The SDGs and Measuring Sustainability

It's crucial, and it's really not that difficult!

The proposed Sustainable Development Goals (SDGs), as presently conceived, will address a range of development challenges. The SDGs, for example, will almost certainly include a set of goals that are designed to build upon the success of the Millennium Development Goals. These, presumably, will set forth targets and goals relating to poverty, health, and education. The SDGS are also likely to promulgate a series of targets and goals designed to make the gains in human development more equitable and durable. These may include matters relating to governance, social justice, conflict resolution, and gender equity. The SDGs are also likely to include goals relating to the "green economy," including water conservation, expansion of renewable energy, reforestation, and sustainable agriculture. ***All of these goals and targets are essential, in some form, to promoting sustainable development, but they do not tell us whether human development is sustainable in terms of natural resource limits and planetary boundaries.***

Measuring What's Sustainable

Evaluating the progress of sustainable development is often characterized as too complex, and too dynamic to be subjected to any kind of quantitative measurement. Much of the literature on sustainable development refers to three "pillars": 1) social development; 2) economic growth, and 3) environmental preservation. Because of the highly integrated and interactive nature of these pillars many observers conclude that it is simply not possible to measure the sustainability of human development.

The problem is further exacerbated by widespread confusion about what is meant by "sustainable development." The term has become so diluted that virtually any "micro" improvement in energy or resource efficiency, however small, is labeled as "sustainable development," as if the goal of "macro" sustainability is satisfied as long as something, anything, is being done to make things more sustainable.

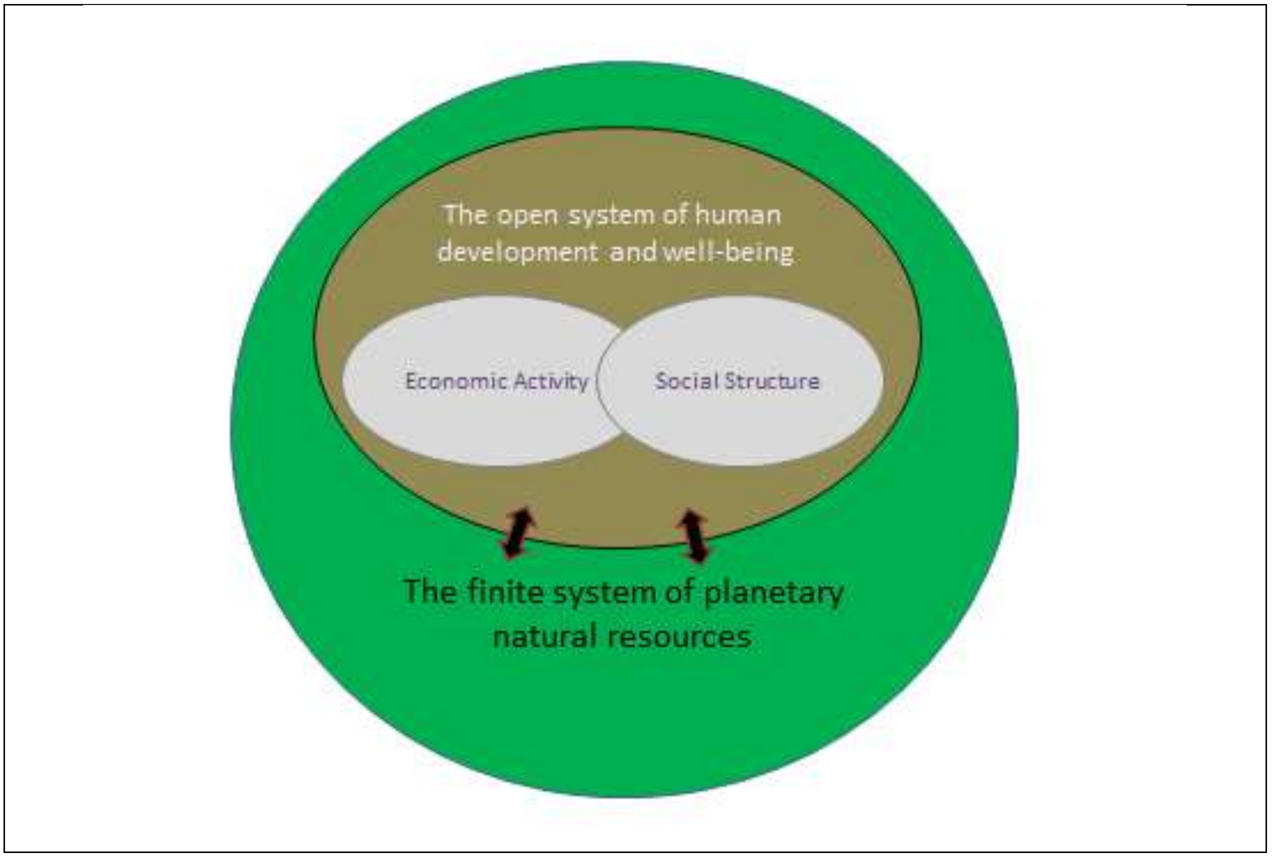
If we are going to measure the sustainability of human development, we have to look at the totality of the human enterprise and the demands that it places on the planet's resources, and then make a determination of whether those demands exceed, in the long-term, the planet's capacity to meet those demands.

The "three pillar" model, as it is generally conceived, does not do that. We have to recognize that economic growth and social development are overlapping subsets of the human enterprise (anthropogenic activity) and its cumulative impact on the environment and planetary resources. Only by measuring total anthropogenic activity, relative to the environment and resources, can we make any assessment of what is, or is not, sustainable.

Total Anthropogenic Activity

Total anthropogenic activity is, of course, structurally complex and highly metabolic. It is an "open system," meaning that it does not operate in a vacuum; it continually interacts with its environment. When total anthropogenic activity depletes resources, exceeds the Earth's regenerative capacity, or violates planetary boundaries (e.g. destroys the ozone layer or overheats the planet) it degrades the ability of Earth to support human activity and jeopardizes both present and future generations. Sustainable development, *if it is to be truly sustainable*, cannot ignore these limitations.

Chart A – Total Anthropogenic Activity and Finite Capacity



Note in Chart A that two of the traditional "pillars" of sustainable development—economic and social—are really subsets of total anthropogenic activity, and both are subject to the limitations that come with living on a finite planet. When total anthropogenic activity exceeds what the Earth can provide[1], both economic and social development are constrained, as is "human development."

[1] Which is already today's reality; global natural resource 'overshoot.'

When forests, oceans and other eco-systems are destroyed, when planetary resources are diminished, or when climate undergoes an adverse shift, the sustainability of human development is jeopardized. This is true at all levels—global, national, and local—and that reality must be reflected in some form in the SDGs.

Measuring Sustainability in the SDGs

Measuring system compliance with planetary boundaries is actually a rather straight-forward process, and in so doing, we actually define with a high degree of precision what constitutes sustainable development.

Sustainability, from the perspective of natural resource limitations, is easily conceptualized as "living within our means." We know, for example, that if we annually harvest more timber than a forest can regrow each year, or if we pump water from an underground aquifer at a rate which is greater than its natural recharge rate, that our management of these resources is unsustainable. These over-consumption practices will eventually destroy the forest or deplete the aquifer. So our definition of sustainability is simple: our demands for natural resource goods and services must be equal to, or less than, the capacity of the environmental system to provide these goods or services. This 'balancing' of our resource demands with planetary capacity is a ***sufficiency*** question. Our human endeavors, by definition, become sustainable if there are ***sufficient*** natural resources to meet our anthropogenic ***open system*** needs as well as providing a minimum quantity of natural resources for the preservation of other higher order species[2].

Oxfam International warns that we must maintain a 'safe operating space' for humanity and Stockholm Environment Institute's work has alerted us to the dangers of exceeding "planetary boundaries." Both these descriptive frameworks help to build awareness about the relationship between human activity and resource limitations. However, we must go beyond these conceptual frameworks and employ metrics that will tell us whether human activities—globally, nationally, and locally—are actually maintaining that safe operating space or contributing to the violation of planetary boundaries.

We need targets or goals in the SDGs that address the ***sufficiency*** of natural resources and provide nations and the world with appropriate prescriptive guidance. In the long run, we must balance our global human development imperative with the need to preserve planetary bio-physical assets. Resource *sufficiency* evaluation and reporting is the appropriate prescriptive response to that challenge.

Resource Sufficiency Evaluation (RSE), in the SDGs or elsewhere, requires a periodic tabulation of natural resource assets, and the creation of simple bio-physical 'balance sheet' reports that compare the total resource demands of our societies with the resources that are available to us[3]. If any one of the natural resource categories of these balance sheet reports indicates a

---

[2] In addition to anthropogenic needs, a minimum quantity of resources must be allocated for maintenance of protected areas for the preservation of bio-diversity. A minimum level of bio-diversity preservation is required to achieve lasting 'planetary system' sustainability.

[3] The amount available for human use is the total resource capacity minus the minimum amount dedicated to the preservation of other higher order species and ecosystem bio-diversity.

supply shortage relative to our total societal demands, then we are not managing our national endeavors[4] in a sustainable manner.

Appendix 1 outlines three possible (and important) resource sufficiency evaluations that might be readily adapted for national sustainability accounting. The sustainable development goal for all three of these illustrative categories is the same; there should be a surplus, rather than a deficit, of natural resource capacity. If there is a deficit, then policy action should be taken to reduce that deficit over time.

Appendix 2 illustrates how this analysis might be extended to put this national analysis into a global context. Appendix 3 illustrates how these evaluations might be done with even greater emphasis on planning for a sustainable future (i.e. meeting the needs of future generations).

Robust methodologies[5] already exist for calculating our aggregated national and global resource demands[6] and comparing them to our natural resource capacities. The science is available to reliability compute and report on these bio-physical balances. What is lacking is general awareness of the need for this type of resource accountability, and the political will to implement it. Hopefully, political support will grow over the next year or two as international leaders consider the importance of promulgating meaningful and effective SDGs.

The Importance of Resource Sufficiency Evaluation:

Over the past 100 years the world has made major strides in improving the human condition. Average life spans have more than doubled. Food production has more than quadrupled. Living standards in many countries have increased by a factor of at least ten. However, this progress in human development has been propelled by the extraction of fossil fuels and the exploitation of natural resources, and it has taken a terrible toll on the environment. The earth's resource base is now steadily shrinking.

The greatest global challenge for this century is to further the progress of human development, while at the same time reconstructing and preserving planetary natural resource assets. Sound natural resource management is critical in today's world of increasing relative resource scarcity.

By including resource sufficiency evaluation in the SDGs, we can give country leaders a clearer understanding of what is sustainable, and what's not, and thereby contribute to the preservation (and hopefully the reconstruction) of national and planetary bio-physical assets. Importantly, resource sufficiency evaluation will be applicable to countries on both sides of the north-south divide. Every nation – both developed and developing – should be evaluating, reporting on, and making progress toward bio-physical balance. Developed

[4] Please note that the proposed bio-physical balance sheets must be evaluated and reported at the national and global spatial scales, and wherever possible they must aggregate the various (and often mutually exclusive) demands that we place on national and planetary resource capacity.

[5] For example Ecological Footprint Accounting (EFA), which utilizes LCA, I/O, and other scientific approaches, to interpret resource flows through the lens of bio-capacity.

[6] No matter where they occur in the world.

nations, as a matter of economic and social justice, must account for their greenhouse gas emissions and their consumption of natural resources, while developing nations must determine whether they have adequate resources (water, arable land, etc.) to sustain human development.

The establishment of national resource planning and resource sufficiency goals is crucial to inter-generational equity. Improvements in long-term resource management, a natural outcome of implementing these goals, would benefit future generations. Preserving natural resource systems is at the heart of protecting opportunities and the needs of future generations.

Lastly, and possibly most importantly, resource sufficiency metrics and goals, when **reported out**[7] to the citizens of all nations, would build public awareness of the global challenges associated with resource system overuse. This type of resource accountability would help educate and inform the citizenry of all nations, and force sustainability into the political discourse. This broader awareness and political discourse (that would result from transparent reporting of resource sufficiency progress) would help build political support for the hard policy choices that must be made, if we are to accomplish truly transformative change for more sustainable global living.

In summary, we believe that one or more of the sustainable development goals must address the extent to which we are living within planetary resource constraints. Societies at all levels—global, national, and local—must evaluate whether or not they have ***sufficient*** resources to support the long-term well-being of their people.

End of Paper[8]

[7] The choice of words, here, highlights the need for a high level of publicity, rather than just including natural resource sufficiency progress in often-ignored government reports. Today, people hear about the accumulation of national debt, and how financial debt may jeopardize the interests of future generations. In a similar fashion, the public needs to hear about the natural resource debts that many nations are accumulating.

[8] For further information please contact ebarry@sustainableworldinitiative.net .

Appendix 1 – Natural resource sufficiency metrics and goals

The tables below illustrate one way that resource sufficiency metrics might be established and evaluated to inform future policy decisions for more sustainable behavior at the national level.

Bio-physical 'balance sheet' accounting - Germany

Resource category	Societal Demand	National Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	420	160	-260	unsustainable	Million global hectares
Fresh Water	30	110	80	sustainable	Billion cubic meters
Energy	330	130	-200	unsustainable	1000 Kt of oil equivalent

Bio-physical 'balance sheet' accounting - Brazil

Resource category	Societal Demand	National Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	560	1,710	1,150	sustainable	Million Global hectares
Fresh Water	60	5,400	5,340	sustainable	Billion cubic meters
Energy	240	230	-10	unsustainable	1000 Kt of oil equivalent

Bio-physical 'balance sheet' accounting - Egypt

Resource category	Societal Demand	National Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	130	40	-90	unsustainable	Million global hectares
Fresh Water	70	2	-68	unsustainable	Billion cubic meters
Energy	70	90	20	sustainable	1000 Kt of oil equivalent

Bio-physical 'balance sheet' accounting – Bangladesh

Resource category	Societal Demand	National Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	90	60	-30	unsustainable	Million global hectares
Fresh Water	40	100	60	sustainable	Billion cubic meters
Energy	30	25	-5	unsustainable	1000 Kt of oil equivalent

In this illustration three natural resource categories are selected; bio-capacity, water, and energy.
For all categories, the various human demands (e.g. for water: residential potable water, agricultural irrigation demands and industrial uses) and capacities (e.g. surface water, ground water, and from desalinization plants) are **aggregated** for the national entity. Societal demand includes all resources that are consumed by the citizens of the nation, regardless of where in the world they are conscripted by human manufacturing or other processes. National capacity is equal to the aggregated quantity of resources that are available from within the sovereign territories of the nation.

The basic bio-physical 'balance sheet' in this illustration can be found in columns 2, 3, and 4 (highlighted in grey). The sustainability goal for all resource categories is the same; to have a surplus for each resource category. A nation that has more sovereign resource capacity than its society demands is sustainable by definition, for that resource category. If it has a surplus for all resource categories, the national society is being operated sustainably (with respect to natural resource goods and services).

Appendix 2 – Natural resource sufficiency from a global perspective

The five tables below illustrate one way that the national evaluations in Appendix 1 might be viewed in a regional or more global perspective. This example shows the resource balances for the same four countries, but includes an additional column for acquired (off-shore) capacity. It also includes a fifth table which aggregates the data from all four of the individual nations. This table represents a more (but an obviously incomplete) global perspective.

Bio-physical 'balance sheet' accounting - Germany

Resource category	Societal Demand	National Capacity	Acquired Capacity	Total Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	420	160	260	420	0	probably unsustainable	Million global hectares
Fresh Water	30	110	0	110	80	sustainable	Billion cubic meters
Energy	330	130	200	330	0	potentially sustainable	1000 Kt of oil equivalent

Bio-physical 'balance sheet' accounting - Brazil

Resource category	Societal Demand	National Capacity	Acquired Capacity	Total Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	560	1,710	0	1,710	1,150	sustainable	Million global hectares
Fresh Water	60	5,400	0	5,400	5,340	sustainable	Billion cubic meters
Energy	240	230	10	240	0	potentially sustainable	1000 Kt of oil equivalent

Bio-physical 'balance sheet' accounting - Egypt

Resource category	Societal Demand	National Capacity	Acquired Capacity	Total Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	130	40	90	130	0	unsustainable	Million global hectares
Fresh Water	70	2	68	70	0	unsustainable	Billion cubic meters
Energy	70	90	0	90	20	sustainable	1000 Kt of oil equivalent

Bio-physical 'balance sheet' accounting – Bangladesh

Resource category	Societal Demand	National Capacity	Acquired Capacity	Total Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	90	60	30	90	0	unsustainable	Million global hectares
Fresh Water	40	100	0	100	60	potentially sustainable	Billion cubic meters
Energy	30	25	5	30	0	unsustainable	1000 Kt of oil equivalent

Bio-physical 'balance sheet' accounting – All four countries

Resource category	Societal Demand	Total Nat'l Capacity	Acquired Capacity	Total Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	1,190	1,970	380	2,350	1,160	sustainable	Million global hectares
Fresh Water	200	5,612	68	5,680	5,480	sustainable	Billion cubic meters
Energy	670	475	215	690	20	unsustainable	1000 Kt of oil equivalent

A nation that has more sovereign resource capacity than is demanded by its society is sustainable by definition (at least for that resource category). Nations that, in certain resource categories, must acquire off-shore resources to fulfill their total needs, could be viewed as sustainable for that resource if their acquisitions are done in the context of legitimate international agreements. In these cases, the long term viability of their off-shore acquisitions would have to be objectively and fairly assessed in order to assign a meaningful sustainability rating.

Appendix 3 – Resource sufficiency balance sheets: Planning for a sustainable future (e.g. 2050)

The national and global resource evaluation process illustrated in Appendix 2 can also be used to plan for the future. Like the investment community, which finds it necessary to assess the future viability of a business entity[9] before making investment decisions, we also must do natural resource sufficiency planning before we proceed with our national and aggregated global human development agenda. The five tables below mirror the same evaluation process that was illustrated in Appendix 2, but instead of reporting on current activity, the data in these tables illustrate a projected scenario for the year 2050. The data contained in this illustrative scenario is 'in-the-ballpark' when we consider anticipated population growth, increased economic activity, human development aspirations, and future trends in technology.

Bio-physical 'balance sheet' accounting - Germany

Resource category	Societal Demand	National Capacity	Acquired Capacity	Total Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	540	180	200	380	(160)	unsustainable	Million global hectares
Fresh Water	50	110	0	110	60	sustainable	Billion cubic meters
Energy	480	130	220	350	(130)	unsustainable	1000 Kt of oil equivalent

Bio-physical 'balance sheet' accounting - Brazil

Resource category	Societal Demand	National Capacity	Acquired Capacity	Total Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	2300	1500	100	1600	(700)	unsustainable	Million global hectares
Fresh Water	480	5100	0	5100	4620	sustainable	Billion cubic meters
Energy	700	430	110	540	(160)	unsustainable	1000 Kt of oil equivalent

Bio-physical 'balance sheet' accounting - Egypt

Resource category	Societal Demand	National Capacity	Acquired Capacity	Total Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	260	35	80	115	(145)	unsustainable	Million global hectares
Fresh Water	180	6	144	150	(30)	unsustainable	Billion cubic meters
Energy	140	80	20	100	(40)	unsustainable	1000 Kt of oil equivalent

Bio-physical 'balance sheet' accounting – Bangladesh

Resource category	Societal Demand	National Capacity	Acquired Capacity	Total Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	140	50	60	110	(30)	unsustainable	Million global hectares
Fresh Water	80	60	20	80	0	potentially sustainable	Billion cubic meters
Energy	50	20	15	35	(15)	unsustainable	1000 Kt of oil equivalent

Bio-physical 'balance sheet' accounting – All four countries

Resource category	Societal Demand	Total Nat'l Capacity	Acquired Capacity	Total Capacity	Surplus (Deficit)	Sustainability Rating	Measurement Units
Bio-capacity	3420	1765	440	2205	(1035)	unsustainable	Million global hectares
Fresh Water	790	5276	164	5440	4650	sustainable	Billion cubic meters
Energy	1370	660	365	1025	(345)	unsustainable	1000 Kt of oil equivalent

[9] Using accepted financial forecasting practices and methodologies.