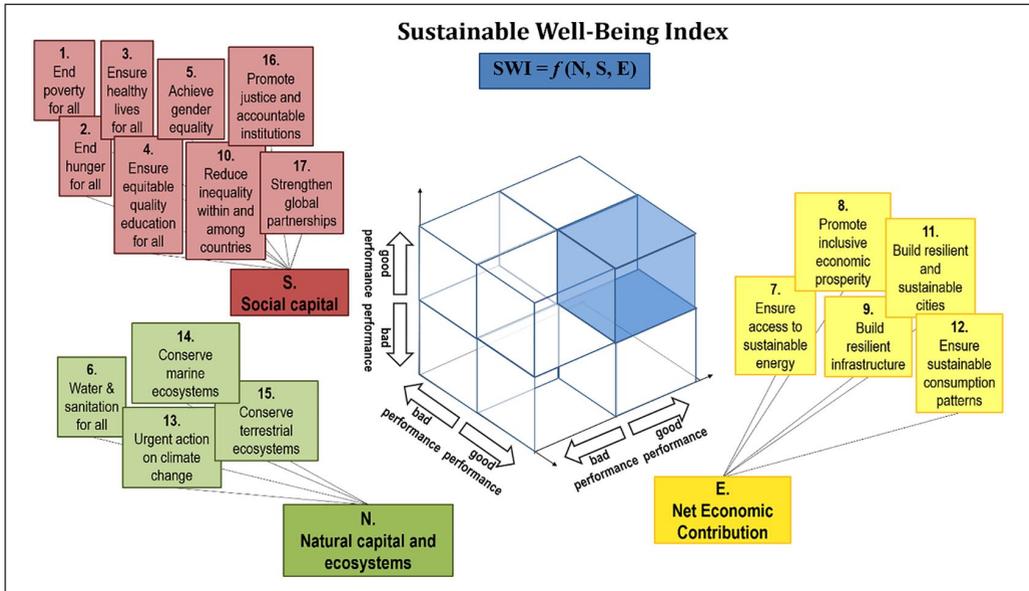


Figure 4. A representation of the Sustainable Wellbeing Index (SWI).

We discussed in a previous article different sets of metrics as potential components of the SWI, as well as an equation that works for combining these in an index, while considering half-saturation constants for accounting for limiting factors. Despite being partial, these measures give a weight to some of the main national natural assets, provide a picture of some of the main aspects of social wellbeing, and correct measures of economic progress by discounting overexploitation of resources and costs related to climate-impacting activities. For example, regarding the environment, the natural capital accounting performed by the World Bank includes the value of forest resources, cropland, pastureland, and protected areas for a set of over 100 countries (Lange et al., 2018). The World Happiness Report includes a measure that reflects aspects such as social support, health, freedom of choice, generosity, perception of corruption, and income inequality (Helliwell et al., 2017). Our calculations based on the GPI, the total cost/benefit system of accounting used to estimate net economic contributions, are in line with the results of the Inclusive Wealth Index by the UN, which dispute the efficiency and productivity of conventional corporations, while highlighting the positive economic impact of businesses based on human, social, and natural capital (Kubiszewski and et al, 2013; UNU-IHDP and UNE, 2014). Using the same tools, the independent agency Trucost in partnership with UNEP and the Food and Agriculture Organization (FAO, 2015) finds that most conventional businesses, from energy conglomerates in the fossil fuel sector to industrial food producers, are extremely inefficient: their social and environmental costs largely exceed their revenues (UNEP, 2013). Measuring social capital and informal production, the OECD estimates that the unpaid activities performed in households and communities create enormous (unaccounted) value for the economy, in some cases up to 80% of national income (Miranda, 2011). Although being only examples, these measures cover many of the aspects considered by the SDGs and are able to capture potential benefits of innovative business models in the different dimensions of wellbeing.

Using some of these measures, innovative business models can be assessed on the basis of their impacts on achieving the SDGs and, ultimately, on their impacts on the different component of wellbeing and the SWI.

For instance, if we consider urban gardens, as a possible solution in a sharing economy as argued previously, they have the potential for contributing to multiple SDGs. At the same time, indicators of natural and social capital, and net economic contributions, can capture their benefits at least partially. Urban gardens contribute to reduce poverty by reducing the share of disposable income allocated for food (SDG 1 on “no poverty”) and they directly contribute to reduce hunger in some parts of the world (SDG 2 on “zero hunger”) (FAO, 2018). Food from urban gardens can improve nutrition and urban gardens often imply sustainable agriculture practices (SDG 3 on “good health and wellbeing”), being one element for implementing sustainable cities and communities (SDG 11). All of this opens up opportunities for educational experiences (SDG 4 on “quality education”), also stimulating social relationships and sustainable forms of production and consumption (SDG 12). Urban gardens are green areas that contribute to climate action (SDG 13) and enrich local biodiversity (SDG 15 on “life on land”). The contributions of urban gardens to multiple SDGs lead to increasing contributions to wellbeing accountable within the terms of the SWI equation. Ideally, the simultaneous achievement of all of the SDGs directly linked to, for example, natural capital and ecosystems, would lead to the maximization of natural capital contributions to wellbeing and the SWI.

While GDP is unable to account for these contributions, natural capital accounting will consider the increasing value that cropland resources in urban areas will have in the Anthropocene. Social capital indicators will consider the positive effects of urban gardens on improving quality relations and perception of generosity. Alternative economic indicators will account for the costs avoided by absorbing CO₂ and particulate emissions.

However, as we know that synergies and trade-offs exist among SDGs (Dörgó et al., 2018; Le Blanc, 2015; Lu et al., 2015; Nilsson et al., 2016; UN, 2016; Weitz et al., 2018), a balance between different contributions to wellbeing has to be found. Regarding urban gardens and urban agriculture, Ward et al. (2014) proposed an optimization model to address trade-offs emerging among different environmental impacts (i.e. water use vs land use), food choices, dietary guidelines, and economic benefits.

Similar examples can be made for the different typologies of new and innovative business models (Figure 2), linking their effects to the SDGs through wellbeing indicators (Figure 1). For instance, the effects on multiple SDGs of reusing clothes via secondhand shops can be compared with the effects on SDGs of buying new clothes (Table 1). In this example, we calculate the economic impact of the purchase of cotton T-shirts in terms of its price for the user and some environmental impacts, that is, emissions of CO₂ equivalent, water use, and waste generation. We compare one conventional scenario with two users buying two new T-shirts and using them for a period of 3 years each (which is the average projected life-time estimated by WRAP (2017) for clothing in the United Kingdom) with three secondhand scenarios where the T-shirts are reused. In these alternative scenarios, the two users use the T-shirt for a period of 1.5, 2, and 3 years, respectively. We set the price of one new cotton T-shirt at \$10, and the secondhand price of the same T-shirt as half of it (Trusted Clothes, 2017), that is, \$5. **[AQ: 7]** Assuming that 1 kg of cotton makes up, indicatively, a total of five cotton T-shirts, we consider a minimum estimate of 2000 L of water used for producing one T-shirt (Chapagain et al., 2006). Using the lower limits from Joint Research Centre (JRC; 2014), we estimate that 3 kg of CO₂ equivalent is emitted in the production phase of the T-shirt and 1 kg CO₂ equivalent is emitted per year in the use phase through washing, ironing, and so on.

Results show that the economic benefit for the seller decreases for the T-shirt in the secondhand scenarios, as all the environmental impacts. In particular, water use decreases by 50% in all the secondhand scenarios, while CO₂ emissions decrease by 25% up to 50%. Furthermore, the secondhand scenarios imply an end-of-life waste volume of one T-shirt, compared to two T-shirts

Table 1. Some economic and environmental impacts of single-user versus secondhand scenarios for clothing.

	Single-user scenario		Secondhand scenario		Contribution to Sustainable Development Goals themes
	Two users using two different new T-shirts for 3 years each	Two users using one T-shirt for 1.5 years each	Two users using one T-shirt for 2 years each	Two users using one T-shirt for 3 years each	
Total life-time per T-shirt (years)	3	3	4	6	
Total price (\$)	20	15	15	15	Goal 8 “economic growth”
Water use in the production phase (L)	4000	2000	2000	2000	Goal 6 “water use”
kg CO ₂ eq. in the production phase	6	3	3	3	Goal 13 “low greenhouse gas emissions”
kg CO ₂ eq. in the use phase	6	3	4	6	Goal 12 “material consumption and waste generation”
Waste (number of T-shirts)	2	1	1	1	
<i>Impacts per user per year</i>					
Cost (\$)	3	5	4	2.5	
Water use in the production phase (L)	667	667	500	333	
kg CO ₂ eq. in the production phase	1	1	0.75	0.5	
kg CO ₂ eq. in the use phase	1	1	1	1	
Waste (number of T-shirts)	0.3	0.2	0.2	0.2	

Calculations on impacts are based on minimum estimates from WRAP (2017), Trusted Clothes (2017), JRC (2014), and Chapagain et al. (2006).

wasted in the single-user scenario. By calculating the same impacts per user per year, user cost increases in the 1.5- and 2-year secondhand scenarios (although only the first user pays the \$10 price for the new T-shirt) and decreases for the 3-year one. Water use and CO₂ emissions remain constant in the 1.5-year scenario while decreasing in the others, leading to a water saving of 167–334L per user per year, and avoided emissions of 0.25–0.5 kg CO₂ equivalent per user per year (Table 1). These avoided impacts are disregarded by GDP, which would only register the (hypothetical) decreasing revenues of the seller. Other SDG indicators would indeed account for the avoided impacts (Table 1), and different existing approaches for combining progresses toward multiple SDGs (e.g. ASVIS, 2018; Bertelsmann Stiftung and SDSN, 2018) could feed into the SWI. In this example, we do not consider further impacts due to the use phase, for example, water use; however, we also do not consider further impacts in the production phase (e.g. land use) that would worsen the environmental impact of the single-user scenario. The secondhand scenario with two users using the same T-shirt for 6 years considers the fact that transition toward innovative business models would likely push the market toward higher quality products, especially in terms of durability. This could lead to an increasing price, which could compensate for the economic loss of the seller selling fewer items.

Overall, a transition toward a service economy where innovative models are prevalent, reducing resource use and environmental impacts, strengthening relationships and social capital, and maximizing the benefits while reducing the disbenefits of growth, will be signaled by the SWI. This approach is coherent with wellbeing as the outcome of a convergence of factors, ranging from good human relations, to greater equality as well as a healthy social and natural environment (Wilkinson and Pickett, 2009, 2018).

We expect the SWI to show correspondence with existing measures of wellbeing, such as, for example, the OECD Better Life Index (oecdbetterlifeindex.org; for a more complete list of alternative approaches to aggregate indicators of wellbeing and their possible relations with the SWI, please refer to Costanza et al., 2014a, 2016). However, while providing an overall measure of wellbeing, the SWI will also allow for assessing natural, social, and economic contributions to wellbeing against political objectives (Figure 4). Similar approaches exist and are the result of national governments prioritizing wellbeing over economic growth. The most relevant examples are the New Zealand's Wellbeing Budget (New Zealand Treasury, 2019) and Scotland's National Performance Framework (Scottish Government, 2019).

A wellbeing economy

For achieving a good Anthropocene, a system of economic governance aimed at promoting wellbeing will need to recognize all impacts (both positive and negative) of economic activity, also valuing goods and services such as those related to society and the biosphere which, while not owned by anyone in particular, make a significant contribution to wellbeing.

As wellbeing measurements are integrated into institutional processes, they will be followed by relative rewards and sanctions, as is the case with GDP at present. Consequently, business models will have to change to stay profitable and socially acceptable, while the most impactful in terms of negative effects will need to be phased out. Limited liability—a foundation of the GDP economy and a powerful instrument in the creation of giant corporations often seeking economies of scale without reference to social or environmental consequences—will have to be reconsidered in light of the new parameters of prosperity. In the future, limited liability status may only be granted to companies supporting improvements in wellbeing while complying fully with social and environmental responsibilities. Patterns of ownership may change accordingly, with social enterprises and hybrid organizations that connect for-profit with non-profit activities becoming increasingly

common as wellbeing is incorporated into economic accounting and social and natural capital become prime drivers of economic prosperity. This will build on existing regulatory innovations, such as the introduction of low-profit limited liability companies and social enterprises, allowing organizations to draw on foundation and non-profit funding to operate as socially oriented business.

With the blurring of the distinction between entrepreneurial profit and societal wellbeing, the parallel distinction between producer and consumer (and the transactional, profit-driven activities that seek to separate them) will begin to fade. The emergence of prosumers is likely to change the very meaning of work, as wellbeing accounting shows how human beings can be productive in ways that transcend the traditional framework of paid employment, thus supporting the collaborative nature of the new economy.

With households integrated in economic performance accounting (as has traditionally been the case with firms), families will play a central role in the new economy and the time spent therein will be perceived as adding not only to society's public good but also to its economic dynamism. Moreover, the blurring of professional and leisure activities holds the potential of liberating both women and men from their traditional social roles.

In theory, the GDP economy can only operate within the boundaries of social acceptance and planetary resource capacity. As an extractive system, affording no value to unexploited resources and making no judgment as to the qualitative value of production and consumption, its growth must ultimately conflict with natural and social equilibria. To the contrary, a wellbeing economy's goal is not an increase in material consumption: a "virtuous circle" can thus be created whereby value that is measured in terms of wellbeing feeds the improvements in the human and natural capital upon which the creation of value depends (EEA, 2018). The negative impact on the environment can be greatly reduced by labor-intensive circular production systems involving prosumers. The services that the GDP model considers to be provided free of charge by nature (so-called ecosystem services, which include, for example, a myriad of fundamental "economic" functions ranging from rainfall to pollination, carbon sequestration, and irradiation, which are essential to any form of production) will become fully valued components of society's infrastructure, supported by new, horizontal, structures of governance that connect people more closely to the natural ecosystems in which they live and work. Economic growth in this model lies not in the exploitation of natural and human resource but in improving the quality and effectiveness of human-to-human and human-to-ecosystem interactions, supported by appropriate enabling technologies.

Conclusion

Wellbeing indicators have the potential to connect recent evolutions in policy and the economy, supporting transition to a good Anthropocene. Regarding the economy, innovative business models are defining new forms of prosperity that GDP is unable to capture. Regarding policy, the SDGs, as they relate between each other, reflect the relations among the natural and social capital and net economic benefits, coherently with a holistic perspective on wellbeing. Imposing a GDP-centered narrative above this set of complex interrelations is a betrayal of the political mission of planning and managing for the long-term prosperity of the whole society.

The consideration of GDP as the main indicator of national progress brings misleading measures that will, for example, counteract progresses made toward action for climate change or reducing inequalities and will risk constraining wellbeing to resource use-intensive consumer modes. The use of wellbeing indicators, building on the SDGs, with a focus on relationships among different contributions for a balanced prosperity, instead of the maximization of one form of contribution above the others, will instead give the right signals to policymakers through accounting for the

environmental, social, and economic benefits of solutions for a sharing and collaborative economy. Wellbeing indicators will inform the achievement of the overarching goal of an equitably shared and sustainable high quality of life and promote change in economic governance in the Anthropocene.

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