An appraisal of interlinkages between macro-economic indicators of economic well-being and the Sustainable Development Goals

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Abstract

Recognising the well-known limitations of economic growth as a litmus test of progress and the call by Target 19 of Sustainable Development Goal (SDG) 17 to "develop measurements on progress on sustainable development that complement gross domestic product", this paper advances understanding of the linkages between alternative measures of economic well-being, the well-being economy and the SDGs. A conceptual model is presented, linking four capital assets to well-being goals and domains, which are connected to related SDGs. An assessment is conducted on the extent to which Gross Domestic Product and five alternative indicators of economic well-being (Environmentally Adjusted Net Domestic Product, Measure of Economic Welfare, Genuine Savings, Genuine Progress Indicator and Inclusive Wealth Index) align with (a) the dimensions of economic well-being, and (b) various environmental, economic, social and institutional targets set by the SDGs. The Genuine Progress Indicator (GPI) is found to be the most comprehensive in coverage, accounting for market-based welfare, services from essential capital, and various environmental and social costs, and linking directly to targets in fourteen of the seventeen SDGs. The paper discusses how greater use of alternative measures of economic well-being by policymakers can encourage transitions to economies which prioritise well-being and desirability objectives.

Keywords: economic well-being; sustainable development goals; economic prosperity; indicators; capital assets; measures

1. Introduction

The United Nations' seventeen Sustainable Development Goals (SDGs) provide a global vision and consensus for a more sustainable and prosperous future for the planet by the year 2030, which demands the tackling of a myriad of environmental, economic, social and institutional challenges (UN, 2015). Building on earlier goal-oriented blueprints, such as the Millennium Development Goals, the SDGs demand action by all nations, irrespective of their level of economic development. Rather than existing in isolation, the SDGs and their respective targets and indicators are intricately connected. Objectives to end poverty must occur in tandem with strategies to sustain economic growth, fulfil social needs, embrace the challenges of climate change and protect the environment (Barbier and Burgess, 2017; Bowen et al., 2017; Hak et al., 2016).

SDG 8, 'Decent work and economic growth', specifies a target for all nations to sustain per capita economic growth in accordance with national circumstances (UN, 2015). Irrespective of the level of economic expansion that is 'in accordance with national circumstances', primacy is placed on macro-scale growth. However, economic growth is not a panacea. More than two decades ago, the UNDP (1996) identified five types of harmful Gross Domestic Product (GDP) growth: (1) jobless growth (a bigger economy and few jobs); (2) voiceless growth (a growing economy that represses freedoms and rights); (3) ruthless growth (growth with increasing inequality); (4) rootless growth (growth that leads to the undermining of culture); and (5) futureless growth (growth from undermining finite natural resources). In particular, in relation to (5), there are long-standing arguments, especially in relation to developed economies, that maintaining stocks of natural capital should be prioritised over the economic growth which derives from their depletion (Barbier and Burgess, 2017; Pelenc and Ballet, 2015).

Further complexities in the SDGs relate to how one goal should be prioritised over another, the contribution that their fulfilment makes with respect to human wellbeing, and the societal and policy changes necessary to ensure their achievement (Costanza et al., 2016a). SDG interactions are often described as synergies and trade-offs (Cook et al., 2019). Some trade-offs might be difficult to reconcile. Coscieme et al. (2020) argue that focus on SDG 8 entails the risk of policy incoherence, since its growth narrative does not chime with recognition of planetary boundaries. Furthermore, indefinite economic growth is incompatible with sustainable development and its focus can lead to the selection of misleading indicators, particularly in nations where the negative effects of growth outweigh the benefits (Hickel et al., 2019). Therefore, national SDG frameworks should not consider GDP as the sole indicator of a sustainable economy (Fioramonti, 2016; Fioramonti et al., 2019; Spaiser et al., 2017; Coscieme et al., 2020). This is recognised within the final target of the SDGs, 17.19, which calls for the development of measurements of progress on sustainable development that complement GDP (UN, 2015).

Given these shortcomings and challenges, it is necessary to consider the deeper interlinkages between economies and human well-being, and how these can be measured (Pais et al., 2019). This facilitates better understanding of whether the UN's vision is fomenting a world that is more sustainable, prosperous and desirable. In recent years, a global movement is building which endeavours to shift economies away from a narrow focus on marketed goods and services to sustainable well-being, with the aim of developing suitable evaluative metrics in this regard (Costanza et al., 2018; New Zealand Treasury, 2019; WEA, 2019). Alternative measures of economic well-being are macro-economic indicators that have been advanced regularly during the past few decades. They can override the risk of growth in GDP becoming prioritised as a nation's overarching policy goal (Coscieme et al., 2020; Costanza et al., 2014; Costanza et al.,

2016a; Costanza et al., 2016b). As Coscieme et al. (2020, p. 6) put it, *"measuring progress towards SDG 8 needs to consider further macro-economic indicators that internalize social and environmental externalities"*. Such indicators can operate alongside other emerging tools, such as non-monetary well-being indicators, to provide a comprehensive evaluation of macro-scale progress or regress in economic well-being (Aitken, 2019; Bleys, 2012).

This paper seeks to advance conceptual understanding of the linkages between alternative measures of economic well-being, the well-being economy and the SDGs. This analysis is conducted through use of a conceptual model linking the capital assets (natural, human, social, and financial and physical) of a well-being economy to specific well-being goals and domains, before these are connected to related SDGs. From these fundamental understandings, an appraisal is conducted of the extent to which alternative indicators of economic well-being capture the various aspects of sustainable economic well-being and their calculation components can be linked directly to the SDGs.

This paper is structured as follows. Section 2 of the paper begins with background material, including a brief literature review of the use and limitations of GDP as an aggregate measure of economic well-being, and discussion of the well-being economy. The conceptual framework of the well-being economy is then reviewed and discussed. Section 3 sets out the alternative measures of economic well-being for analysis in this paper. Section 4 applies the conceptual framework to analyse the extent to which alternative measures of economic well-being reflect the vision of the well-being economy and link to the SDGs and their respective targets. Section 5 discusses the implications of the results, some possible economic approaches for maximising economic well-being, and finally reflects on the limitations of alternative measures of economic well-being.

2. Conceptual background

2.1 Economic well-being and sustainable economic well-being

In the field of economics, economic well-being[1] has been referred to as the sum of utility gained through the consumption of material goods and services (Fisher, 1906; Weisbrod and Hansen, 1968). Based on such an interpretation, economic well-being derives mainly from material consumption and can be measured via market data. This is a narrow view of the interlinkages between economies, societies, the environment, institutions and well-being, and has often been criticised in recent years for its failure to capture and address the major problems facing the globe today, including poverty, inequality, environmental degradation and climate change (Coscieme et al., 2020; Jackson, 2011; Stiglitz et al., 2009; McGregor and Pouw, 2016).

More modern interpretations of economic well-being consider quality of life outcomes and the intertwining of economies with sustainability (McGregor and Pouw, 2016; Costanza et al., 2018). The term thus encompasses a broader range of human activities that either enhance or diminish economic well-being, including the benefits human beings receive from nature for free, known as ecosystem services, and the economic, environmental and social externalities of production and consumption (Cook, 2015; Kubiszewski et al., 2013; Lawn, 2003). These broader aspects are components of the well-being economy, which is focused not just on economic well-being but the sustainability of economic well-being (New Zealand Treasury,

[1] Also often referred to as 'economic welfare'.

2019; WEA, 2019). Costanza et al. (2018, p.1) described the well-being economy as having *"the fundamental goal of achieving sustainable well-being with dignity and fairness for humans and the rest of nature…A well-being economy recognises that the economy is embedded in society and nature. It must be understood as an integrated, interdependent system."* Nordhaus and Kokkelenberg (1999) contended that the notion of 'sustainable income' suggests that any measure of economic well-being should account for all stocks of capital affecting consumption and valuations that capture the social value of all goods.

For the purposes of this paper, economic well-being shall be considered to consist of the same three core pillars which underpin the OECD's Better Life Initiative. These are as follows:

- *Material living conditions* – the determinants of peoples' consumption possibilities and their command over resources;
- *Quality of life* – the set of non-monetary attributes that shape peoples' opportunities and life chances, and has intrinsic value under different cultures and contexts;
- *Sustainability* – the sustainability of the socio-economic and natural systems where people live and work, which is important for well-being to last over time and depends upon how human activities impact on the stocks of different types of capital (natural, human, social, and financial and physical). (OECD, 2013)

Linked to the three pillars are a set of five core objectives for the well-being economy, set out by Costanza et al. (2018, p.3):

(1) Stay within planetary biophysical boundaries – a sustainable size of the economy within our ecological life support system;
(2) Meet all fundamental human needs, including food, shelter, dignity, respect, education, health, security, voice, and purpose, among others;
(3) Create and maintain a fair distribution of resources, income, and wealth – within and between nations, current and future generations of humans and other species;
(4) Have an efficient allocation of resources, including common natural and social capital assets, to allow inclusive prosperity, human development and flourishing. A well-being economy recognises that happiness, meaning, and thriving depend on far more than material consumption;
(5) Create governance systems that are fair, responsive, just and accountable.

2.2 Conceptualising the well-being economy

Recognition of the limitations of GDP as a yardstick of economic well-being have helped to promulgate arguments in favour of using a broader set of metrics to provide a more accurate quantification. The OECD (2006, p.3) asserted that *"measures of GDP per capita and economic growth remain critical for any assessment of well-being but they need to be complemented with measures of other dimensions of well-being to get a comprehensive picture"*.

The history of the well-being economy is in fact long-standing, with Karl William Kapp, among others, more than fifty years ago communicating that the goal of public intervention and economic policy was to minimise human suffering and ensure continuation of human life on Earth (Luzzatti, 2019). However, in more recent times, considerable work has taken place in developing a conceptual framework for the evaluation of the well-being economy (Costanza et al., 2018; McGregor and Pouw, 2016; WEA, 2019). This needs to capture the three pillars of economic well-being: material living conditions, quality of life and sustainability (OECD,

2013), as well as the five objectives set out by Costanza et al. (2018). In 2019, the New Zealand government published its first 'Wellbeing Budget', an attempt at putting human well-being and the environment at the heart of its policies. New Zealand's Wellbeing Budget is developed from a Living Standards Framework (LSF) based on four capital assets (natural, human, social, and financial and physical). Together, the four capital assets underpin and provide resilience for twelve domains of well-being: civic, engagement and governance; cultural identity; environment; health; housing; income and consumption; jobs and earnings; knowledge and skills; time use; safety and security; social connections; and subjective well-being. Linked to these twelve categories are a dashboard of 61 well-being indicators which enable progress to be quantified over time (New Zealand Treasury, 2019). Other nations, such as Scotland and Iceland have adopted similar approaches. Iceland published an initial draft pool of 39 well-being indicators in September 2019, approved in April 2020, which were categorised according to the three core dimensions of sustainable development: economic, social and environmental, and charted links between the indicators and the SDGs (Government of Iceland, 2019).

Well-being indicators and their theoretical foundations have considerable merit as a means of responding to the OECD and UN's call for tools that complement GDP to provide a more nuanced picture of national well-being. However, they are additional monitoring tools rather than comparable to GDP, which is a macro-scale, monetary measure of economic well-being. For the purposes of analysing the extent to which alternative measures of economic well-being capture the various dimensions of the well-being economy and the SDGs, Table 1 sets out a conceptual framework linking its four underpinning capital components to four overarching goals[2] and the twelve well-being domains set out in the New Zealand Government's Living Standard's Framework, and finally to related SDGs. The reason the New Zealand approach was chosen as the basis for the conceptual framework was because, unlike the other countries to date, it has been shown that their LSF can be taken to the next stage of operationalisation via linking of well-being indicators to a national Well-Being Budget.

Due to the interlinked nature of the SDGs and their targets, some crossover the respective domains of the well-being economy and thus appear more than once. Equally, the delineation is contestable since some SDGs may also have peripheral overlap with multiple capital asset classes e.g. SDG 2 (Zero hunger) may entail social and human capital aspects of well-being.

[2] Encompassing the five objectives for the well-being economy set out by Costanza et al. (2018).

Table 1. A capital asset, goal and domain-based conceptualisation of the well-being economy

Capital assets	Goal	Domain	Related SDG(s)
Natural *All aspects of the natural environment that support life and human activity, including land, soil, water, plants and animals, minerals and energy resources.*	Planetary biophysical boundaries are not breached – a sustainable economy within our ecological life support system is maintained and even proactively regenerates the ecosystem, healing the harm already done.	Environment	6: Clean water and sanitation
			7: Affordable and clean energy
			11: Sustainable cities and communities
			12: Responsible consumption and production
			13: Climate action
			14: Life below water
			15: Life on land
Social *The norms, rules and institutions that influence the ways in which people live and work together and experience a sense of belonging; includes trust, reciprocity, the rule of law, cultural and community identity, traditions and customs, common values and interests.*	Fundamental human needs met – including the need to be valued and respected; social relations and self-determination; safety, security, and sense of dignity and purpose.	Civic engagement and governance	1: End poverty
			16: Peace, justice and strong institutions
			17: Partnerships for the goals
		Cultural identity	11: Sustainable cities and communities
			16: Peace, justice and strong institutions
			17: Partnerships for the goals
		Social connections	1: End poverty
			16: Peace, justice and strong institutions
			17: Partnerships for the goals
Human *The capabilities and capacities of human beings to engage in work, study, recreation and social activities; includes skills, knowledge, and physical and mental health.*	Human development, capacities and flourishing is supported and cultivated.	Health	1: End poverty
			2: Zero hunger
			3: Good health and well-being
		Knowledge and skills	4: Quality education
		Time use	8: Decent work and economic growth
		Subjective well-being	3: Good health and well-being
			5: Gender equality
			10: Reduced inequalities
Financial and physical *Financial and man-made physical assets which support material living conditions; includes factories, roads, hospitals, houses etc.*	A fair distribution of resources, income and wealth is delivered – within and between nations, and across current and future generations of humans.	Housing	9: Industrial innovation and infrastructure
			11: Sustainable cities and communities
		Income and consumption	8: Decent work and economic growth
			10: Reduced inequalities
			12: Responsible consumption and production
		Jobs and earnings	8: Decent work and economic growth

3. Alternative measures of economic well-being

3.1 Alternative measures of economic well-being

Given the flaws in the use of GDP as a measure of economic well-being, over the past three decades several alternative, monetary-based, aggregate measures of economic well-being have been developed. These are generally classified according to their specific objectives in relation to GDP, particularly whether they seek to adjust or supplement GDP.

Indicators supplementing GDP include composites and dashboard approaches such as the Human Development Index, Happy Planet Index, Better Life and Social Progress Index. These are useful for measuring and integrating aspects of societal well-being, such as health, wealth and life expectancy, and seek to complement GDP with additional information on environmental and societal conditions, either via the creation of satellite accounts or linking GDP to other economic, social and environmental indicators (Goossens et al., 2007). This is akin to the approach of New Zealand in their development of well-being indicators and related budgets.

Indicators adjusting GDP monetise various environmental and social factors (Kenny et al., 2019; Kubiszewski et al., 2013). These have also been referred to in the academic literature as corrective indicators to GDP (Bleys, 2012; Costanza et al., 2009) and, more broadly, as green accounting (Hoekstra, 2019). Green accounting approaches include indicators adjusting GDP which also encompasses various stock and asset-based measures that extend the SNA used to calculate GDP, such as the UN's System of Environmental and Economic Accounting. This integrates economic and environmental data to generate a more informed analysis of interrelationships between the economy and the environment (Hoekstra, 2019).

3.2 Selected indicators for evaluation

Several alternative measures of economic well-being were considered for review in this paper. Two criteria guided the selection process: (1) application of the metric at the national level of analysis; and (2) use of a monetary metric for estimating the economic value of sub-components and aggregation. Criteria (2) underpins the basis for focusing on indicators adjusting GDP and green accounting approaches due to their potential to demonstrate greater capacity than GDP to approximate economic well-being on a macro-economic scale.

The six selected measures of economic well-being are as follows:

- Gross Domestic Product (GDP)
- Environmentally Adjusted Net Domestic Product (EDP)
- Measure of Economic Welfare (MEW)
- Genuine Savings (GS) (also known as Adjusted Net Savings)
- Genuine Progress Indicator (GPI)
- Inclusive Wealth Index (IWI)

This does not constitute an exhaustive list, but in order to confine the analysis to the space limits of this paper, it was deemed necessary to focus on measures that have been reasonably widely adopted, either in the not-too-distant past or currently. Thus, some similar measures, such as the Sustainable Net Benefit Index (Lawn and Sanders, 1999), the Index of Sustainable Economic Welfare (ISEW) (Cigliarano et al., 2014; Stockhammer et al., 1997), National

Welfare Index (Diefenbacher et al., 2010), and Total/Comprehensive Wealth (Ferreira and Hamilton, 2010), were omitted. The ISEW, for example, is largely the same as the first version of the GPI.

Each of the measures is briefly described in turn.

3.2.1 Gross Domestic Product

GDP constitutes a monetary aggregation of all the goods and services produced within a nation's borders in a specific period, usually a year. The OECD defines GDP as "an aggregate measure of production equal to the sum of the gross values added to all resident and institutional units engaged in production and services (plus any taxes, and minus any subsidies, on products not included in the value of their outputs)." (OECD, 2014). GDP thus includes all private and public sector consumption, government expenditure, investments, additions to private inventories, paid-in construction costs, and the foreign balance of trade. GDP can be calculated by the SNA using three separate methods that should arrive at the same outcome: expenditure, production (output) and income (OECD, 2008).

3.2.2 Environmentally Adjusted Net Domestic Product

Alongside the revision of the SNA accounts in 1993, a System for Environmental-Economic Accounting (SEEA) was introduced and has been progressively reformed in subsequent years. The EDP derives from the SEEA, adjusting SNA aggregates with estimates of natural capital depletion and degradation (UN, n.d.). Typically, only a few resources are accounted for in EDP. The first estimate for Sweden included monetary estimates of the depletion of metal ores, loss of agricultural soils, and increments of stock pollutants influencing environmental degradation through acidification and eutrophication (Skanberg, 2001).

3.2.3 Measure of Economic Welfare

The MEW was the first green accounting measure which sought to estimate the annual real consumption of households. Similarly to EDP, the starting point in the MEW is the outcome from the SNA, which is adjusted to account for the monetary value of non-market commodities, both positive and negative. In the MEW, the adjustments include the monetary value of unpaid work, leisure time and environmental damages (Nordhaus and Tobin, 1972). Thus, it was fairly limited in scope but provided the foundations on which the GS and ISEW were built.

3.2.4 Genuine Savings

First formalised by Pearce and Atkinson (1993), GS is derived from capital theory and based on the Hartwick Rule. The measure constitutes a broad measure of weak sustainability that values changes in the natural resource base and environmental quality in addition to man-made assets (physical capital). The measure differentiates between gross and net saving. The former equates to the total amount set aside for the future in terms of either foreign lending or investment in productive assets. The latter accounts for depreciation. GS is an extension of net saving, which subtracts the monetary value of resource depletion and pollution damages and

adds investment in human capital (Qasim et al., 2020)[3]. A positive GS suggests a weakly sustainable economy.

3.2.5 Genuine Progress Indicator

Evolving from the ISEW, the GPI constitutes an attempt to measure whether the environmental impacts and social costs of economic production and consumption are negative or positive factors in economic well-being (Lawn, 2003; Talberth et al., 2007). Following methodological criticism by Bagstad et al. (2014) concerning the GPI's somewhat arbitrary calculation practices and lack of a solid theoretical basis, Talberth and Weisdorf (2017) advanced the GPI 2.0 methodology. GPI 2.0 will be the version analysed in this paper, which is defined as *"a monetary measure of economic welfare for a given population in a given year that accounts for benefits and costs experienced by that population in association with investment, production, trade, and consumption of goods and services"* (Talberth and Weisdorf, 2017, p. 142). A capital-asset approach is applied to the various flows of well-being benefits, grouping 'services from essential capital' into human, social, built and natural capital. Financial capital is already included within market-exchange value, so is excluded from GPI 2.0, avoiding the potential double counting of benefits.

3.2.6 Inclusive Wealth Index

The IWI measures the wealth of nations by analysing stocks of capital assets. Launched in 2012 by the UN University's International Human Dimensions Programme and the UN Environment Programme, the IWI is a bi-annual estimate of the trajectory of a nation's wealth using the shadow prices of its productive bases and adjusting for damages relating to greenhouse gas emissions, oil capital gains and total factor productivity (UNEP, 2018).

3.3 Method of analysis

The analysis is exploratory rather than deterministic. Direct linkages between the measures and SDGs were classed as impacts to SDGs that might occur in tandem with macro-economic activity, especially its expansion. For example, aspects of the SDGs linked to jobs and productivity, or the social, economic and environmental externalities of production and consumption. For example, if an indicator included a cost deduction for greenhouse gas emissions, then a direct link is evident between its calculation method and SDG 13 on climate action.

Indirect linkages were the more speculative, tangential consequences of economic output, such as enhanced opportunities to fulfil healthcare and education-related targets due to increased wealth. These are discussed in the ensuing analysis but are likely implications of economic output (and often growth) rather than a specific component of an alternative measure of economic well-being that might incentivise policy action to boost SDG performance.

[3] This methodology referred to in this paper will be the one used in the recent national assessment of New Zealand's GS by Qasim et al. (2020), which is slightly broader in scope than the World Bank's approach.

4. Results

Each of the measures of economic well-being is reviewed in turn. The aim of the analysis is not to provide a critique of theoretical foundations, detailed calculation procedures or data availability for each measure, but rather to provide a conceptual assessment focused predominantly on the direct linkages between the measure's calculation procedures, the capital-asset foundations of the well-being economy and the SDGs.

4.1 Gross Domestic Product

GDP is the indicator via which progress towards SDG 8, Target 8.1 is assessed: "sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries" (UN, 2016). Within SDG8, Targets 8.2, 8.3, 8.5, 8.9 and 8.B are directly aligned with the objectives of Target 8.1, seeking increased employment and productivity. Targets 8.1 and 8.B aim to boost investment and increase aid for trade, respectively, the fulfilment of which will translate into expanded macro-economic activity, all other factors being equal. There is also some direct synergy with aspects of the human, social and financial and physical capital asset classes in the well-being economy. The national pursuit of increased GDP is also likely to be an objective which has synergy with reducing poverty in the least developed countries, and thus concords with Target 1.1's aim to eradicate extreme poverty for all people, measured by the number of people living on less than $1.25 a day. Increased wealth can also directly contribute to meeting the part of Target 2.3 relating to the doubling of incomes for small-scale producers. Investment in industry boosts GDP, all other factors being equal, and assists with meeting Target 9.2 on raising industry's share in gross domestic product. Finally, boosting GDP can also help to fulfil Target 10.1 on achieving and sustaining income growth among the bottom 40 per cent of a nation's population at a rate higher than the national average.

The incoherence of GDP growth as a policy objective is revealed through the extent to which it does not capture the trade-offs of economic activity, which are indicated by the array of SDGs likely to be negatively impacted by increased economic activity if not managed properly. Even within SDG 8, the pursuit of increased GDP is likely to be inconsistent with the objective of Target 8.4 to improve progressively, through to 2030, global resource efficiency in consumption and production (Thomas et al., 2018). Boosting GDP might also be incompatible with the environmental goals linked to the natural capital asset class of the well-being economy, especially SDGs 13, 14 and 15 (Hickel et al., 2019). Equally, there could be negative implications of expanding GDP with respect to the human and financial and physical asset classes, particularly concerning SDGs 10 and 12 (Lafortune et al., 2018). Extensive evidence suggests that increased GDP typically leads to increased income inequality, undermining the ambitions of SDG 10 (Cosciene et al., 2020; Piketty, 2014).

Overall, GDP can be directly linked to ten targets within five of the SDGs. None of these five SDGs relate to the natural capital asset class, reconfirming that the well-being economy's environmental domain is overlooked in the SNA. As exemplified above, there are likely numerous indirect negative impacts to the environment caused by increased wealth. There are also likely positive indirect effects, such as increased capacity to provide high-quality healthcare (SDG 3) and education (SDG 4).

4.2 Environmentally Adjusted Net Domestic Product

The EDP bears quite close similarity to the IWI. Based on the SEEA, it takes a stock rather than flow-based approach, but also seeks to account for the various externalities of economic activity. Physical resource accounts are linked to the monetary balance and flow accounts calculated in accordance with the methodology of the SNA. Emphasis is also placed on accounting for changes in environmental quality and the maintenance of tangible wealth.

The SEEA accounts for the following: materials flow and solid waste; energy and carbon emissions; water and wastewater; agriculture, forestry and fisheries; ecosystems; and land-use and management. In addition to SDGs 1, 2, 8 and 9 on zero poverty, zero hunger, economic growth and infrastructure, respectively, a broad array of SDG goals and targets can be directly linked to these physical resource accounts. Materials flow and solid waste can be connected to SDGs 11 and 12. Energy and carbon emissions link to SDGs 7, 12 and 13. Water and wastewater management is a core component of SDG 6. Agriculture links to SDGs 2 and 15. Forestry and fisheries link to several targets within SDGs 14 and 15. The sustainability of ecosystems, such as mountains and deserts, are included in SDG 15. Sustainable land-use and management is also addressed within SDG 15.

Overall, eleven SDGs can be linked directly to the SDGs in the EDP. Akin to expanded GDP, there are likely several indirect links with other SDGs. These might include enhanced health and well-being (SDG 3), better education (SDG 4), and stronger institutions (SDG 16).

4.3 Measure of Economic Welfare

The MEW was an early forerunner which led to the emergence of the ISEW and the GPI. It starts with the value for GDP before adding the monetary value of leisure time and unpaid work, before deducting the costs of environmental damage. The value of leisure time and unpaid work are difficult to link to any SDG targets. However, the costs of environmental damage can be connected to a broad variety of goals and targets depending on the breadth of the included costs.

Overall, the MEW is a little more extensive than GDP in incentivising action likely to be of benefit to SDG performance. Like GDP, direct links are evident with targets in SDGs 1, 2, 8 and 9, but also potentially various pollution-related targets, including air pollutants (Targets 3.9 and 11.6), greenhouse gas emissions (Targets 9.2, 9.4, 11.3 and 13.2), water pollutants (Targets 14.1 and 15.5) and reducing solid waste (Target 11.6). The MEW can be directly linked to and drive policy action concerning targets within nine of the seventeen SDGs.

4.4 Genuine Savings

In the first stage of the GS, Gross National Savings (GNS) are calculated, which amount to the difference between gross national income and public and private consumption plus net current transfers. Net National Savings (NNS) are then calculated by deducting depreciation of fixed capital from Gross National Savings. Boosting GNS/NNS could be achieved mainly through focus on SDG 8 via expanded economic activity or SDG 12, particularly via Target 12.1 on implementing national sustainable consumption and production plans.

From NNS, the Net National Savings Minus Rents (NNSFR) are calculated by deducting natural resource rents from Net National Savings. These exclude potentially renewable resources and instead include rents from non-renewable resources such as fossil fuels, minerals

and metals. Increased values for the NNSFR are likely to be delivered through more sustainable management and efficient use of natural resources (Target 12.2 of the SDGs), which will reduce natural resource rents. Where feasible, the NNSFR calculation could incentivise policymakers to focus on circular economy principles in relation to non-renewable resources, which would lead to alignment with Target 12.5 aimed at substantially reducing waste generation through prevention, reduction, recycling and reuse. Reduction in the use of fossil fuels for energy generation and associated resource rents also chimes with the pursuit of SDG 7's objectives concerning increasing access to affordable and clean energy. Targets 7.2 and 7.3 on increasing the share of renewable energy and improving energy efficiency are particularly apt in this context. There are obvious co-benefits between the pursuit of environmentally focused SDGs and meeting the climate change objectives of SDG 13.

The Net National Savings Minus Rents Plus Forestry (NNSF) are estimated by adding the rents from forest depletion to the NNSFR. Rents from forestry are excluded from World Bank estimates of the GS but were included within the New Zealand estimate. This approach is potentially aligned with the objectives of SDG 15, especially Target 15.2 on the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services. A resource rent approach alone, however, is unlikely to incentivise the conservation of ecosystem services of value to human well-being. Thus, fulfilment of Target 15.9 is unlikely to be stimulated by the NNSF, which seeks to integrate ecosystem and biodiversity values into national and local planning. A broader approach to the NNSF would be necessary to incentivise policy action that is aligned with the overarching objectives of SDG 14 on the conservation and sustainability of marine and aquatic life.

The GS is calculated by adding investments in education to the NNSF and deducting for pollution damage. The former amounts to a proxy measure for human capital and has synergy with all ten of the targets linked to SDG 4 on ensuring inclusive and equitable access to education. The latter has health and well-being implications that contribute to the meeting of Target 3.9 on reducing the health impacts of air, water and soil pollution. Similar objectives relating to the minimisation of pollution impacts can be observed in Targets 6.3 and 11.5 (drinking water quality), 11.6 (cities), 14.1 (marine environment) and 15.5 (degradation of natural habitats).

Overall, the calculation methodology of the GS goes well beyond GDP by capturing several environmental externalities, and pursuing its maximisation is likely to have the potential to incentivise direct policy action across targets in twelve of the SDGs: 1, 2, 3, 6, 7, 8, 9, 11, 12, 13, 14 and 15. Of these, seven of the SDGs[4] belong to the natural capital asset class, three to human, one to social, and two to financial and physical. None of the directly aligned SDGs related to the intangible well-being domains of civic engagement and governance, cultural identity and social connections.

4.5 Genuine Progress Indicator

The new calculation methodology – GPI 2.0 – embraces a capital asset to services approach. Links to the SDGs can be identified by examining its calculation processes – for this task, the methodology set out in Table 1 of Talberth and Weisdorf (2017, p.6) is utilised. GPI 2.0 splits its calculation into three categories: market-based welfare, services from essential capital, and environmental and social costs. Each of these has multiple sub-categories and sub-components,

[4] SDG 11 cuts across the capital asset classes, however, Target 11.6 relates specifically to an environmental dimension within SDG11.

which are monetised and aggregated to arrive at the three category totals, which in turn are also aggregated to determine a monetary value for economic well-being in each time period.

Akin to the GS, the market-based welfare category in the GPI commences with consumption. There is thus direct joinability with SDGs 1, 2, 8 and 9, as per the other measures. Various deductions from consumption in this category can be directly linked to SDGs and their targets. In the case of the sub-category of defensive and regrettable expenditures, the direct links are as follows: costs of medical care (3.7 and 3.8), costs of legal services (16.3), costs of food and energy waste (7.3, 12.3, and 12.5), household pollution abatement (3.9), welfare neutral goods (12.1), and household security (11.1). In the case of the sub-category of household investments, the direct links are as follows: costs of consumer durables (8.4 and 12.5), costs of household repairs and maintenance (11.1 and 11.C), costs of home improvement (11.1 and 11.C), and the costs of higher and vocational education (4.3 and 4.4). The market-based welfare category then deducts the costs of income inequality (10.4) and adds the economic value for the public provision of goods and services (11.2, 12.7 and 17.17).

Services from essential capital include benefits from human, social, built, and natural capital classes. For human capital, these include services from higher education (4.3 and 4.4), manufacturing jobs (8.2, 8.3 and 9.2) and green jobs (8.9). For social capital, these include benefits from leisure time, voluntary work and internet services (9.C). Of these, leisure time and voluntary work are not possible to link directly to any SDG targets. Built capital comprises benefits from transportation infrastructure (9.1 and 11.2), water infrastructure (9.1), and household capital (11.1). Protected natural capital benefits encompass the many ecosystem services from ecosystems, including marine and freshwater (14.2, 15.1 and 15.8), deserts (15.1), forests (15.2), grasslands (15.1) and wetlands (15.1).

Environmental and social costs account for the negative environmental and social externalities of economic activity. This category includes three sub-categories: the depletion of natural capital, costs of pollution and social costs of economic activity. The depletion of natural capital involves monetisation of the costs of land conversion (15.1 and 15.A), replacement costs of non-renewable energy resources (9.2, 9.4, 11.3 and 13.2), replacement costs of groundwater depletion (15.1), and productivity losses due to soil erosion (15.3). The costs of pollution include air pollutants (3.9 and 11.6), greenhouse gas emissions (9.2, 9.4, 11.3 and 13.2), water (14.1 and 15.5) and solid waste (11.6). The social costs of economic activity include monetisation of the impacts of crime (16.3 and 16.5), underemployment (8.5, 8.6 and 8.B), homelessness (11.1), commuting (11.2) and vehicular accidents (3.6).

Overall, the GPI aligns very closely with the conceptual framework for the well-being economy outlined in this paper. Direct links are evident between the natural, financial and physical, social and human capital asset classes, and targets across fourteen of the seventeen SDGs. Limited direct connections were observed with respect to the SDGs in the social capital class, especially SDG 5 on gender equality and SDG 17 on the forging of partnerships to meet the goals. However, indirect benefits relating to SDG 17 are very likely to be stimulated by maximising the services from essential capital (especially human) and minimising the negative environmental and social externalities of economic activity. In addition, although GPI 2.0 does not account for the costs of gender inequality, its pursuit could be enhanced indirectly through its simultaneous integration into company policies seeking to maximise the sustainability of production (SDG 12), or as part of government action to boost employment rights (SDG 8).

4.6 Inclusive Wealth Index

The IWI has some comparable features to the GPI in terms of its scope, capital asset foundations and SDG linkages. The social capital aspect in the GPI is not included – directly, at least – and instead the IWI's measurement is confined to manufactured (physical), human and natural capital assets. Within natural capital, the IWI focuses on forests, agricultural land, rivers and estuaries, the atmosphere, oceans and subsoil resources such as soil nutrients. The total stocks of assets across the set of capital assets determine a nation's wealth, its productive base. Despite direct links between the components in IWI and the targets of the seventeen SDGs, neither SDG 8 nor any of the other SDGs recognise the need to transition to an SNA that contains wealth estimates. In cases where wealth increases because of the pursuit of the SDGs, then government actions could be said to be sustainable, and unsustainable if wealth declined.

Similarly to the other measures reviewed in this paper, an objective of the IWI is to partially fulfil the ambitions of Target 17.19 by providing a complementary assessment to GDP. Thus, it is complementary to SDG Target 8.1. However, its linkages are far broader through emphasis on wealth, since the SDGs, together with their respective targets and indicators, link in a direct manner with the productive base of the economy, especially natural capital stocks such as water, air, soil and forests. A decrease in the IWI could be due to a reduction in natural capital stocks, such as unsustainable use of marine resources (SDG 14) or terrestrial ecosystems, forests and biodiversity (SDG 15), or failure to tackle the impacts of climate change (SDG 13). Increases in the IWI could directly lead to SDG benefits in targets linked to SDGs 1, 2, 3, 8, 9, 11, 12, 13, 14 and 15. Akin to natural capital accounting, the IWI incentivises policy-action to preserve capital assets intact, or to increase stocks, which in turn has the potential to contribute to the meeting of various SDGs and their targets. In comparison to the GS and GPI, the IWI includes only a limited adjustment for the environmental and social externalities of economic activity, seeking to account for the impacts of greenhouse gas emissions (SDG 13), total factor productivity (exogenous factors impacting economic growth) (SDG 8), and oil capital gains (SDGs 8 and 12). Thus, unlike the GS (to an extent) and the GPI (more comprehensively), the IWI does not directly focus on the quality of natural capital stocks and incentivise links with targets in the SDGs relating to the minimisation of pollution, such as 9.2, 9.4, 11.3, 11.6, 13.2, and 14.1. In addition, the social externalities of economic activity, such as inequality (SDG 10) are overlooked.

Overall, the IWI is similar to the EDP in providing a useful measure of the extent to which a nation is weakly sustainable, providing more depth than the MEW, and a similar capital asset framework to the GPI, but with limited comprehensiveness concerning the environmental and social externalities of economic activity. The measure can be directly linked to ten of the seventeen SDGs.

4.7 Performance summary

Table 2 provides a summary of the performance of each indicator, highlighting the areas of overlap between the calculation method and at least one of targets linked to the goals of the respective SDGs. The Genuine Progress Indicator (GPI) is found to be the most comprehensive in coverage, linking directly to 14 of the 17 SDGs.

Table 2. Indicators of economic well-being and direct SDG alignment.

		Indicator of economic well-being					
Sustainable Development Goal		**GDP**	**EDP**	**MEW**	**GS**	**GPI**	**IWI**
1	No poverty	✓	✓	✓	✓	✓	✓
2	Zero hunger	✓	✓	✓	✓	✓	✓
3	Good health and well-being			✓	✓	✓	✓
4	Quality education					✓	
5	Gender equality						
6	Clean water and sanitation		✓		✓	✓	
7	Affordable and clean energy		✓		✓	✓	
8	Decent work and economic growth	✓	✓	✓	✓	✓	✓
9	Industry, innovation and infrastructure	✓	✓	✓	✓	✓	✓
10	Reduced inequality	✓				✓	
11	Sustainable cities and communities		✓	✓	✓	✓	✓
12	Responsible consumption and production		✓		✓	✓	✓
13	Climate action		✓	✓	✓	✓	✓
14	Life below water		✓	✓	✓	✓	✓
15	Life on land		✓	✓	✓	✓	✓
16	Peace, justice and strong institutions						
17	Partnerships						
Total number of alignments		**5**	**11**	**8**	**12**	**14**	**10**

5. Discussion

5.1 Summary of outcomes and challenges of operationalising the alternative measures

Alternative measures of economic well-being provide a nuanced means of assessing progress, providing more detailed information about the economic well-being implications of macro-economic activity. They either seek to account for the environmental and social costs of activity, assess decline in resource asset stocks, or both. Although forged on similar capital asset foundations, the IWI's omission of the social asset limits its comprehensiveness in comparison to the GPI, which, with fourteen direct linkages between its methodology and the SDGs, was found to be the most extensive of the six measures.

The extent to which any alternative measure of economic well-being encompasses SDG components is a biproduct of its scope. More straight-forward measures, such as the MEW, are not especially data intensive, but lack comprehensive in breadth. More extensive measures, such as those based on the GPI 2.0 methodology, are data intensive, procedurally challenging and potentially cumbersome to calculate. Moreover, however complex, no metric can capture of all the multifarious dimensions of economic well-being specific to a nation. In addition, at the indicator rather than goal and target level, the extent to which the SDGs embrace the well-being economy is limited, excluding even a well-being metric. The specifics of well-being will

also vary from one nation to another, which reiterates concerns about the extent to which any sustainability-themed indicator should be used to form international performance comparisons (Olafsson et al., 2014; Cook et al., 2017). Aggregate economic well-being measures and well-being indicators are also static measures of performance, which give hints as to the likely sustainability of national economic activity and the likelihood of indirect linkages to SDGs being realised. Costanza et al. (2016b) voiced the importance of developing dynamic, non-linear systems models of what was coined 'the economy-in-society-in-nature', which could keep track of stocks and flows of the four capital assets, and their costs and benefits. Although highly complex, such models would help to facilitate better understanding of past, present and likely future performance, facilitating better understanding of the economic approaches and policies that are most likely to generate recovery from the impacts of the COVID-19 crisis and accord with the United Nations' 2030 vision for a more sustainable and desirable world.

5.2 Economic approaches to securing and promoting well-being

The recent and, to date, ongoing COVID-19 crisis has the potential to induce record rates of unemployment, bankruptcies, and private and public sector debt levels, to mention just a few of the global economic implications. It is clear GDP will decline across the planet, at least in the short-term, predominantly due to a fall in personal disposable income and severe contraction in production and consumption. However, within weeks of widespread lockdown across the planet, there were reports of environmental benefits from the partial suspension of capitalism, including cleaner air in Chinese cities due to a 40% reduction in coal consumption by the nation's six largest power plants (Oxford Institute for Energy Studies, 2020). In Europe, satellite data revealed reductions in nitrogen oxide emissions across Northern Italy (ESA, 2020). Although measures of economic well-being will, in time, be able to approximate some of the economic well-being implications of COVID-19, the fact remains that any overall effects, positive or negative, will be the result of unplanned forces imposed on the world rather than intended systemic and policy changes.

The current crisis has, however, reinforced the importance of systemic, paradigm-level transitions of a planned character in which economic activities of least damage to the environment and society have been promulgated. In systemic language, these are economic activities that have the natural, social, human, and financial and physical capital assets as their bedrock, but have limited negative feedback, not exceeding the waste assimilative capacity of the environment, socially just and desirable. This paper does not wish to speculate on which economic approach will maximise economic well-being, but to use the ongoing hiatus to briefly mention the merits of three possible options – steady state economics, degrowth, and doughnut economics – in the light of the need to recover from the damage of COVID-19 and maintain pursuit of the United Nations' 2030 vision.

5.2.1 Steady-state economics

The concept of the steady-state economy has been articulated and promoted most prominently by Daly (1974; 1991). A steady-state economy involves constant stocks of physical wealth, maintained by throughput of natural resources. Emphasis is placed on maximising the durability of the stocks, reducing the flow of natural capital necessary for maintenance and minimising negative ecological impacts. Growth is assumed to entail expansion in stocks of physical wealth, increasing drawdown on scarce natural capital and straining the waste assimilative capacity of affected ecosystems. Steady-state approaches instead encourage economic activities reliant on a sustainable yield of renewable resources (Ekins, 2003; Goodland and Daly, 1996). Although various arguments have been outlined concerning the limited practicability of the

steady-state economy in a growth-dominated world and often the undesirability of such an approach in the developing world or after a deep recession, evidence suggests that the ecological implications of non-adherence have been increasingly apparent. These includes impacts such as overpopulation, increased pollution, increased concentrations of greenhouse gas emissions, ocean acidification, reduced stocks of non-renewable energy resources and minerals, and biodiversity loss. With regards to the latter, a recent report by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019) identified that damage to various ecosystems was undermining 35 of 44 UN goals, including the SDGs relating to poverty (SDG 1), hunger (SDG 2), health (SDG 3), water (SDG 6), cities (SDG 11), climate (SDG 13), oceans (SDG 14) and land (SDG 15).

5.2.2 Degrowth

Closely tied to the idea of the steady-state economy is degrowth which, for developed economies, is likely to be a stage in the transition from a growing to non-growing economy. In March 2020, the US-based Center for the Advancement of the Steady-State Economy voiced that in cases where the size of the economy has overshot the carrying capacity of the ecosystems that contain it, degrowth may be required before establishing a steady state economy that can be maintained over the longer term (CASSE, 2020). Kerschner (2010) argued for degrowth as an objective of developed countries, leaving ecological space for developing nations to catch up, and eventually for the whole world to reach a steady-state whereby economic well-being needs, prosperity and desirability are fulfilled. The socio-economic implications of the transition to the steady-state are likely to be challenging for developed nations (Kallis et al., 2012), much like the current, unplanned economic impacts of the COVID-19 crisis. Given that SDG 8, 'Decent work and economic growth', sets a target for all nations to sustain per capita economic growth in accordance with national circumstances (UN, 2015), it could be argued that this includes the possibility of targeting negative or zero growth in developed nations, provided this commitment has positive synergies with other SDGs and their respective targets.

5.2.3 Doughnut economics

Doughnut economics was first elaborated in 2012 and has since been expanded to reflect social (twelve dimensions) and ecological boundaries (9 dimensions) in line with the objectives of the SDGs and planetary boundaries, respectively (Raworth, 2017). Although perhaps more of a coherent visual framework for sustainable development than a prescriptive guide concerning how to manage an economy, doughnut economics nevertheless has considerable implications for economic policymaking. Firstly, it reinforces linkages between planetary health and human well-being. This has profound implications in terms of the quality of the four capital asset stocks depicted in this paper as contributing to economic well-being. Secondly, through the embedding of the social objectives of the SDGs, it helps to identify the various deficiencies and related economic inequalities, many of which could be causally related. Thirdly, through recognition of planetary boundaries, doughnut economics chime with the constraints-based approach of steady-state economics and drives home arguments against political prioritisation of GDP growth. Economies must be regenerative and distributive by design (Raworth, 2017). Fourthly, considerable modelling work is likely to be needed to best understand how to transform modern, developed economies that are highly unsustainable into ones that are simultaneously regenerative and distributive, and socially just. Fifthly, evaluative tools such as alternative measures of economic well-being could play an important role as part of a suite of monitoring indicators in this regard. In April 2020, the city of Amsterdam in the Netherlands relied on doughnut economics as the theoretical basis and framework for their circular economy strategy 2020-2025, intending to then commence the process of developing suitable monitoring tools (City of Amsterdam, 2020).

The three approaches of steady state, degrowth and doughnut economics encompass several SDG objectives, but also represent macro-economic models of the well-being economy that can transition beyond economic growth objectives. The well-being economy has been envisioned as an approach that goes beyond the limitations of the SDGs, placing strong emphasis on personal and environmental health, which implies fundamental shifts in the forms of production and consumption, work and governance (Fioramonti, 2016; Fioramonti et al., 2019). The SDGs thus provide a potential bridge between the old, growth-based and new, well-being focused models of the economy. They recognise the merits of growth in GDP, particularly in developing nations, and simultaneously advance deployment of alternative measures of economic well-being, such as the GPI, which are more appropriate for evaluating the well-being economy on a macro-economic scale.

5.3 Challenges in conceptualising and modelling economic well-being

The capital asset approach modelled in this paper depicts economic well-being as deriving from four categories. Translating these assets and their flows into monetary values is, in many cases, a challenge. Even monetary valuation of financial and physical capital, which may appear easiest as it already forms part of the SNA used to calculate GDP, can be more complex than it first appears. Financial products are vulnerable to risks and market distortions that can change their value greatly from one day to the next. Equally, the value of physical assets depends greatly on assumptions, not least how long the capital stock will survive and the extent to which its capacity to produce will diminish. SEEA methods for estimating the monetary value of resource stocks and flows still require assumptions to be made, such as those concerning future extraction rates, prescriptive discount rates and wider market impacts. In addition, many of the well-being benefits (ecosystem services) from natural capital have public goods characteristics that cannot be traded in markets. Although monetary (non-market) methods exist to estimate the value of flows or marginal changes in the quantity and quality of such benefits, these are methodologically challenging and sometimes controversial. The concept of social capital is equally elusive, not just in terms of how to value it but also how it should be defined in the first place. This was observed and reported in relation to the quality of life aspects in the Better Life Index that are non-monetary, contextual and culturally specific (Costanza et al., 2018). Many of the benefits of intangibles, such as social networks, community cohesion and institutional support systems, appear to lie beyond the realm of economic well-being, constituting broader aspects of human well-being. In that respect, perhaps the IWI should be praised for the omission of the social capital asset class from its methodology.

Another dilemma with respect to capital asset approaches to modelling economic well-being is the extent to which they should be considered substitutable. In terms of delivering sustainability of economic well-being, capital asset approaches tend to assume that this objective is met if the total stocks of capital do not decline over time. This suggests that capital assets are substitutable along the lines of the Hartwick Rule. For example, declining natural capital could be compensated with more human capital – investment in education – or more physical infrastructure – roads, hospitals, power plants etc. This is ‘weak sustainability’ and it is evident in GDP and the alternative indicators of economic well-being, where increases in consumption of physical goods and services can potentially offset various environmental and social damages. Criticism of weak sustainability has been extensive, predominantly because of ignorance of the importance of maintaining ‘critical’ natural capital. These are the environmental stocks that should not be drawn down below a certain quantity or diminished greatly in quality due to their fundamental role in supporting life and economic activities on the planet. The lack of a strong

sustainability approach in alternative measures of economic well-being entails the risk that natural capital stocks will become over-extracted, however, defining critical thresholds in a national context is another very challenging issue. Despite these methodological weaknesses and concerns about the extent to which the macro-scale sustainability of economies is measured, the capital asset approach retains advantages in terms of providing information about the potential level of economic production in the future.

5.4 Alternative conceptualisations of economic well-being

There are alternative conceptualisations of economic well-being that have merit, especially when considered in the light of the SDGs. These include needs and capability-based approaches that are particularly relevant in developing nation contexts, where the population may have few opportunities to access food (SDG 1 and SDG 2), health (SDG 3), clean water and sanitation (SDG 6), shelter, energy (SDG 7) and education (SDG 4). Sen's (1985) 'capability approach' to economic well-being looks at not only the consumption activities available to individuals, but also their capacity to choose from different options. In other words, the approach differentiates between functioning, capabilities and potential. A person without access to healthcare is unlikely to have the potential to enjoy many consumption activities available to others within that society. Although difficult to operationalise in practice, capability thinking formed part of the basis underpinning the formation of the Human Development Index, a composite index using GDP, health and educational data to estimate the level of development and opportunity within nations. It has often been cited as an alternative to GDP, however, it is better thought of as a supplement providing a snapshot of socio-economic well-being. National well-being indicator sets, although lacking the macro-scale evaluative and monetary advantages of alternative indicators of economic well-being, are more comprehensive in scope and, in the case of New Zealand, were developed using a capital asset framework. If used in conjunction with systemic approaches, such as doughnut economics, and linked well-being budgets, they may be very useful for ensuring that economic and social well-being is both maximised and sustainable in developed and developing economies alike.

6. Conclusion

Alternative measures of economic well-being can capture the deeper realities of the prosperity and sustainability of a national economy. This paper's conceptualisation of the well-being economy and delineation of linkages between its capital asset components, domains and SDGs enabled an appraisal to be made of the extent to which aggregate indicators of economic well-being capture the vision of a more sustainable and prosperous future for the planet. Pursuit of economic growth per capita, a core target of SDG 8, is calculated effectively using GDP data. However, the GDP calculation is unable to reveal the deeper intricacies of economic well-being, including the various capital and domain components which provide its productive base. Calculation components within alternative measures of economic welfare, such as the GPI, can be linked directly or indirectly to targets within most of the SDGs. Through the deployment of such measures, monetary insights can be provided to decision-makers concerning the well-being advantages of aligning policy objectives with the SDGs, and the costs of non-adherence.

In recent times, nations such as New Zealand, Iceland and Scotland have published well-being indicator sets, which include economic, environmental and social dimensions, and have been designed to align with the SDGs. These are useful for revealing trends in well-being dimensions and are important barometers of progress. However, well-being indicators alone cannot

estimate, monetarily, macro-level progress in national economic well-being, nor give indications of its likely sustainability and prosperity. The use of alternative measures of economic well-being, alongside traditional activity yardsticks such as GDP and emerging well-being indicator sets, has the potential to provide a highly nuanced macro-economic evaluation of a nation's economic well-being. In addition, in the light of the COVID-19 crisis in 2020 and emerging global recession, voluminous work is needed among the academic community to articulate the modelling tools, and the economic paradigms and systems, necessary to mitigate the potentially negative impacts to economic well-being, maintaining the possibility of fulfilling the United Nations' transformative 2030 vision.

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