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Measuring sustainability and well-being

INCLUSIVE WEALTH REPORT

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CHAPTER 2: INCLUSIVE WEALTH: FROM THEORY TO PRACTICE

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2.1. Introduction

One is unlikely to find a major publicly traded firm that does not conduct asset accounting and balance sheet analysis. The information embedded in such reports provides investors valuable insights into the composition of firm assets, and insights into its short- and long-run trends. Surprisingly, few nations have a history of preparing annual balance sheets, thus hamstringing the ability of policy analysts and policymakers to understand trends in the composition and status of national wealth, and use such information to inform policy design. Recently, however, the advent of wealth accounting by UN Environment and others is helping fill this information gap – how this information will be used remains to be seen.

Currently, UN Environment measures of wealth are calculated as weighted sums of human, natural and produced capital, with the weighted index called the Inclusive Wealth Index (IWI).[22] One can view a nation's wealth as an index of the productive base from which the flow of goods and services (i.e., gross national product or GDP) is generated. Roughly speaking, if the productive base (per capita) of a country has not fallen over time, and if projections suggest this pattern will continue into the future, we say the country's growth is sustainable. Note, that while sustainable growth can accommodate a pattern of increasing (or decreasing) GDP per capita over time, it is not wise to assume that a pattern of increasing GDP over time is consistent with sustainable growth. A simple example in the next section illustrates this point.

This chapter has four sections. The first section provides an overview of the rationale underlying the claim that – from an intergenerational welfare perspective – linking resource allocation policies to changes in wealth is more appropriate than linking resource allocation policies to changes in GDP. This second section provides an overview of the basis for wealth estimation and explores how various types of conservation and development policies recognizing the trade-off can be understood better with the help of inclusive wealth. The second section also brings the wealth concept closer to national level policies on selected conservation goals and targets, and shows its comparative advantage over others.

The third section illustrates some of the advantages of estimating wealth in the context of the United Nations Sustainable Development Goals (SDGs), which were endorsed in 2015. The chapter examines some of the global policy goals manifested in the 2030 Agenda and the SDGs. By selecting a few goals and targets, it has been shown how we can achieve greater results for the SDGs if the indicator is orchestrated through a wealth index. Finally, the chapter synthesizes the lessons learned, including caveats and limitations of wealth in formulating policies for conservation and development at various levels of decision-making units.

2.2. Gross Domestic Product, Wealth Measurement, Substitution and Sustainability

2.2.1. Gross domestic product and inclusive wealth

GDP was introduced at the Bretton Woods Conference in 1944, and was to serve as an index of the size of a country's economy – an accounting measure of all goods and services produced in a country over a given period of time. Since its inception, however, GDP gradually morphed from simply a measure of market activity, into a measure of a country's overall well-being – per capita GDP – a far cry from its original interpretation in the 1940s.

The shortcomings of GDP as a measure of social well-being are well known, with the two most germane to this discussion being: GDP ignores (i) the value of human capital and the non-market values of natural capital; and (ii) the economic value of externalities, both positive and negative. Few will argue that GDP was intended to serve as a measure of social inclusivity or environmental sustainability.[23] Perhaps this is why, as countries continue to advance economically, one questions the ability of GDP to adequately gauge human well-being and sustainability. This is especially the case when natural resource availability appears to present impediments to economic growth.

GDP is a measure of the value of service flows generated by an economy's produced (or physical), human and natural capital over a period of time. Wealth – in this case IW – is defined as the sum of the value of three types of capital stock: human capital, physical capital and natural capital. The value of each capital is defined as the unit stock value of that capital multiplied by the quantity of that capital. For example, if the unit stock price of physical capital is $1 and the economy is endowed with 5 million units of physical capital, the stock value of physical capital is $5 million. The IWI measures the wealth of a country by carrying out a comprehensive analysis of the country's productive base – the productive base includes

22 The long-run plan is to eventually define quantifiable measures of social and cultural capital, and introduce them into future wealth measures.
23 One might have an equally difficult time arguing inclusive wealth is a measure of social inclusivity.

three types of capital: manufactured or physical, human and natural. Its objective is that of measuring a nation's capacity to create and maintain human well-being over time. A country's IW is the social value (as contrasted with the market value) of all its capital assets, including natural capital, human capital and produced capital. If a country's IWI is non-decreasing over time, we say its growth is sustainable. The implication being that the average household in the future will be no worse off than households today.

Manufactured capital is the physical capital produced by humans – automobiles, roads, buildings, etc. Human capital is often defined as the stock of knowledge and skills possessed by a population, and the health status of that population. Investments in education, training and health are called investments in human capital.[24] Natural capital can be viewed as the stocks of natural assets, ranging from soil, water and air, to all living things.

The wide range of services natural capital provides are called ecosystem services, some of which are provisioning services like fuel from wood, cooking water from streams and lakes, and food from agricultural production. In developing countries, the poor and other economically vulnerable groups are highly dependent on ecosystem services for their livelihoods, with natural capital accounting for 36 percent of wealth in low-income countries (WAVES, 2012).

In addition to the provisioning service flows that directly support human life, there are less visible ecosystem services that come within the purview of regulating, habitat and supporting, and cultural functions. Although these services can be just as important – in some cases, essential – for human well-being, their contributions typically fall outside the domain of market valuation. Examples of regulating services include a forest's contribution to flood control and climate regulation, or its carbon storage services – each of which may be intangible from an economic standpoint, but undeniably valuable to humans, animals and other life forms. Despite the importance of the regulating and sustaining services to human well-being, the value of the services or the natural capital that produce them are seldom measured.

One could argue that, traditionally, economic policymakers focused on efficient production (e.g. eliminating subsidies, curtailing trade barriers) and increasing per capita GDP growth. The thinking was that efficiency and growth would increase the size of the economy, and the larger the economy, the more goods and services available for social consumption. Such productive activities, however, were often accompanied by negative externalities like air and water pollution. As the negative impact of the environmental externalities became more apparent, and were documented with verifiable statistics, many countries adjusted their industrial policies to lessen the levels and impact of the externalities. Still, in spite of these efforts, air pollution levels in cities across the globe provide evidence of the continued negative side effects of modern economic production.[25] Furthermore, the impacts of environmental degradation on health and recreational quality have not yet made their way into any well-known economic indices.

We have come to a similar point with natural resource and ecosystem management: a more clear understanding – and acceptance – of the potential problems associated with natural resource and ecosystem degradation has led to efforts to collect data that eventually should help better manage ecosystems and increasingly scarce natural resources. Data such as water stocks and qualities, soil depth, forested area and carbon sequestration are beginning to enter national account tables via the United Nations System of Environmental-Economic Accounting (SEEA).[26] The hope is to eventually use the natural resource stock levels to calculate natural resources, and possibly ecosystem services, stocks and flow value indices.

2.2.2. Why a wealth-based index of sustainability?

Typically, if per capita GDP growth is non-negative, decision makers assume the economy is doing well. The following example, however, illustrates this assumption could be misleading. Table 2.1 presents hypothetical levels of physical, human and natural capital for an (closed) economy, along with unit flow and unit stock prices. For simplicity, assume the economy produces a single final good, and that producing a unit of the final good takes one year, and requires one unit of natural capital, 40 units of physical capital and 0.006 units of labour.[27] The reader can verify that, given the factor endowments in Table 2.1, the maximum amount of the final good the economy can produce over the year is 250,000 units. In such a case, given the unit rental rates of capital and labour, and assuming the unit cost of the unit price of timber is $20; the economy's GDP is $9 million. The initial value of IW is equal to the sum of the stock values of physical, human and natural capital: $1x10,000,000 + $400,000x150 + $20x1,000,000 = $90,000,000.

24 See http://www.econlib.org/library/Enc/HumanCapital.html for a short discussion by Becker on human capital.
25 For example, see http://www.who.int/phe/health_topics/outdoorair/databases/cities/en/ for historical data on air pollution, and https://waqi.info/ for real-time (current) air quality data.
26 For more information, see https://unstats.un.org/unsd/envaccounting/seea.asp.
27 This production structure – one unit of natural capital, 40 units of physical capital and 0.006 units of labour – is often referred to as a fixed coefficient or Leon tief production function.

Table 2.1: Productive base – capital quantities, unit flow and stock values, GDP and inclusive wealth

Factor	Quantity	Unit Cost	Unit Value Stock	Flow Value	Initial Value Stock
Physical capital	10,000,000	$0.10	$1.00	$1,000,000	$10,000,000
Human Capital	150	$20,000	$400,000	$3,000,000	$60,000,000
Natural Capital	1,000,000	$20	$20	$5,000,000	$20,000,000
GDP	-	-	-	$9,000,000	-
Inclusive Wealth	-	-	-	-	$90,000,000

To keep calculations simple, assume physical and human capital does not depreciate, and the economy never replaces the natural capital used over the year. Then GDP in the subsequent year would also be equal to $9 million. However, since the economy used 250,000 units of natural capital, its capital stock would be equal to 750,000 and its IW equal to $85 million. In this simple example, the economy could generate $9 million in GDP for four years. On the other hand, IW per capita is falling over time – hence, the economy's growth pattern is not sustainable.

In this example, GDP does not change and provides no indication the economy is approaching a cliff. The inclusive wealth measure, however, provides a warning, as IW falls over the period. As a sustainability index, it appears the Inclusive Wealth Index (IWI) is superior to GDP (and any current measure of income changes). As such, the example illustrates why we might want to focus on wealth-based measures of sustainability. For an elegant mathematical argument underlying the superiority of wealth-based sustainability measures, see Dasgupta, (2009).

Of course, with no trade, and given the fixed coefficient production structure, the economy would be unable to produce any of the final good in the fifth year. This example, of course is highly stylized, but does show what can happen to a region in a country if an essential natural resource is improperly managed and if one ignores sustainability concerns. An extremely relevant example is the Aral Sea debacle, where water diversions for cotton and rice production caused the surface area of the Aral Sea to shrink to the extent that ships could no longer reach the cities on its shores – transforming a once economically vibrant water body into one with virtually no economic value.

2.2.3. Substitution and sustainability indices

The GDP and inclusive wealth pattern in the above example occurs because the assumed production technology did not allow input substitution – for example, it did not allow the economy to use more human capital and less natural capital and get the same level of output. If it was possible to produce income without natural capital, or produce the same level of output with less natural capital and more human or physical capital, the economy or region could continue generating income as natural capital levels fell. This issue of substitution possibilities for natural capital is central to an ongoing discourse on policy formulation for sustainable development.

Many economists assume technological advances will offset the potential fall in productivity due to natural capital losses. This view implicitly assumes human and physical capital can serve as substitutes for natural capital. On the other hand, many ecological scientists assume the substitution possibilities among human, physical and natural capital are limited, and that natural capital stocks impose a limit on productivity: this notion borrows from the concept of carrying capacity (Ehrlich and Pringle, 2008). The ecologists implicitly assume a shrinking natural capital base implies a decreasing level of potential productivity – maintaining the life support system of the earth is required to ensure sustainability.

Concerns with the substitutability of natural, human and physical capital influence the way we define and measure sustainability indices. Two broad classes of sustainability indices exist. One class assumes human and physical capital is unable to serve as a substitute for natural capital. Strong sustainability goals are linked to such restrictions. A sustainability index designed to satisfy strong sustainability goals would likely require the level of natural capital stocks per capita to not fall over time, and a separate index of human and physical capital per capita to not fall over time.

The other class of sustainability indices accommodates substitution between natural, human and physical capital. Weak sustainability goals are linked to these requirements. The IWI is a single index composed of the values of human, physical and natural capital and yields a weak sustainability index. By construction, it allows for an increase in IW (per capita) in the face of natural capital depreciation – it can increase as long as the decrease in natural capital stocks is offset by enough of an increase in human and physical capital stocks.

Combining, or reconciling, the economists' and ecologists' perspectives should be possible if the context and character of resources are known. The ecologists' notions of substitution and sustainability are captured in the Aral Sea debacle, where there are no substitution possibilities across human, physical and natural capital. An island tourism economy, on the other hand, is an example of how substitution could lead to an opposite outcome. Say an island's growth is linked to water recreation activities and, over time, loses natural capital through the degradation of its coral reef system. If the island invests in casinos and associated activities, it is possible the increase in physical and human capital could lead to an outcome where IW per capita increases over time.

Some types of natural capital have little or no human or physical capital alternatives. In poor nations the ability of climate conditions to control vector borne diseases may be limited. The regulative services inherent in nutrient cycling, soil formation and bioremediation also likely have few human and physical capital alternatives. The capital underlying these services is referred to as critical capital. If one could identify and measure critical capital, and monitor the levels and growth of that capital, it might be possible to develop a sustainability index of critical capital, but it is unlikely a market value of the capital would enter GDP measures anytime soon.

The Aral Sea, island tourism and critical capital examples suggest that the degree of ease with which an economy can substitute human or physical capital for natural capital will determine whether a strong or weak sustainability criteria is appropriate. Initial empirical studies suggest substitution possibilities exist for a wide range of production scenarios (Markandya and Pedroso-Galinato, 2007).

The IWR also suggests that, over the past 20 years, for over 100 countries, the negative wealth effects of a decline in natural capital have been offset by growth in human and physical capital. However, the emergence of concepts like critical natural capital and regulating services of ecosystems, and their role in sustaining the extremely impoverished, suggests there remains significant deficiencies in our current crop of sustainability indices. For instance, like GDP, the IWI has very little to say about income distribution and its impact on social welfare.

The IWI has the potential to measure a nation's wealth in terms of economic progress and long-term sustainability. It measures the wealth of nations via implementing an analysis of a country's productive base. The value of the productive base provides an index of an economy's production potential: if the IWI increases over time, it signals the economy is making economic progress much the same way that per capita GDP does. If the health and human capital component of the IWI increases, it provides a signal that human well-being is improving as well. An increasing IWI also suggests past and current consumption does not come at the cost of future generations' consumption potential.

Using the IWI can scale up resource efficiency – by providing policymakers with an overview of changes in the productive base of a country. It provides insights into trends within the capital asset groups, particularly human and natural capital – the central pillars of IW that remain underserved by current statistical collection efforts, and economic and policymaking analysis. The IWI can provide insights into whether current growth is sustainable or is based on overexploiting natural capital. This information can help develop policy better suited to sustaining growth while better managing human and natural capital. For example, results from the 2014 IWR demonstrate that investing in human capital would be the most beneficial for countries with the highest rates of population growth. It also demonstrates the multiple benefits of investments in natural capital, in particular agricultural land and forests.

2.3. Wealth, Income, Growth and Sustainability

2.3.1. Inclusive wealth and growth accounting

Section 2.2 provides an overview of the rationale for preferring changes in wealth per capita over GDP per capita as an index of sustainability – although this does not mean we should assume GDP is devoid of policy relevance. We compared the per capital growth rates of IW and GDP for 121 countries, and found 47 averaged negative rates of growth in per capita IW over the years 1990 through 2010.

Table 2.2 reports the growth rates of the 47 countries, and reveals almost all of them are either developing or middle-income countries; 10 of the countries also experienced negative per capita GDP growth over the 20-year period. Almost half of the countries in Table 2.2 are in sub-Saharan Africa. The remaining 74 countries experienced positive rates of growth in both per capita IW and per capita GDP (for a list of these countries, see Table 2A in the appendix to this chapter).

Table 2.2: Countries with negative (average) per capita growth rates* in inclusive wealth: 1990–2015

Country	Per Capita Growth in %		Country	Per Capita Growth in %		Country	Per Capita Growth in %	
	IWI	GDP		IWI	GDP		IWI	GDP
Burundi	-0.6	-8.0	Ecuador	-4.6	6.0	Nicaragua	-3.0	7.8
Cameroon	-8.4	-1.0	Ghana	-3.6	12.5	Nigeria	-8.6	15.9
Central African Rep.	-9.8	-1.0	Guyana	-0.5	20.4	Papua New Guinea	-12.8	9.2
Congo	-12.5	-13.9	Honduras	-3.0	5.8	Paraguay	-5.5	5.3
Côte d'Ivoire	-2.6	-4.1	Indonesia	-0.1	16.9	Peru	-2.8	17.4
Gabon	-8.1	-5.7	Iran	-3.5	14.7	Saudi Arabia	-6.5	1.7
Niger	-5.1	-2.1	Iraq	-13.7	12.2	Senegal	-5.0	4.5
Tajikistan*	-4.9	-1.0	Lao	-7.2	25.5	Sierra Leone	-4.2	0.7
UA Emirates	-13.9	-13.8	Liberia	-14.7	38.9	Sudan	-7.5	18.0
Zimbabwe	-5.4	-12.0	Malawi	-6.2	8.9	Tanzania	-10.9	9.7
Algeria	-3.6	6.4	Mali	-7.7	10.3	Trinidad & Tobago	-1.0	27.5
Belize	-6.6	11.4	Mongolia	-5.8	12.5	Uganda	-1.5	18.5
Benin	-6.0	5.6	Mozambique	-11.5	26.2	Venezuela	-5.3	3.6
Bolivia	-9.8	9.9	Myanmar	-6.3	50.9	Yemen	-1.9	7.7
Botswana	-0.9	13.3	Namibia	-3.8	10.5	Zambia	-11.1	10.1
Colombia	-0.5	9.9	Nepal	-7.5	13.5			

** Note: reported averages are 5-year averages, e.g. (GDP_{1995} – GDP_{1990})/GDP_{1990}.*
Sources: This report and the World Bank Development Indicators.

Often, macroeconomists use an analytical tool called growth accounting to gain insight into economic growth dynamics. This tool can also be used to understand inclusive wealth dynamics; albeit growth accounting only provides a clearer understanding of what contributes to growth – it does not imply causality. Before writing the growth accounting expression, consider the following definitions: Let *At* denote the value of IW at time t – a proxy for the aggregate value of physical capital, human capital and natural capital. Let *Kt* , *Ht* and *Nt* denote the levels of physical capital, human capital and natural capital (respectively) at time t. Let *Pk* , *Ph* and *Pn* denote the (respective) unit prices of physical, human and natural capital – to keep subsequent notation simply, these prices are assumed constant over time. Given this notation, we write IW as:

$$A_t = P_K K_t + P_H H_t + P_N N_t$$

Given our IWI is defined in per capita terms, divide both sides of this equation by population, which we denote by *Lt*. Reasonably straightforward algebraic manipulations yield the following inclusive wealth growth accounting expression:[28]

$$\frac{\dot{a}_t}{a_t} = \alpha_{K,t}\left(\frac{\dot{K}_t}{K_t} - \frac{\dot{L}_t}{L_t}\right) + \alpha_{H,t}\left(\frac{\dot{H}_t}{H_t} - \frac{\dot{L}_t}{L_t}\right) + \alpha_{N,t}\left(\frac{\dot{N}_t}{N_t} - \frac{\dot{L}_t}{L_t}\right)$$

(1)

Here is the (instantaneous) change in the level of IW per capita. The remaining "dotted" variables represent the change in that variable given a change in time– e.g. *Kt* is the instantaneous change in the physical capital. The following variables are inclusive wealth value shares at time t; $\alpha_{K,t} = P_K K_t / A_t$ is physical capital's share of IW; $\alpha_{H,t} = P_H H_t / A_t$ is human capital's share of IW; $\alpha_{N,t} = P_N N_t / A_t$ and is natural capital's share of IW. The three shares sum to unity. Finally, the term $\dot{a}_t / a_t$ is the (instantaneous) rate of growth in IW per capita – analogous definitions extend to the remaining variables, e.g. $\dot{L}_t / l_t$ is the rate of growth in population.

Equation (1) reveals seven sources of IWI growth. One source is population growth, which puts downward pressure on the IWI. Between 1990 and 2015, the average annual rate of population growth in sub-Saharan Africa was 2.7 percent, as compared to less than 1 percent annual growth in the OECD countries. Hence, even if a country did not overexploit its natural resource base, high population growth rates could explain a large part of a pattern of unsustainable growth.

Changes in physical, human and natural capital account for three more sources of IWI growth. An increase in the stock of physical and human capital occurs when a nation invests enough of its income (GDP) to yield a net increase in physical or human capital.

For example, when investment in physical capital is greater than the amount lost through depreciation, then physical capital growth contributes positively to IWI growth. Investments in agricultural extension training can lead to soil conservation and lower levels of natural resource degradation, as could training in forest management – both forms of human capital investment. What we hope is clear is that, even if an economy is experiencing a decline in natural resource stocks, the IWI index can increase if the economy reinvests enough of its income to increase its physical and human capital stocks.

The remaining three potential influences on IWI growth are the inclusive wealth asset shares. Consider two countries, both of whom are depleting their natural resource base. All else equal, the country with the larger natural capital share will have the larger fall in its IWI. An implication for development is, arguably, the inclusive wealth share of natural resources in most developing countries will be higher than that for a typical developed country. If this is the case, to support sustainable development a developing country will likely need larger rates of growth in physical (and human) capital stocks than the typical developed country. If the natural resource share in one country is 5 percent and the physical capital share is 50 percent, a 10 percent fall in natural capital stocks can be offset by a 1 percent increase in physical capital. On the other hand, if the natural resource share in the country is 20 percent and the physical capital share is 50 percent, the country would need a 4 percent increase in the capital stock to offset a 10 percent fall in natural capital.

Table 2.3: Malawi inclusive wealth growth accounting

Asset Type	2005 US $ per capita					5-year Growth			
	1990	1995	2000	2005	2010	1995	2000	2005	2010
Human	1,505	1,488	1,504	1,571	1,576	-0.011	0.011	0.045	0.003
Physical	889	871	749	671	789	-0.020	-0.140	-0.104	0.176
Natural	2,499	2,287	1,983	1,690	1,414	-0.085	-0.133	-0.148	-0.163
Inclusive Wealth	4,893	4,646	4,236	3,932	3,779	-0.050	-0.088	-0.072	-0.039
	Inclusive Wealth Shares					Contributions to IWI growth			
Human	0.308	0.320	0.355	0.400	0.417	-0.003	0.003	0.016	0.001
Physical	0.182	0.187	0.177	0.171	0.209	-0.004	-0.026	-0.018	0.030
Natural	0.511	0.492	0.468	0.430	0.374	-0.043	-0.065	-0.069	-0.070

28 For the empirical exercises conducted in prior chapters, the change in time is a year, not instantaneous as depicted in this section. A rough approximation of equation (1) using discrete time is

$$\Delta a_t = \alpha_{K,t}\left(\frac{\Delta K_t}{K_t} - \frac{\Delta L_t}{L_t}\right) + \alpha_{H,t}\left(\frac{\Delta H_t}{H_t} - \frac{\Delta L_t}{L_t}\right) + \alpha_{N,t}\left(\frac{\Delta N_t}{N_t} - \frac{\Delta L_t}{L_t}\right)$$

Returning to Table 2.2, for almost all 47 countries, natural resources serve as an important source of GDP, and one can safely assume that the fall in per capita IW is linked directly to natural resource extraction (e.g. minerals and oil) or harvesting (e.g. forests). Also, population growth is high in most of the countries, which further serves to hamper sustainable growth. Finally, at least for the developing countries in the list, natural resource shares are likely quite high. Hence, in spite of the relatively high rates of GDP growth experienced by some of the countries, these factors combine to make sustainable growth a difficult objective to achieve. Table 2.3 provides an example of inclusive wealth growth accounting for Malawi. Note, natural capital accounts for over 50 percent of Malawi's IW in 1990, and falls to 37 percent by 2010. The rates of growth in human capital is very low relative to the rates of decline in natural capital, as are the rates of growth in physical capital. These factors all contribute to the unsustainable wealth trajectory for the country.

As for the 74 countries in the appendix (Table 2A), even if a county's natural capital stocks are falling, its reinvestment in physical and human capital more than offsets the wealth lost through depleted natural assets. The result being an increase in IW, and hence, what appears to be a sustainable growth trajectory. Table 2.4 reports inclusive growth accounting figures for China. China begins with a natural capital share of 42 percent in 1990, which falls to 21 percent by 2010. Note, however, the rates of growth in human and physical capital stocks (relative to the decline in natural capital stocks). This reinvestment in human and physical capital is one of the reasons China's IWI has outperformed all other countries.

Table 2.4: China inclusive wealth growth accounting

Asset Type	2005 US $ per capita					5-year Growth			
	1990	1995	2000	2005	2010	1995	2000	2005	2010
Human	8,043	8,620	9,138	9,504	10,025	0.072	0.060	0.040	0.055
Physical	1,369	1,995	3,123	5,044	8,748	0.457	0.565	0.615	0.734
Natural	6,805	6,355	5,882	5,429	5,061	-0.066	-0.074	-0.077	-0.068
Inclusive Wealth	16,217	16,970	18,143	19,977	23,834	0.046	0.069	0.101	0.193
	Inclusive Wealth Shares					Contributions to IWI growth			
Human	0.496	0.508	0.504	0.476	0.421	0.036	0.031	0.020	0.026
Physical	0.084	0.118	0.172	0.252	0.367	0.039	0.066	0.106	0.185
Natural	0.420	0.374	0.324	0.272	0.212	-0.028	-0.028	-0.025	-0.018

2.4. Wealth and the Sustainable Development Goals (SDGs)

Unlike the Millennium Development Goals, which were more focused on achieving specific development targets for developing nations, the proposed SDGs[29] are truly global in nature. Applicable to all nations, developing or developed, the SDGs emerged from an evolving and collaborative process, representing collective aspirations, while taking into account different national realities, capacities and levels of development. Rooted in the outcome document, *The Future We Want*, from the Rio+20 summit in 2012, the SDGs were promulgated to reflect the pursuit of all three dimensions of sustainable development - social, economic and environmental. Through Rio+20, the Open Working Group was formed with representatives from 70 countries, which by July 2014 had published a draft with a set of 17 goals and 169 targets. Assessing and valuing natural capital and the change in per capita inclusive/comprehensive wealth over time has the potential to keep track of progress on most SDGs.

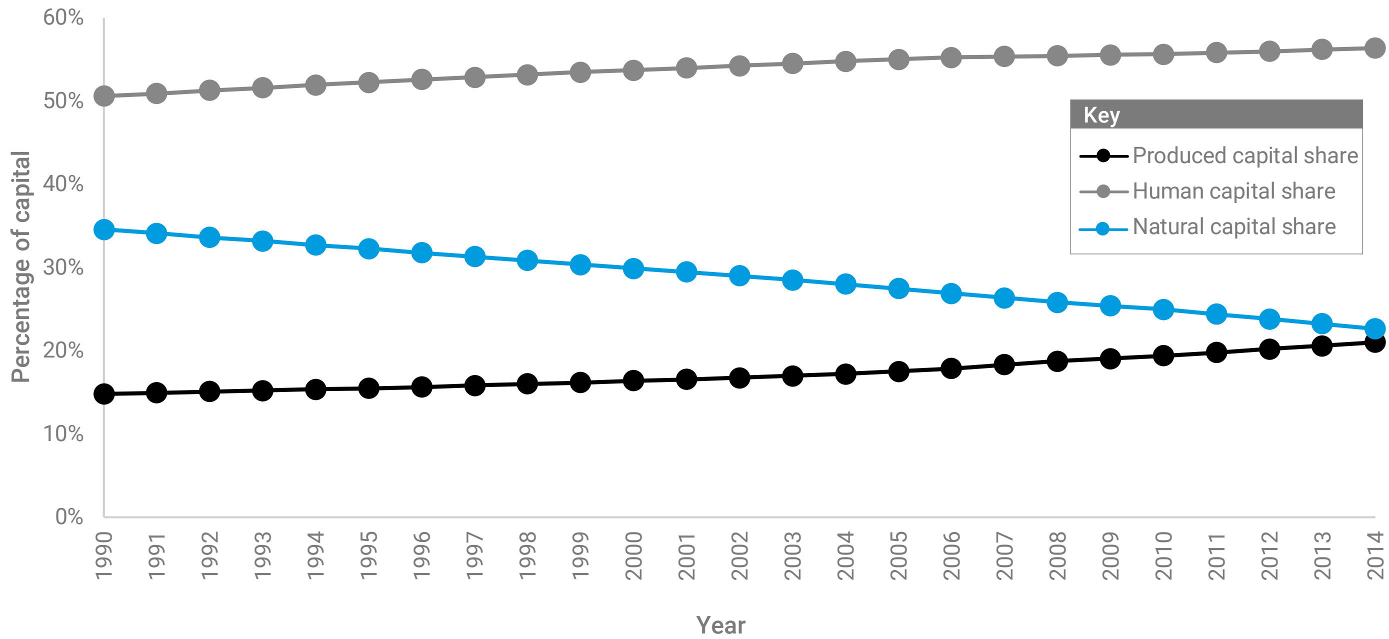
The IWI is a multi-purpose, multi-target measure of sustainable development. An increase in the IWI will suggest poverty eradication (SDG, 1) and an improvement in food security, while promoting sustainable agriculture (SDG 2) and healthy lives and well-being (SDG 3). An increase in the IWI will also indicate sustained, but not necessarily inclusive economic growth (SDG 8), and sustainable consumption and production patterns (SDG 12). A decrease in the IWI will indicate degradation of natural capital and failure to take steps to combat climate change and its impacts (SGD 13), conserve and sustainably use the oceans, seas and marine resources (SDG 14), protect, restore and promote the sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, reverse land degradation and halt biodiversity loss (SDG 15). The IWI can measure the strength of the means of implementation for sustainable development (SDG 17).

The IWI has a specific role to play in complementing SDG Target 8.1, which is currently measured by GDP growth, with a target of 7 percent per year (a measure of growth in the level of transactions). The IWI complements this by emphasizing the growth of wealth – something that is much better aligned with the SDGs as the indicators and targets clearly link sustainability with the productive base of the economy: water, air, soil and other natural assets.

The environmental dimension of the SDGs is very explicit. Most of the targets are directly or indirectly related to the status of natural capital. The overarching message from the 2030 Agenda is for nations to keep their natural capital stocks intact. Since GDP does not track natural capital levels, it will most certainly be inadequate for managing these resources. Fig 2.1 highlights one conclusion we can draw from the chapters in this volume: that natural capital's share in IW has fallen since 1990, while the share of human capital and physical capital have steadily increased. Under a weak substitutability criteria, the world has been experiencing sustainable growth. Our guess, however, is the world likely would not satisfy sustainability under a strong substitutability criteria.

29 See Appendix for a full list of Sustainable Development Goals and targets. See further at: https://sustainabledevelopment.un.org/sdgsproposal

Fig 2.1: Global trend in human (HC), natural (NC) and physical (PC) capital shares



One of the core strengths of the SDGs is its recognition of the complex interlinkages that prevail among human well-being, economic prosperity and a healthy natural habitat. Thus, as we move towards exploring more sustainable ways of developing, we need forms of measure that reflect such objectives. In this regard, an indicator or a bundle of indicators that can reflect such interlinkages, connectivity and causality by recognizing impact on sustainability and inclusivity, are key to measuring long-term progress.

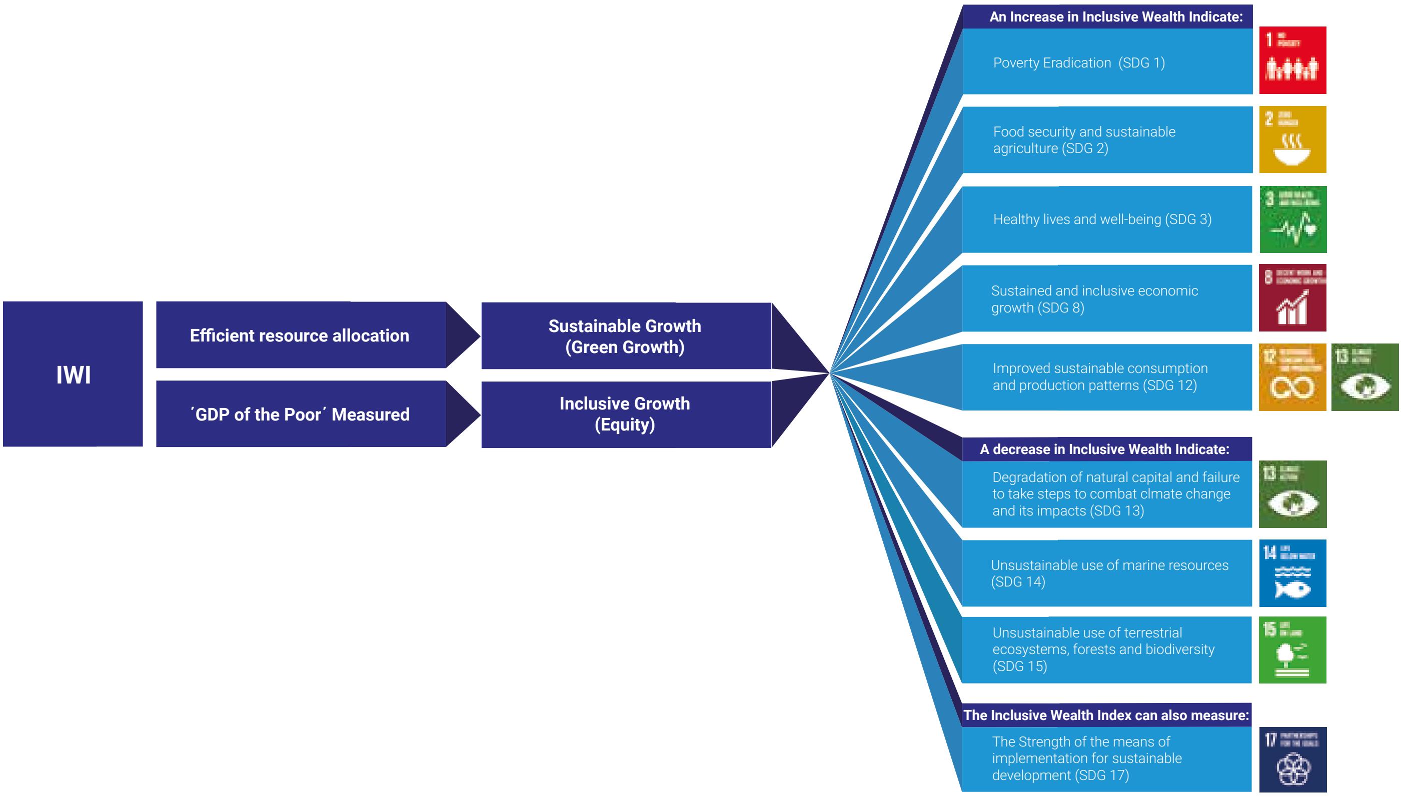
2.4.1. Inclusive Wealth Index – sustainability and inclusivity

By incorporating changes in human and natural capital alongside the existing measures of produced capital, namely GDP, the IWI provides a balance sheet for nations that offers them a more comprehensive view of their asset endowments. Fundamentally, the approach aims to address the major policy gaps that exist on growth and development that fail to address issues of sustainability, natural resource depletion and human well-being.

The 2014 IWR assessed data from 140 countries over a span of 20 years and observed changes in produced capital, human capital and natural capital. The aggregate data suggests that while GDP and the HDI made significant strides over the period, natural capital declined in 127 of the 140 countries. Such analysis through the IWI enables countries to monitor their comprehensive capital pool and push for greater action and accountability and the pursuit of more sustainable pathways.

Assessing and valuing natural capital and the change in per capita inclusive/comprehensive wealth over time has the potential to keep track of progress on several SDGs. Fig 2.2 illustrates.

Fig 2.2: Institutional Framework for IWI and Sustainable Development Goals (SDGs)



The IWI has a specific role to play in tracking SDGs and related targets 1, 2, 3 and 8.1. The IWI complements the current target provided by technical work of the SDGs, of 7 percent per year in GDP (a measure of growth in the level of transactions) as the wealth estimates would keep track of the base from which income is generated. The wealth estimate is much better aligned with the SDGs as they are more reliable about information on the productive base of the economy.

The IWI's key strength lies in its potential to serve as an indicator for guiding sustainable development policy. The Inclusive Wealth can inform planning and investment decisions that promote a low-carbon, resource efficient and socially inclusive economy. Wealth estimates organize information on various types of wealth and the trade-offs between them. As the estimates in this volume suggest, a number of countries are recording growth in human capital at the cost of natural capital (unsustainable agriculture and industrialization leading to better ports, roads and infrastructure, at least in the short run). Unlike GDP, information on wealth can also be used as an instrument for designing more efficient and effective policy reforms and regulation changes that act as a catalyst for sustainable investment and development pathways.

Recognizing the importance of natural capital – for poorer members of society and for the broader economy – can inform planning and policy decisions that prioritize investing in natural capital as a way of reinvesting in wealth. Inter alia, fighting poverty is conditional on the sustainable management of land. Without managing our natural resources, such as agricultural land, forests and fish stocks, we will not be able to ensure sustainable economic growth and an inclusive green economy (UNEP, 2015).

However, in order to monitor progress towards the SDGs, we must be equipped with appropriate benchmark data, be capable of assessing progress from one year to the next, and have a meaningful way to compare progress across countries. Such analysis, through universally accepted indicators and statistical frameworks, is key to understanding how the globe is faring. Significant data gaps exist, however, specifically with regards to natural capital measurement. As data is a key building block in the development framework, we must explore: 1) how innovation in information technology and existing data infrastructures can be aligned to produce improved development data; 2) how participatory mechanisms, and qualitative methods and knowledge can strengthen quantitative information to enhance our understanding; and 3) disaggregating data to enable more nuanced insights into the inequalities and challenges faced by particular groups within a given economy.

Moreover, the new sustainability indicators that emerged over the past decade – including the IWI – have pushed the envelope and called for a re-imagination of how we define and measure progress. Although these indicators are the results of efforts to capture the three domains of sustainable development – economic, social and political – it is important to more clearly identify and understand the links, inter-dynamics and causality between these domains. Indeed, this is an area of work not limited to economists or statisticians, but entails the involvement of policy analysts, academics and development practitioners from diverse fields. In order to support all these initiatives, indices and measurement of SDG performance, there is a fundamental need for policy coherence. Building capacities for integrated policy and data assessment, as well as coherence and coordination among strategies to achieve the SDGs, can allow for mutual co-benefits and avoid any counterproductive results.

Nonetheless, it is important to acknowledge and appreciate the political processes thus far that have led to the culmination of the SDGs. Fundamentally, the SDGs and their widespread acceptance will not only represent the aspirations of both the developed and developing worlds but will reflect their mutual meeting ground. It is imperative that we continue to work past the challenges that may arise, and strive to make the three common foundational principles of the SDGs – leave no one behind; ensure equity and dignity for all; and achieve prosperity within earth's safe and restored operating space (UNEP, 2015) – a reality.

2.5. Inclusive Wealth and Conservation Policies

A large literature exists that argues the current System of National Accounts (SNA) undervalues natural capital and its contributions to human well-being. In such cases, policies aimed at protecting natural capital will, at best be fraught with inefficiencies, and likely lead to sub-optimal resource allocations. The inclusive wealth account can serve as a key tool in designing more efficient and effective environmentally sustainable policies that underpin economic and social progress, and overall sustainable development imperatives. This section discusses how the IWR can be used to inform policy decisions related to the conservation of natural capital, with a specific focus on forests, air pollution and fisheries.

2.5.1. Inclusive wealth and forestry policy

As demonstrated in Chapter 6, in many countries, forests comprise a major share of their capital stocks, and are a source of a range of vital ecosystem services: provisioning services (e.g. food, fuel and fibre); regulating services (e.g. carbon regulation); supporting services (e.g. biodiversity conservation); and cultural services (e.g. recreation and tourism) (MA, 2005). Yet in many countries, the current SNA does not adequately account for the contributions of forest capital to watershed protection, carbon storage and biodiversity conservation, as well as a factor of production in other sectors of the economy.

Under the IWR, the value of forest capital is calculated as the present value of the future net benefits expected over the life of a forest resource. It integrates the contributions of a wide range of forest services, although current data limitations preclude a full accounting of all contributions. The forest capital component of the IWR can serve as an indicator of whether forest resources are being used sustainably for present and future generations. This information could be used to move resource managers and country authorities towards policy options aimed at: (i) managing trade-offs among competing forest uses; (ii) designing effective and efficient economic policy instruments (e.g. property rights, taxes and subsidies, creating markets for non-market forest services) and (iii) providing the basis for monitoring policy implementation and effectiveness (Lange, 2004).

Lange (2004, 2003) outlines six key policy questions related to managing forest resources or developing cross-sectoral policies that facilitate forest management. These policy questions underlie World Bank initiatives like WAVES (Wealth Accounting for Ecosystem Services). Given that policy uses and management options likely vary from country to country, we do not attempt to provide an exhaustive list of relevant questions and policy options. The remaining section outlines how the IWR and, in particular, the forest account component of the IWR could be used to inform some of these policy questions.

2.5.2. What is the total economic contribution of forests and forest ecosystems, and what are the potential benefits from sustainable management?

The forest capital component of the IWI takes into account a wide range of forest contributions and, therefore, reflects a more accurate approximation of the value of forest resources. Consequently, the value of forest capital is likely to be higher than that typically embedded in GDP calculations. This higher valuation should help forest resources gain wider recognition in macroeconomic policy deliberations: a higher value of forest contributions to GDP could potentially increase the forestry sector's bargaining power for a larger share of the national budget for forest management and investment.

2.5.1.1. How are benefits of forest resources distributed across society?

Presently, inclusive wealth measures provide country-level aggregate measures of forestry assets. However, it has been argued that a more robust accounting needs to distinguish the spatial productivity of different forest assets. For instance, it is important to distinguish between forest benefits that accrue to commercial users (e.g. hydroelectric power, municipalities, fisheries) and those that accrue to subsistence users (charcoal for heating and cooking), and between benefits that accrue to direct and indirect beneficiaries. It would also be useful to distinguish between forest benefits to local communities, downstream users, non-local communities and the global community (e.g. biodiversity and carbon storage).

The United Nations Framework for the SEEA highlights the importance of this information – particularly regarding optimal forest management aimed at meeting both economic and social objectives (e.g. local community preservation versus increased equity). Policy response may include designing economic instruments like property rights – ensuring that beneficiaries pay for the benefits (e.g. in the form of environmental fees) to compensate those who might be sacrificing the benefits. At watershed levels, the value of forest capital can be useful in designing Payment for Ecosystem Services schemes.

2.1.5.2. Is economic growth sustainable or is it based on the depletion of forests?

IW can be used for evaluating trade-offs between economic (GDP) growth and forest wealth. This information is a key indicator of whether economic growth across a range of countries for which data is available is sustainable, or if economic growth comes at the expense of declining forest wealth triggered by deforestation and land use change. This information would be useful for re-evaluating existing forestry and economy-wide policy options; for example:

1. Which sectors are the key contributors to economic growth?
2. How are these sectors linked to forestry resources and what are the potential impacts?
3. What are the costs of forest asset depletion?
4. Can available resources be re-allocated across sectors to achieve at least the same level of economic growth with minimal or no damage to the forestry sector?

2.1.5.3. What are the economic trade-offs among competing users and how can we optimize forest resource utilization?

Forest accounts from IW could help assess the trade-offs among competing users: for example, forestry versus agricultural land use, and commercial logging versus catchment protection. Assessing the level of economic trade-offs could help in the design of appropriate economic instruments to minimize losses tied to these trade-offs – instruments like user fees, compensating payments and property rights.

2.1.5.4. What are the impacts of other sectors' policies on forests?

Linking forestry values to other sectors and the wider economy would provide a convenient way of integrating forestry policy with national development, and monitoring interactions and feedback across different sectors. This would make it possible to measure the winners and losers, and measure pressures on forest capital coming from alternative macroeconomic or development policies. Potential conflicts – for example, between forestry versus agriculture – are relatively easy to identify (e.g. deforestation and cattle grazing). Policy response would include creating optimal forest management strategies aimed at addressing these conflicts. One set of strategies includes developing economic instruments like fees and compensating payments schemes to influence forest use. Another is to build social capital – for example, facilitate strategic alliances with stakeholders across sectors who are dependent on the forestry sector (agriculture, tourism, electric power and water). Table 2.5 further illustrates how information from forest accounts can be used to inform these questions and their corresponding policy linkages.

Table 2.5: Selected policy applications of forest accounts

Indicator/measure	Use for policy analysis	Examples of policies and actions taken from policy analysis
1. What is the total economic contribution of forests and what are the benefits from sustainable management		
Total value of forests including non-market forest goods and services.	More comprehensive, accurate value of forests' contribution to GDP.	Showing a higher value for forest contribution to GDP may increase the forestry sector's ability to request a larger share of national budget for forest management and investment.
Value of forest services to non forestry sectors.	Measure of the economic importance of forest services to agriculture, electricity, fisheries, tourism, municipal water supply, etc.	Design economic instruments to promote sustainable forest use, for example: • Institute conservation fee on water and hydroelectricity tariffs for downstream beneficiaries that can be used for forest management or to compensate local communities • Institute tourism fees for biodiversity conservation for forest management/ compensation of local communities • Negotiate international payments for carbon storage services of forests • Build multi-sectorial stakeholder alliances based on mutual benefits. • Identify institutional weaknesses in forest management, e.g. where one sector benefits but does not pay, or does not have a say in forest management.
Value of forest goods and services used by local communities.	Share of forest goods in rural livelihoods provides measure of dependence on forests of local communities.	Useful for design and implementation of PRSPs.
2. What is the distribution of forest benefits among different groups in society		
Share of forest benefits accruing to commercial, artisanal and subsistence users of forests Or Share accruing to local, downstream and global beneficiaries.	Identify social benefits from preservation of local communities and increased equity	• Identify potential conflicts, e.g. benefits to subsistence users/local communities are low because commercial / downstream users obtain benefits. • Design economic instruments so that beneficiaries pay for the benefits, compensating those who may sacrifice benefits. For example, property rights – some say over how a forest is managed – and fees for environmental services received. • Optimize investment in forests and forest infrastructure that balances social objectives for equity and regional development as well as economic objectives of maximizing national income.
3. Is economic growth sustainable or is it based on the depletion of forests?		
Value of forest assets and the cost of deforestation and forest degradation.	Macroeconomic indicators of sustainability (such as NDP, national wealth, asset depletion).	Reassess forest management if deforestation is occurring.

Indicator/measure	Use for policy analysis	Examples of policies and actions taken from policy analysis
4. What are the trade-offs among competing users of forests?		
Value of forest goods and services under alternative forest management options.	• Measure economic linkages between forestry and other sectors of the economy, upstream and downstream. • Identify the economic trade-offs among competing sectors.	• Optimize forest use and investment in forests and forest infrastructure by considering total economic value of forests, market and non market, including linkages to non-forestry sectors and impacts on all stakeholders, economy-wide. • Identify winners and losers. • Design appropriate economic instruments to achieve that strategy (fees, compensating payments, property rights, etc.).
5. What are the impacts of non-forestry policies on forest use?		
Analyze economic development scenarios that trace the full chain of causation from macroeconomic policy and/or non-forestry sector policies to their impact on forestry and land use.	• Assess the winners and losers, pressures on forests and forest users from alternative development strategies. • Identify potential conflicts between development objectives of forestry and those of other sectors, e.g. commercial logging vs. catchment protection (Ministry of Agriculture, Ministry of Energy, etc.). • Identify conflicts among divisions of the same ministry (Ministry of Agriculture), e.g. pastoralists' use of forest vs. downstream crop farmers.	• Identify winners and losers. • Identify optimal forest management strategy, based on addressing conflicts among ministries and within a single ministry. • Design appropriate economic instruments to achieve that strategy (fees, compensating payments, property rights, etc.).

Source: FAO. Policy Uses of Forest Accounts

2.6. Conclusions

National income, usually referred to as GDP, correlates strongly with national wealth. GDP provides information on levels of economic activities in the economy. However, a lot of critical information is missing in national accounts. Wealth accounting fills that gap. Wealth information (which includes all types of capital) also provides a better guide for measuring progress, trade-offs and sustainability.

One of the key aspects of wealth estimates is that they provide a robust methodology for valuing natural capital. This goes beyond mere transaction or exchange value, to capture externality aspects. The pricing for capital in inclusive wealth schemes uses a shadow pricing method, which is more reliable and scientifically credible.

The share of natural capital in the total wealth of a nation also depends on how well these assets are maintained, as the value of natural capital is directly related to institutions and the technological advancement of nations, which is reflected through rents from natural assets. The shadow pricing method is well equipped to capture these aspects.

There should be a regular estimate of wealth on a national scale to track the sustainability of the economy. Natural capital must take priority as it is likely to be pushed to the margins as there is no well-functioning market, especially in developing countries, to capture its contribution. The scale, unit and dimension of natural capital must be explicitly spelled out and conservation policies should be clearly linked with wealth and natural capital. At the institutional level, there should be a natural capital committee in every country to monitor and assess the trends. The committees should work closely with ministries of finance and development.

In order to examine the impact of trade reform and agricultural policies (such as subsidies), the ease with which one capital can substitute another should be estimated. This is known as the substitutability of capital – for example, produced capital for natural capital. In the case of critical natural capital, assessment and monitoring at the national scale is a must. Countries are in the process of designing the means to achieve the SDGs; a detailed mapping of the goals and targets should be done vis-à-vis natural capital.

Policies on protected areas (marine/terrestrial), forests, land degradation, climate change and biodiversity have a better prospect of being embraced by the public at large if their link with natural capital is properly delineated and understood.

Finally, wealth information can supplement the information in Systems of National Accounts, but eventually all macroeconomic policies and the allocation of resources should take cognizance of changes in net per capita wealth. This should serve as the key guide for sustainability and equity, including for various SDG targets.

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APPENDIX

** Note, reported averages are 5-year averages, e.g., $(GDP_{1995} - GDP_{1990})/GDP_{1990}$.*

Sources: This report and the World Bank Development Indicators.

Table 2A: Countries with positive (average) per capita growth rates (percent)* in inclusive wealth: 1990–2015

Country	Per Capita Growth		Country	Per Capita Growth		Country	Per Capita Growth	
	IWI	GDP		IWI	GDP		IWI	GDP
Albania	3.9	23.1	Gambia	0.2	2.4	Norway	1.5	10.0
Argentina	1.6	15.1	Germany	7.6	6.6	Pakistan	3.2	8.9
Armenia	5.3	25.2	Greece	5.0	9.0	Panama	3.1	18.7
Australia	1.6	9.8	Guatemala	1.3	7.1	Philippines	2.5	8.9
Austria	5.8	8.5	Iceland	0.1	8.0	Poland	5.7	20.9
Bahrain	4.1	4.2	India	3.8	26.1	Portugal	5.2	8.0
Bangladesh	7.2	17.5	Ireland	7.9	21.6	Romania	5.3	13.1
Barbados	3.2	4.0	Israel	4.4	10.8	Russia	0.7	7.2
Belgium	5.3	7.6	Italy	4.1	4.0	Rwanda	3.3	14.2
Brazil	0.6	9.0	Jamaica	3.4	2.7	Singapore	9.7	20.5
Bulgaria	4.9	14.7	Japan	4.6	4.1	South Africa	0.5	5.3
Canada	1.4	6.9	Jordan	3.5	11.0	Spain	9.9	8.4
Chile	5.7	21.5	Kazakhstan	1.6	17.5	Sri Lanka	6.0	23.7
China	10.2	58.4	Kenya	1.0	1.2	Swaziland	1.6	8.0
Costa Rica	4.0	13.7	Kyrgyzstan	0.8	0.8	Sweden	3.2	8.8
Cuba	0.6	11.3	Lesotho	4.5	14.6	Switzerland	2.2	4.0
Cyprus	5.0	10.0	Luxembourg	7.7	12.6	Thailand	6.4	20.4
Czech Republic	5.8	9.5	Malaysia	2.2	19.4	Tunisia	5.7	16.9
Denmark	2.5	7.0	Malta	8.5	15.4	Turkey	4.6	12.1
Dom Republic	5.1	20.8	Mauritania	1.4	4.4	Ukraine	1.9	0.5
Egypt	3.3	13.8	Mauritius	6.6	21.3	UK	4.3	8.0
El Salvador	8.1	12.9	Mexico	4.6	5.7	Uruguay	3.8	15.3
Fiji	3.5	5.8	Morocco	5.6	13.6	USA	3.0	7.6
Finland	3.5	9.0	Netherlands	4.7	9.3	Vietnam	10.0	31.5
France	5.5	5.8	New Zealand	2.4	7.6			

Construction project, London, United Kingdom, Jamie Street on Unsplash.com