Valuing Humanity's Life Support Systems: Inclusive Wealth and *Satoyama* Landscapes

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Abstract

We present a new metric known as the inclusive wealth index (IWI) for evaluating progress in human well-being. The metric is based on a welfare economic framework but goes just beyond incorporating the economic component of welfare to include natural and social systems. There has been much debate on declining natural systems and the implications this will have on human well-being. We make a strong case in contradiction to recent literature from the natural sciences in our assertion that humanity's life support systems include not just the natural systems but also the social and economic systems. We illustrate how local place-based programs can contribute to maintaining and strengthening these life support systems. The socio-ecological production of *satoyama* landscapes in Japan will be used to illustrate this synergy.

Key words: inclusive wealth, *satoyama*, sustainable development, well-being

1. Introduction

Humanity is no doubt at a crossroads. The recent experiences of a triage of social, environmental and economic crises across many parts of the world have brought a certain sense of fallibility and vulnerability, not seen just 40 years ago. The economic crisis that has gripped many of the past economic giants such as the United States and much of Western Europe has finally aroused people into questioning the economic models we have used over the past six decades. Increasing unemployment rates, especially among the young, have caused social tensions to rise in what were termed stable nations only a decade ago. Spain, Portugal, Greece, France, and Italy just to name a few are all experiencing sluggish economic growth and are plagued by growing social issues with regard to health and education. This does not bode well for many of the developing countries that have been looking to the West for their model of economic growth. Countries rich in resources such as minerals and petroleum have been doing relatively well but, as these resources become scarce, for how long?

New models are needed and the good news is that this call is increasingly coming from the political community, private sector and the general public. Politicians are increasingly calling for new economic systems as demonstrated by the Sarkozy initiative focusing on evaluating progress beyond GDP. The recent report by the United Nations Secretary General's high level panel, "Resilient People, Resilient Planet" again calls for new economic systems and goes further by questioning the use of economic production indicators such as gross domestic product to measure human well-being, while urging new holistic measures that give a broader perspective to well-being. The report was written with the Rio+20 summit in mind.

At the time of writing of the present article, preparations are underway for the Rio+20 summit to be held in Rio de Janeiro in June 2012. The Rio summit, for those who are new to the literature on sustainable development, was held in Rio de Janeiro in 1992 and called the UN Conference on Environment and Development. One hundred severnty-two governments participated in that summit, of which 108 were represented by their heads of state. Three non-legally binding documents were signed, which included the Rio Declaration on Environment and Development, Agenda 21, and the Forest Principles. In addition two legally binding documents were agreed on, regarding the establishment of the Convention on Biological Diversity and the Framework Convention on Climate Change. The Rio+20 summit is being called the UN Conference on Sustainable Development.

The notion of sustainable development, however, is not new, but has been around for decades (Duraiappah, 2003). The most recent concept and definition of it can be traced back to 1983, when then Secretary General of the

United Nations, Javier Perez de Cuellar, appointed Gro Harlem Brundtland from Norway to head a special commission to address the rapid deterioration of the human and ecological environments. The resolution establishing the commission by the General Assembly in A/RES/38/161 (United Nations General Assembly, 1983) stipulates the following terms of reference:

(a) To propose long-term environmental strategies for achieving sustainable development to the year 2000 and beyond;

(b) To recommend ways in which concern for the environment may be translated into greater co-operation among developing countries and between countries at different stages of economic and social development and lead to the achievement of common and mutually supportive objectives which take account of the interrelationships among people, resources, environment and development;

(c) To consider ways and means by which the international community can deal more effectively with environmental concerns, in the light of the other recommendations in its report;

(d) To help define shared perceptions of long-term environmental issues and of the appropriate efforts needed to deal successfully with the problems of protecting and enhancing the environment, a long-term agenda for action during the coming decades, and aspirational goals for the world community.

In 1987, the commission published, "Our Common Future." The report emphasized the notion of sustainable development and defined it as "development that meets the needs of the present without compromising the needs of the future" (World Commission on Environment and Development, 1987). Although the terms of reference given to the commission at first sight might seem to be narrowly confined to the environment, the commission members had the foresight to understand the importance of addressing these issues within an integrated framework, bringing together the social, economic and environmental spheres to address the notion of sustainability. At the end of the day, it is the welfare of humans that we are concerned about, not just the present generation but future generations as well.

The commission calls for a new era of economic growth that is socially and environmentally sustainable. The report does an excellent job of informing us of the state of the planet, emphasizing the need for urgent action, and explaining what needs to be done and where action is required both across regions as well as in key focus areas. The report, however, falls short on providing guidance on how to measure progress in a quantifiable way that can provide support to policymakers on where interventions and responses are needed.

This brings us back to the present. We witness an almost similar process leading to the Rio+20 summit. We have an influential report similar to the Brundlantd report, "Our Common Future," being released by the UN Secretary General, called "Resilient People, Resilient Planet." The reports have a common theme. They both call for a new era of economic growth although the tone in the recent report conveys urgency and catastrophic consequences if warnings go unheeded, but another common theme between both reports is the lack of concrete suggestions for solutions. There are of course many ways to operationalize sustainable development and move towards a new economic system that endorses and supports the principles underlying sustainable development. In this paper, we shall concentrate on a key aspect that if, we believe strongly, not addressed will always be a barrier to a transition to sustainability. Providing overarching principles and definitions for sustainable development is no doubt a move in the right direction. However, not providing a new metric to measure progress leaves countries with little option but to continue using gross domestic product (GDP) per capita to track progress. This, in turn, leaves most countries in a dilemma. GDP per capita measures economic output, while sustainable development is more concerned about meeting present needs without compromising the needs of future generations.

The object of this paper is to present a new metric known as the "inclusive wealth index" (IWI) for evaluating progress in human well-being. The metric is based on a welfare economic framework but goes beyond just incorporating the economic component of welfare to include natural and social systems. There has been much debate on declining natural systems and the implications this will have on human well-being. However, this paper also acknowledges the importance of social systems as well in determining well-being. Therefore, we make a strong case in contradiction to recent literature from the natural sciences that humanity's life support systems include not just natural systems but also social and economic systems. The second part of the paper then illustrates how local place-based programs can contribute to maintaining and strengthening these life support systems. The socio-ecological production landscapes of Japan will be used to illustrate this synergy between the local and national in this paper.

2. We only Manage What We Measure

The affiliation with GDP per capita is understandable. It is easy to compute, it is based on a rigorous and well-tested economic theory. Moreover, the data needed to compute GDP are relatively easy to compile and countries have been quick to adopt this system of national accounts. However, to use GDP per capita as a measure of well-being is a mistake. Although some attempts have been made by the United Nations to redress this oversight in the form of the Human Development Index, there are still gaping fallacies in accounting for sustainability.

Let us begin with GDP per capita. Simon Kuznets developed the gross domestic product in 1934 for the American Congress. He immediately warned against using it as a measure of social welfare and emphasized that the well-being of the citizens of a country should not be measured by just economic production. However,

after the Second World War, GDP came to be the mainstream indicator of success as countries were recovering from the war and busy building up the infrastructure required for recovering and moving forward. Therefore, it may have served as a good proxy for economic success in the early years after the war but became more and more redundant as countries progressed and different goals and problems emerged.

The first real alternative to GDP emerged in 1990, when development economist Mahbub ul Haq together with Amartya Sen developed the Human Deveopment Index (HDI). The main difference between GDP and HDI was the inclusion of literacy and life expectancy in with the gross domestic product to obtain a composite index. In 2011, gross national income (GNI) was used instead of GDP. No doubt, HDI made a move in the right direction by including determinants and/or constituents of well-being in the equation. HDI moved the focus from the standard of living that many economists said was depicted by GDP per capita to the quality of life as HDI was reportedly mentioned to measure.

Both indicators no doubt have a purpose. The problem arises when they are used as indicators for measuring dimensions they were not designed in the first place to measure. Therefore, using GDP or HDI as indicators for measuring sustainable development is erroneous. Neither GDP/capita nor HDI inform users on two key components of sustainability. First, there is no explicit attention to the future. Both indicators are snapshots of the status of a country at the present. Second, there is no attention to the environment and the role it plays in economic production in the case of GDP and to life expectancy in the case of HDI. Neither indicator therefore gives any indication if the progress made to date can be maintained in the future and if the present indicators give the correct status of the well-being of a country and its citizens in the absence of environmental factors.

There is no doubt a universal consensus on why it is important for indicators of progress to provide indications if trends can be maintained or improved, or have the possibility of decline over time. However, in the case of the environment, there is an urgent need to illustrate why it is important for well-being, and any metric to measure progress must include it as part of the equation.

The link between the environment and well-being has been well documented. The Millennium Ecosystem Assessment (MA) elucidated the links among ecosystem services and the various constituents and/or determinants of well-being (MA, 2005). The Biodiversity Synthesis report from the MA as well as other studies elaborated in more detail the close interdependencies between changes in biodiversity, ecosystem services and the various constituents of well-being and the implications for poverty and inequality across countries and individuals (Duraiapah *et al*., 2005; Dasgupta, 2001).

It is therefore not surprising we continue to see degradation of the natural environment. Because it is not reflected in the indicators we use to guide our economic decisions, any changes in natural systems are therefore assumed by default benign. It should also not come as a surprise if we continuously hear of the growth versus environment debate. The fact that we do not recognize the close inter-dependency among the natural and economic system and only see trade-offs and not synergies explains this overly simplistic and grossly wrong debate. The bottom line is we are basically using the wrong measure for evaluating improvements in well-being and subsequently guiding policymaking.

2.1 Inclusive wealth and well-being

We begin by drawing on a revised definition of sustainable development (Dasgupta & Duraiappah, 2012). Equations in this section are adapted from Arrow *et al*. (2012) and Dasgupta and Duraiappah (2012).

Definition 1. By sustainable development we mean a pattern of societal development along which (intergenerational) well-being does not decline.

We therefore state that intergenerational well-being is captured by Equation 1:

$$\mathbf{V}_{(t)} = \int_t^{\infty} [\mathbf{U}(\mathbf{C}(s))e^{-\delta(s-t)}]ds, \;\; \delta \geq 0 \qquad (1),$$

where $\boldsymbol{C}(t)$ *denotes a vector of consumption flows at time t and* δ *the discount rate*.

Hence $\mathbf{U}(\mathbf{C}(t))$ denotes utility (the satisfaction that one enjoys from consuming goods and services) flow at time *t.* At any point in time, one can measure how stocks of assets evolve or vary. In doing this, one is able to determine the productive base of an economy. Formally, we create an economic forecast by assuming a resource allocation mechanism.

Let $\mathbf{K}(t)$ denote a set of vector stocks of capital assets at time *t*. Then for a given $\mathbf{K}(t)$**,** $\mathbf{C}(t)$**,** $\mathbf{U}(\mathbf{C}(t))$ and together with (1), we can write

$$\mathbf{V}(t) = \mathrm{V}(\mathbf{K}(t), \mathbf{M}, t) \qquad (2),$$

where $\mathbf{V}(t)$ *denotes intergenerational well-being at time t,* $\mathbf{K}(t)$ *denotes a set of vector stocks of capital assets at time t and* $\mathbf{M}$ *denotes an evolving political economy.*

Differentiating $\mathbf{V}(t)$ with respect to *t* in equation 2, we obtain:

$$d\mathbf{V}(t) = \frac{\Delta \mathbf{V}}{\Delta t} + \sum\nolimits_i [(\Delta \mathbf{V}(t) / \Delta \mathbf{K}_i(t))(d\mathbf{K}_i(t) / dt)] \geq 0 \qquad (3)$$

Equation (3) illustrates the criterion for sustainability. In other words it shows the sustainability of an economy's development.

We proceed in deriving the shadow price. Let $\Delta\mathbf{V}(t)$ represents a small change in $\mathbf{V}(t)$ and $\Delta\mathbf{K}_i(t)$ represent a small increase in capital asset *i* at time *t*. Using Definition 1 together with Equation 2, we obtain the shadow price of asset *i* at time *t*

$$p_i(t) \equiv \frac{\Delta \mathbf{V}(t)}{\Delta \mathbf{K}_i(t)} \qquad \textit{for all } i \tag{4}$$

Let Δt represent a small passage of time following t. To measure inclusive wealth we represent $\mathbf{Q}(t)$ as the shadow price of time that is

$$\mathbf{Q}(t) = \Delta \mathbf{V}(t)/\Delta t \tag{5}$$

Using Equation 6 we can construct an aggregate index of a country's stock of capital assets by using the shadow prices as weights. This index is known as inclusive wealth

$$\mathbf{W} = \mathbf{Q}(t)t + \sum_i p_i(t)\mathbf{K}_i(t) \tag{6},$$

where $p_i(t)$ *refers to shadow prices of capital assets* $\mathbf{K}_i(t)$. Institutions are reflected in the p_i's via M (Dasgupta & Duraiappah, 2012).

An important relationship or linkage exists between changes in inclusive wealth at constant prices and intergenerational well-being. (Arrow *et al*., 2012). To show this formally, let Δ denote these changes.

$$\Delta \mathbf{V}(t) = \left[\frac{\Delta \mathbf{V}(t)}{\Delta t}\right]\Delta t + \sum_i \left[\frac{\Delta \mathbf{V}(t)}{\mathbf{K}_i(t)}\right]\Delta \mathbf{K}_i(t) \tag{7}$$

By using Equations 4 and 5 we can express Equation 6 as

$$\Delta \mathbf{V}(t) = \mathbf{Q}(t)\Delta t + \sum_i p_i(t)\Delta \mathbf{K}_i(t) \tag{8}$$

From our derived equations, (6) and (7) are equivalent to Equation (8), stating that the change in well-being is equal to the change in wealth and this is equal to the change in the capital asset base or productive base of a nation.

2.2 The productive base of a country

The productive base or inclusive wealth of a country as illustrated by Equation 7 is typically the total value of the different capital assets a country owns. The typical capital assets commonly known are produced capital, human capital, natural capital and social capital.

As Fig. 1 shows, the way the different capitals are used is to a large extent determined by the evolving cultural and social norms. Similarly, the human well-being constituents are also determined by the evolving cultural norms. The weights society places on these different capital assets are determined by the relative shadow prices of each capital asset category and its respective elements.

Figure 1 also shows that wastes produced by the economic system flow back to the ecological system and can cause degradation to these systems which causes a decline in some of the ecosystem services they provide, which form part of the natural capital asset base. These negative externalities are captured through damage functions on the overall productive base or inclusive wealth of a country. Damages caused by climate change are an example of such an impact on the inclusive wealth of a country.

The framework developed for the inclusive wealth accounts makes a fundamental difference from many previous studies on natural capital and life supporting systems found in the natural sciences literature. For example, the recent article in *Nature* on planetary boundaries (Rockström *et al*., 2009) only points towards natural systems as the key to life-supporting systems and goes on to identify critical thresholds and tipping points beyond which no changes should occur. We, on the other hand, take a different approach, whereby we suggest that in addition to natural systems, there is also a need for a

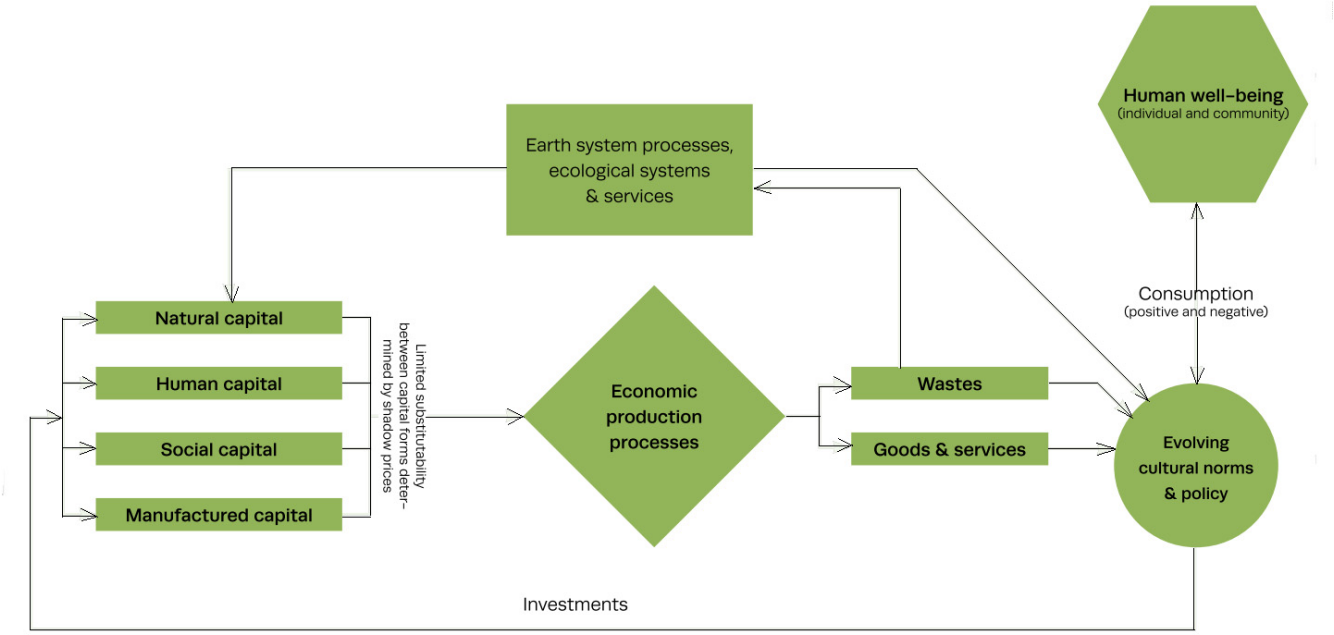

Fig. 1 The productive base and human well-being (Source: UNU-IHDP and UNEP 2012).

critical level of human and produced capital for human well-being. We argue that critical levels of each capital asset must be identified as a system working in a holistic framework towards the end goal of improving human well-being. Therefore, in addition to critical levels of natural capital, we argue for critical levels of human and produced capital necessary for achieving a minimum level of well-being and maintaining those for the present and future generations.

2.3 Common assets

The list of types of capital assets can be substantially long and in many cases difficult to account for and evaluate. In this paper, we focus on the three main categories of capital as follows. They are known to be relatively large compared to other forms of capital and where we have relatively good data to compute changes over time.

2.3.1 Reproducible or produced capital (roads, buildings, ports, machinery, equipment)

In common parlance, including national accounts, this category pretty much exhausts the list of capital assets. When national income accountants and international organizations speak of investment, they usually mean the accumulation of reproducible capital. Reproducible capital is frequently called "manufactured capital."

2.3.2 Human capital (education, skills, tacit knowledge, health)

This category is embodied in people. As teachers are painfully aware, human capital is not transferable without cost from one person to another.

Education, skills, and health are ends as well as means. They have intrinsic worth, but are also of indirect value (investment in human capital raises a person's productivity).

2.3.3 Natural capital (local ecosystems, biomes, subsoil resources)

Natural capital refers to stocks of nature which produce a range of ecosystem services. Ecosystem services are the benefits ecosystems provide for human well-being. Today it has become commonplace that nature should enter explicitly in economic calculations.

2.4 Inclusive wealth estimate

In this section, we present results from the forthcoming first publication of the Inclusive Wealth Report for 20 countries on their inclusive wealth over a period of 19 years (UNU-IHDP & UNEP, 2012). These 20 countries were chosen in a manner such that they represent about 58% of the world's population and 72% of the world's GDP as of 2010. As natural capital is a major focus in this first Inclusive Wealth Report, we selected countries where nature plays an important role in their economies, as with oil in Ecuador, Nigeria, Norway, Saudi Arabia and Venezuela; minerals in Chile; and forests in Brazil. We also sought to include major economies on all of the continents. To calculate the inclusive wealth of a country, one obtains data for each of the forms of the capital assets discussed. Some variables for which these capital assets are calculated include education and wages for human capital, and renewable and non-renewable natural resources such as forest resources, fossil fuels and minerals for natural capital. IWI as shown in column (1) of Table 1 is computed by first adding the various capital growth rates. Column (3) indicates IWI per capita, that is, how much wealth each person in a country receives when the total inclusive wealth is divided among the entire population, all other things being equal. In other words we account for the effects of population growth on the overall inclusive wealth. Column (4) indicates the percentage changes in IWI due to effects of population growth. All countries except Russia have a positive Inclusive Wealth Index as shown in Table 1. This means that keeping the population constant, 19 of the 20 countries are on a sustainable track. The picture changes when we include population growth rates and compute the per capita statistics. Five additional countries have negative IWI. This suggests that these countries have population growth rates greater than their IWI growth rates, implying a dwindling productive base to maintain the growing

Table 1 Average annual IWI growth rates (in %) for the period 1990-2008.

Countries \ Indicators	IWI (1)	Population (2)	IWI per capita (3)	% change due to population (4)
Australia	1.41	1.29	0.12	91.49
Brazil	2.3	1.38	0.91	60.43
Canada	1.41	1.03	0.37	73.76
Chile	2.56	1.35	1.19	53.52
China	2.92	0.83	2.07	29.11
Colombia	1.62	1.7	-0.08	104.94
Ecuador	2.14	1.76	0.37	82.71
France	1.95	0.51	1.44	26.15
Germany	2.06	0.23	1.83	11.17
India	2.66	1.74	0.91	65.79
Japan	1.1	0.19	0.91	17.27
Kenya	2.85	2.79	0.06	97.89
Nigeria	0.53	2.44	-1.87	452.83
Norway	1.33	0.67	0.66	50.38
Russia	-0.5	-0.19	-0.31	38
Saudi Arabia	1.57	2.72	-1.12	171.34
South Africa	1.57	1.64	-0.07	104.46
United Kingdom	1.26	0.38	0.88	30.16
United States	1.74	1.04	0.69	60.34
Venezuela	1.7	1.99	-0.29	117.06

Source: UNU-IHDP and UNEP, 2012.

population of these countries. The countries which saw the biggest change in IWI because of population growth were Nigeria, Saudi Arabia and Venezuela. Countries with relatively high population growth rates such as Nigeria, and Saudi Arabia, which had rates of above 2% per year, saw their IWI go from positive to negative while Colombia, South Africa, and Venezuela also saw their IWI go negative, but their already low IWI growth rates are acknowledged. Russia, on the other hand, experienced a negative population growth rate but still returned a negative IWI growth rate because of a relatively large negative IWI rate prior to taking into account its population growth rate. Looking more closely at the group of industrialized countries, Australia, Canada and even to a certain extent the United States had much of their growth in inclusive wealth dampened by relatively high population growth rates. They have two options. The first would be to reduce their population growth rate further but this can only be suggested after taking into consideration the population dynamics of the country, total population, and population density. These countries have relatively small populations in comparison to the land area they have, suggesting a further reduction in their population growth rate that incidentally is below the replacement rate of 2.1 might not be the best strategy. This might actually jeopardize the overall inclusive wealth growth rate of the nation as it might hamper the build- up of produced and human capitals, which are also essential determinants of well-being. Therefore, if population levels in these countries are to be maintained at their present levels, then these countries have not been building up their productive base over the past 19 years to maintain these population levels. We shall look in more detail at how these countries have been developing their capital asset base in Chapter Three. Figure 2 provides more detailed information on the change in the natural capital composition. As Fig. 2 illustrates, only a few countries like Japan, the United States and France have been able to increase the forest component of their natural capital base while most other countries have seen declines. We shall show in the following chapter why this has been the case for Japan.

3. The *Satoyama*, Natural Capital and the IWI

In this Chapter, we will look at Japan in particular and explore the reasons the forest stock in Japan has been increasing and the role it has played in increasing the IWI of the country. This paper will introduce the term "*satoyama*" and illustrate the critical role it has played over the past two decades in maintaining a positive IWI for Japan. The lessons learnt from the landscapes can be useful for other countries trying to increase their productive base over time.

"*Satoyama*" is a Japanese term for landscapes that comprise a mosaic of different ecosystem types, including secondary forests, agricultural lands, irrigation ponds and grasslands, along with human settlements. Numerous groups and individuals have attempted to define "*satoyama*" from their own background and interests, and some refer to it as ecosystems; coppices and

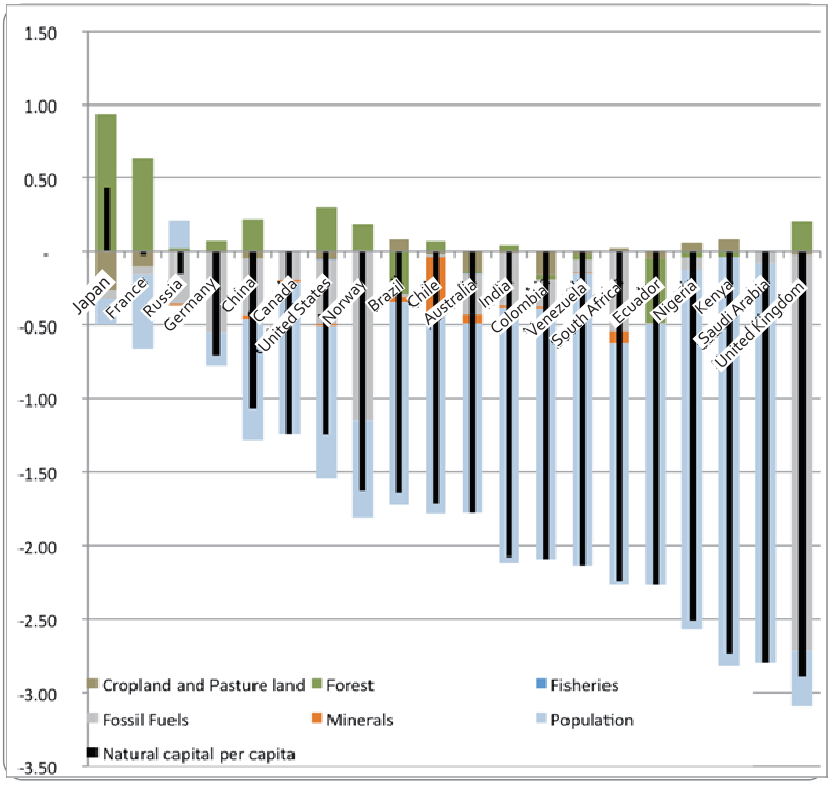

Fig. 2 Composition of natural capital asset categories. Source:UNU-IHDP and UNEP, 2012.

secondary forests, while others refer to it as traditional rural landscapes (Takeuchi, *et al.*, 2003). These landscapes have been formed and developed through prolonged interaction between humans and ecosystems, and are most often found in the rural areas of Japan. It is estimated that the *satoyama* comprises more than 40% of Japan's total landmass (Ministry of the Environment, Japan, 2001). For instance, *satoyama* land in Ishikawa Prefecture accounts for more than 60%-70% of the total prefectural land area (Ishikawa Prefecture, 2004) and in Chiba it is estimated that approximately 58% of the land is *satoyama* (Chiba Prefecture, 2008).

Satoyama landscapes in the past produced much of the food, fuelwood, timber and water for local communities. They also provided a way of life, illustrating the symbolic interaction between humans and the natural system. In many ways, they demonstrate how society in the past used land in a sustainable manner to produce goods which society had reason to value. The mosaic approach adopted by the *satoyama* implies a rich diversity of ecosystem types, with each system having a great variety of flora and fauna.

The *satoyama* possesses numerous significant values which are derived from their ecological, social, cultural and economic functions through the use of the ecosystem services flowing within these areas. Besides its role as a home for humans, the *satoyama* pools the various ecosystems–including agro, forestry, wetlands, grasslands, marine and coastal ecosystems–and biodiversity, to provide ecosystem services that contribute to human well-being. For instance, the ecosystems in the *satoyama* provide direct use values such as food, fiber, fuelwood and water among others. At the same time, the *satoyama* also produces a number of indirect use values that include flood and water regulation, water purification, cultural services and pollination among many others. Then there are optional values, which might include the maintenance of the *satoyama* for future generations as a source of their cultural heritage.

The values of these ecosystem services that contribute to human well-being differ across different social groups. For example, local communities value many of the direct uses, like rice production, fish production and water regulation, much higher than urban residents, who might be able to acquire these services from other sources. Urban residents, on the other hand, might place high values on the indirect uses such as climate regulation and cultural services. These different values of ecosystem services held by different social groups influence the perceptions and attitudes towards the *satoyama* and its use in preserving biodiversity and the sustainable supply of different ecosystem services. Recognizing and respecting these differences in perceptions and attitudes is important if *satoyama* landscapes are to be used to reduce the rate of loss in biodiversity and maintain a sustainable supply of ecosystem services.

A recent comprehensive assessment of the *satoyama* found that *satoyama* landscapes have been on the decline over the past two decades (Duraiappah *et al*., 2012). The key drivers of this decline have been urbanization, the aging population and under-use of land for agriculture and forestry. Therefore, although the area under *satoyama*-type systems has been declining, the acreage under forests has been on the rise and this has contributed to the increase in the inclusive wealth of Japan as shown in the previous Chapter. This results in an interesting paradox. On one hand, the decline in *satoyama* landscapes has caused a drop in biodiversity and many regulating services valued by individuals and society at large in Japan (Iida &Nakashizuka, 1995; Kameyama *et al*., 1994). On the other hand, the increase in unmanaged forests has caused an increase in the natural capital wealth of Japan as computed by the potential timber and non-timber forest products the forests are able to supply. The key word here is "potential." It would seem that the value we had used to compute the natural capital wealth might have been overestimated because of the higher values used for forest products while the actual value placed on natural systems by Japanese society seems to be on the landscape itself and the values it provides. This may imply the actual wealth of Japan might be lower than computed and might actually result in a lower IWI than that reported by the IWR 2012 (UNU-IHDP & UNEP, 2012).

Although "*satoyama*" is a Japanese term, these mosaic types of ecosystems where human-nature interaction is central are not unique to Japan alone. Such landscapes are found throughout many regions of the world, though the issues might vary from one area to another. Given the features of the *satoyama* and *satoumi*, which typically embody a symbiotic relationship between ecosystems and humans to produce a bundle of ecosystem services for human well-being, it is an issue not only of significance to the local region, but also of international importance.

English does not have a word corresponding to "*satoyama*." However, this idea is widely recognized in Asian countries. For example, there are words such as "*mauel*" in Korean and "*kebun-talun*" or "*pekarangan*" in Indonesian. Yabu (2009a, 2009b) has reported in 'Satochi-Satoyama *Culture* (Volume I and II)' that ecosystems and livelihoods present in agricultural villages in China and Korea are surprisingly similar to those of the *satoyama* in Japan. Yabu (2009a, 2009b) suggests that "*satochi-satoyama* culture" could provide a basic foundation to conceptualize the sustainable use of biodiversity and ecosystem services and be considered the natural wealth of a country.

Lessons learnt from the Japanese experiences in *satoyama* landscapes which emphasize the sustainable use of ecosystems for the delivery of ecosystem services for human well-being might offer a unique land management system, which could produce both conservation and development benefits for society. In some countries, it might be seen purely as a cultural heritage, while in others, it might offer opportunities that could contribute to both economic and human development.

4. Lessons Learnt and Conclusion

The experience of Japan with regard to its management of its natural capital and its contribution to the inclusive wealth of the country can provide some lessons for many developing and developed countries. First, it has maintained a positive IWI over the past 19 years. Second, it has increased its natural capital per capita growth rates over the past 19 years. Third, much of the growth in natural capital has been driven by an increase in its forest stocks.

Although Japan's IWI growth rate is approximately the same as its IWI?? growth rate, its performance has been described as poor and in a bad state of affairs as compared to other countries. However, based on IWI, Japan is performing relatively much better than most other industrialized countries because of its relatively better build up of natural capital, which in turn has been driven by an increase in its forest stocks. The sustainability of its productive base would seem from the preliminary results to be much more secure than in other countries which have both increasing populations and declining natural capital.

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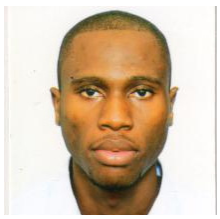

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Elorm DARKEY is currently completing his Master's studies in Economics at the University of Bonn, Germany. He obtained his degree in a combined major in Economics and Mathematics from the University of Ghana. After completing his undergraduate studies, he served as a teaching assistant at the Regional Maritime University in Ghana. Having previously served as an intern with the Science Management Unit at UNU-IHDP by providing analytical support for databases and research activities, Elorm is currently supporting the same unit as a Project Assistant of the Inclusive Wealth Report. His primary research interest lies in welfare economics and he finds environmental and sustainability issues a vital component of well-being.

(Received 6 June 2012, Accepted 23 July 2012)