"Mind the Gap: Bringing Sustainability[1] into Sharper Focus,"

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Preamble:

Riders of the London underground – the "tube" to Londoners - are regularly reminded on loudspeakers to "mind the gap" between the train and the station platform. The warning, of course, is given out to prevent passengers from tripping in the space between platform and train car. The same warning, however, needs to be given to humanity at large, which is in mortal danger of tripping over the biological and natural resource limits imposed by Mother Nature.

Humanity needs to "mind the gap" between the demands we are placing upon the Earth, and the planet's ability to satisfy those demands.

The coupled relationship between human activity and the natural resource systems of the planet is a highly complex and integrated set of interactions. Human life and all our economic and societal activities are inextricably dependent on adequate and healthy biophysical systems. Modern humans are consuming prodigious amounts of resources and our activities are putting a tremendous stress on the biosphere, as the size of the human footprint, a comprehensive numerical measure, has become immense and pervasive across all of Earth's terrestrial and marine ecosystems.

The key problem - and it is huge - is that "the gap" that now threatens to trip up humanity is not as clearly delineated as the gap that appears between the train and the station platform on London's underground. While there is mounting scientific evidence that human economic activity is in overshoot, consuming more of nature's goods and services each year than natural systems can produce, most people—including policymakers—are largely unaware of "the gap." Increasing public understanding of the extent to which human activity exceeds sustainable limits

[1] Sustainability, for the purposes of this paper, recognizes that adequate 'natural capital' stocks and "services" are essential assets for human well-being. This, in turn, requires that the rate at which humans consume renewable and replenishable resources not exceed the rate of regeneration of the corresponding natural capital stocks. Non-renewable natural capital should be used no faster than renewable substitutes can be developed and brought 'on-line'. This paper's focus on biophysical resource preservation does not suggest that economic or societal development (the other two 'pillars' of sustainable development) are less important.

is essential to building public support for the policies that are needed to keep us within those limits.

Population is unquestionably a factor that greatly affects how our species impacts the planet, and there is growing recognition that the population factor must be a part of the global sustainable development discourse.

A. The current scale of human activity on Earth is already too large in relation to the finite resources of one planet; business as usual is unsustainable.

The cumulative evidence suggests that the current scale of the human economy is already excessive; that the human enterprise is in a state of unsustainable 'overshoot.' By this we mean that the consumption and dissipation of energy and material resources exceed the regenerative and assimilative capacity of supportive ecosystems. Many critical stocks of 'natural capital' are in decline and global waste sinks are filled to overflowing. The clear message from these realities is that "business as usual" is not an option for the world community. Any society that is living by depleting essential capital assets is unsustainable *by definition.*

Resource overshoot can be demonstrated empirically in at least four ways:

1. Unequivocal empirical evidence of the degradation of resource ecosystems (e.g., marine fisheries and tropical rain forests) and the depletion of non-renewable resources (e.g., conventional petroleum and various industrial minerals and metals);
2. Direct observation of the gross pollution of major ecosystems and the global commons (e.g., expanding ocean anoxic zones and the accumulation of atmospheric green-house gases [carbon dioxide is the largest waste product of industrial economies]);
3. Macro-economic analysis that compares traditional GDP with indicators that incorporate physical assessments and appropriate valuation of natural capital stocks and pollution damage costs (e.g., the 'Genuine Progress Indicator' or the 'Index of Sustainable Economic Welfare');
4. Ecological footprint analysis, a quantitative method that compares human demand for bio-capacity (ecosystem services) with sustainably available supply. The aggregate human eco-footprint is already approximately 50% larger than the available bio-capacity. Moreover, demand is increasing and supply is in decline. How is this possible? In the short term, it means borrowing on the future capital of nature; that is, by funding current consumption at the expense of depleting critical natural capital stocks.

Within just the last few decades the growth of the human endeavor has passed a major milestone and caused a fundamental shift in the human relationship with nature. The human species is now clearly demanding more ecosystem goods and services, and extracting more non-renewable resources, than the finite earth-system can sustainably provide, and this global resource overshoot condition is getting worse with every passing year. This fundamental change in the global condition is often described as moving from an "empty world" economic model, to natural resource overshoot, and it is a very important but not readily understood transformation.

There have been many comprehensive international studies that address humanity's over-exploitation of environmental resources[2]. The High-Level Panel on Global Sustainability[3] recently reported to the UN Secretary-General:

"The current global development model is unsustainable. We can no longer assume that our collective actions will not trigger tipping points as environmental thresholds are breached, risking irreversible damage to both ecosystems and human communities."

Business interests are also beginning to recognize that we are living unsustainably. As the WBCSD recently put it[4]:

"An equally firm finding is that business-as-usual cannot get us to sustainability or secure economic and social prosperity; these can be achieved only through radical change, starting now."

Indeed, a growing number of studies and reports[5] from governments, think tanks, academia, and civil society warn that resource overshoot is imperiling the welfare of future generations, and the frequency and intensity of these warnings are increasing. The global scientific and academic community has repeatedly and clearly demonstrated that business as usual for the global economy is unsustainable.

B. Climate change, fresh water shortages, biodiversity loss, food shortages (and price increases), and peak oil are all symptomatic of this global resource imbalance.

Today, significant international attention and effort is focused upon global warming and the perils associated with planetary climate disruption. But "climate change," is just one of many serious inter-connected environmental challenges confronting the world today. Other challenges such as population growth, fresh water and food shortages, biodiversity loss, and the global "peaking" of oil production, may have equally (or more) serious impacts on future human well-being. Indeed, a "perfect storm" of multiple challenges for humanity to address may be brewing.

A crucial first-step in addressing any challenge is to fully understand the problem. Sufficient reflection brings recognition that climate change per se is really not 'the problem.' Likewise,

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[2] For example the now 25 year old Brundtland Commission report; "Our Common Future," and the entire series of IPCC reports (4) that were published in 1990, 1995, 2001, and 2007, and authored by literally thousands of experts.

[3] "Resilient People, Resilient Planet; A Future Worth Choosing," An 'overview' issued 30 January, 2012 by the United Nations Secretary-General's High-Level Panel on Global Sustainability, page 4, item 8.

[4] The World Business Council for Sustainable Development; an excerpt from the introductory "Message from the co-chairs" of their report; "Vision 2050 – The new agenda for business."

[5] For example, in addition to those cited in footnote 2, see the Statement of concerned scientists at http://www.un.org/popin/icpd/conference/ngo/940909224555.html; Achim Steiner's address to the United Nation's Security Council at http://www.unep.org/newscentre/default.aspx?DocumentID=2646&ArticleID=8817; the Millenium Ecosystem Assessment reports at http://www.maweb.org/en/index.aspx; Statement by the World Resources Institute at http://www.wri.org/publication/millennium-ecosystem-assessment-living-beyond-our-means-natural-assets-and-human-we; Global Footprint Network's global overshoot chart and commentary at http://www.footprintnetwork.org/en/index.php/GFN/page/world_footprint/.

water shortages, overgrazing, erosion, desertification, the rapid extinction of species, deforestation, loss of cropland productivity, and fishery and marine ecosystem collapse, are not 'the problem'. Each of these crises, though alarming in itself, is merely a symptom of a much deeper eco-structural malaise—gross human ecological dysfunction. It lies in the fundamental theme here to "Mind the Gap." Humanity is increasingly demanding more than the earth can sustainably provide.

In short, it is really a scale and balance (or rather imbalance) problem that we must address. The present scale of aggregate human demand exceeds the long-term bio-productive and waste assimilation capacities of Earth.

C. Global resource overshoot must be dealt with to preserve life, promote social justice, and create intergenerational equity.

Human life and all our economic and societal activities are completely dependent on adequate and healthy resource systems. With few exceptions, human welfare depends on both social and economic development, and both of these depend on a healthy system of natural resource goods and services. Therefore, future development of the human enterprise, if we wish it to be durable, can only be done within the context of resource sufficiency planning and accountability that is appropriately designed to adequately protect the planet's natural resource assets.

There is an increasing awareness that progress in human development is being jeopardized by anthropogenic over-use of natural resources. In many regions of the world, environmental system degradation is already taking a highly visible toll on people and communities. And as we look longer-term at the human trajectory and its impact on vital ecosystems, the negative impacts on human well-being will only intensify. Studies show[6] that environmental degradation scenarios significantly reduce future prospects for human development.

Achieving a balance between production in nature and consumption by humans is not merely one of many 'options,' it is an obligatory requirement for sustainability. Otherwise we will continue to undermine the Earth's natural resource assets and services, causing hardship and suffering for future generations. Eliminating overshoot is an essential prerequisite to achieving social justice, creating intergenerational equity and preserving the advances of civilization.

D. Sustainability must be evaluated in an integrated manner, and resource Sufficiency Evaluation and Reporting (SER) must be adopted, and fully integrated into policy development.

Resource sufficiency evaluation can be described with a simple formula:

$$Res_{Demands} < Res_{Supply} \qquad \text{(equation D.1)}$$

[6] UNDP Human Development Report 2011 (Summary), page 2, and figure 2 page 3 taken from; "Forecasting the Impacts of Environmental Constraints on Human Development," Human Development Research Paper, UNDP, New York, which draws on forecasts from International Futures, Version 6.42.

The total resources taken from any system must be less than or equal to the amount of resources the system can naturally supply. This formula, and the need to balance total resource demands within total resource supplies, holds true for any system if we wish to prevent its material degradation over time. A sustainable system is;

> "…one that can continue to operate indefinitely without degrading the biophysical basis of its own existence." (Rees, 2009).

The importance of the definition is that it establishes a principle applicable to all ecological scales. Depletion of a fossil (non-replenishable) aquifer is not sustainable. Even non-fossil aquifers, while replenishable, can be depleted at an unsustainable rate. Likewise, if we harvest timber from a forest at a rate that is greater than the timber re-growth rate, we will deplete the resource and eventually destroy the forest biome.

The resource sufficiency formula (equation D.1) and these two regional resource examples may seem like statements of the obvious, but what is not so readily understood (or acted upon) is that this same principle applies at a macro-scale. Regional ecosystem management and local resource balancing are certainly necessary, but not sufficient! We must also do resource sufficiency planning at national and global scales.

If we wish to have a sustainable society, resource balancing must be complied with at a scale that is inclusive of the total activities and impacts of that society. We often talk about sustainable communities or sustainable cities. But unless a municipal entity has actually evaluated its total resource demands over an appropriate regional area, and complied with the resource sufficiency formula, its claim to being "sustainable" has little merit. The word sustainable used in this context only suggests that the municipal entity seeks to be more environmentally efficient.

Scientifically based accounting methodologies are available to do aggregated resource sufficiency evaluation. These methodologies can be used to demonstrate unsustainable behavior long before such behavior causes severe and potentially irreparable damage to planetary resource systems. This type of sufficiency evaluation and planning is the ultimate early warning system for sustainability.

Financial balance sheets and other general accounting practices give misleading results because they require the valuation of material goods and flows in some common unit of currency such as the dollar. As a consequence they ignore the external costs that lead to overshoot. Resource sufficiency evaluation, in contrast, is done using standardized biophysical units such as energy equivalents or normalized land area units (i.e. global hectares). As comprehensive resource measures they more fully reflect all costs and benefits, including environmental ones.

Much has been published in the environmental literature about human domination of Earth's ecosystems,[7] and more recently about our over-use of "planetary boundaries,[8]" and how the scale of our activities has made a large and defining impact on global resources and natural resource systems. While extremely useful, these studies have a clear limitation. The majority of

[7] Peter M. Vitousek, Harold A. Mooney, Jane Lubchenco, Jerry M. Melillo; "Human Domination of Earth's Ecosystems," Science, Vol. 277, 25 July 1997, www.sciencemag.org

[8] Rockstrom, etal; "A safe operating space for humanity," Nature 461, 472-475 (24 September 2009)

them focus on individual resources or individual resource systems. These studies contribute to our scientific body of knowledge and they illustrate the reality of human global resource dominance. They also directly or implicitly make the case that we must become more responsible mangers of the Earth's relatively scarce resources. However, studies of individual resource systems do not address the critical issue of sustainability, for two reasons:

1. Resource sufficiency is usually not the primary focus of this type of study. Although these studies measure our consumption of resources, often as a percentage of total global capacity, they often fail to indicate what level of consumption is sustainable. For example, the percentage of accessible surface fresh water we use, or the percentage of terrestrial N fixation that is human-caused, is indeed valuable scientific information. However, it does not address what levels of anthropogenic water use or nitrogen fixation might actually be sustainable.

2. Individual resource or resource system studies do not account for the coupled interactive nature of the individual resource components. Since resource demands tend to be mutually exclusive and additive, studies that only assess one resource system - without reference to its impact on other systems and vise-versa - will, almost inevitably, paint an incomplete picture. Projected increases in the production of biofuels, for example, may help to make our energy outlook more sustainable, but at the expense of sustainable food production.

In contrast to the single resource analysis approach, there are methodologies that consolidate individual demand components within a broader resource category (e.g. renewable resources or energy). These methodologies are appropriate for sustainability analysis provided they actually compare the aggregated human demand with the Earth system capacity. This approach is true resource sufficiency evaluation and provides a more accurate measurement of global resource overshoot[9]. As noted above, evaluations of single resource components are valuable, but integrated and aggregated resource sufficiency evaluation must be done to ensure that our human societal and economic activity is truly durable.

A central focus of ecologists and other resource managers throughout the world is the sufficiency of resource systems. However, such balancing activities are almost always done on a regional or individual biome basis. For instance, when a forest biome is harvested selectively, at a level that equals the annual timber growth rate, then resource sufficiency management is presumed to be occurring. The timber harvest (demand) is being balanced with the timber growth rate (supply). Similarly, when annual fish catches are limited by regional marine management systems, resource balancing is occurring. The total catch (demand) is being balanced with the fishery reproduction and re-growth rate (supply).

Local and regional resource balancing is, of course, necessary to preserve the ecosystems upon which we rely. However, it is very important to understand that local and resource specific balancing is not sufficient to preserve the integrity of the Earth system as a whole. Because we place multiple demands on global resource systems (e.g. both timber extraction and carbon sequestration demands on a forest biome) we must perform resource sufficiency evaluations at

[9] For example: http://www.footprintnetwork.org/en/index.php/GFN/page/world_footprint/

an integrated, aggregated level. Even if we do a thorough job of preserving ecological assets via sound sustainable management practices at the local or regional level, the multiplicative couplings among these systems, taken together, may trump sustainable managerial practices at lower scales.

All nations are responsible for integrating physical assessments of their natural capital assets (renewable, replenishable and non-renewable 'resources') into their systems of national accounts for policy and management purposes. Overcoming overshoot and adherence to the strong sustainability criterion requires that we maintain sufficient supplies of natural capital *per capita* to ensure an adequate flow of 'natural income' (both material goods and life-support services) indefinitely into the future. Note that as population will increase for many years, consumption must decline to achieve a biologically sustainable economy.

There is a growing call from the global community[10][11] to create and implement a meaningful set of sustainable development goals (SDGs) to monitor the advancement of human well-being. For example, the High-Level Panel on Global Sustainability (HLP) in their recent report to the UN Secretary-General[12] repeatedly makes this call to action:

> *"Many argue that if it cannot be measured, it cannot be managed. The international community should measure development beyond gross domestic product (GDP) and develop a new sustainable development index or set of indicators."*

Also from the same report:

> *"International governance for sustainable development must be strengthened by using existing institutions more dynamically and by considering the creation of a global sustainable development council and the adoption of sustainable development goals."*

As humanity goes about the business of designing and implementing new SDGs, we must guard against our natural inclination to favor short term advancement of human well-being at the expense of protecting the long term integrity of environmental resource systems. Human development programs will not produce lasting results if, at the global scale, we continue to undermine the planet's natural resource assets. Therefore we must ensure that at least one set of SDGs (or class of development indicators) will measure and report on the longer term durability of national and global development. To accomplish this, the new goals (or the new set of indicators) must include actual bio-physical resource sufficiency 'balance sheets' that reflect aggregated national level demands and supplies of natural resources. These evaluations, including historical and projected resource sufficiency trends, should be made public and widely disseminated in order to better inform the policy process and build political support for needed change.

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[10] "The Future We Want," the zero draft compilation document of the Rio+20 UN Conference on Sustainable Development issued January 10, 2012; paragraphs 105-111.

[11] The Post 2015 Development Agenda; a briefing by Mr. Sha Zukang, Under-Secretary-General for Economic and Social Affairs, Secretary-General of the 2012 UN Conference on Sustainable Development, paragraphs 11, 19, and 21.

[12] "Resilient People, Resilient Planet; A Future Worth Choosing," A summary overview issued 30 January, 2012 by the United Nations Secretary-General's High-Level Panel on Global Sustainability, page 7, items g and j.

The over-all practice of resource sufficiency evaluation and reporting must be adopted by virtually all nations, with appropriate support from international institutions. This practice will 'operationalize' our shared responsibility to reduce and eventually eliminate global resource overshoot.

E. Any evaluation of sustainability must include consideration of all the factors that contribute to resource overshoot, including population.

The population issue, which includes human population numbers, growth trends, and a large variety of demographic characteristics (age distribution, household growth, urban vs. rural living, etc.) must be fully understood and accounted for in order to understand the quality and quantity of natural resources that humanity will need for development and long term well-being. Yet population is not in the mainstream global dialog about a sustainable future. The "Zero Draft" of the compilation document for the UNCSD (Rio+20) global conference to be held in Rio this June, makes only passing mention of population and does not discuss it in the context of sustainable development. This is only one small example of how, for decades, the world has been avoiding an open and constructive dialog that integrates the topic of population into discussions of environmental resource sufficiency and ecosystem preservation.

Environmental impact and natural resource demands are known to be a function of how many people (P), consume how many things (C), in the process of deploying what kinds of technologies (T)[13]. For example, population eco-footprint (EF) estimates are based on both population size and average per capita consumption (which is itself a reflection of incomes and technology). Similarly, the resource intensity of production (technology) and population are both factors in the generalized I = PCT equation. Yet, as the world focuses on the "greening" of the global economy, most governments emphasize only the T factor of this formula, virtually ignoring the P factor.

Many believe that the advancement of technology, "techno-fix," can solve the global sustainability challenge. When we compare the history of the world economy (GDP adjusted for inflation) with humanity's total ecological footprint, we observe that humanity has indeed been successful in reducing the intensity of our resource demands relative to the amount of economic goods and services that the global economy has produced. However, if we adjust global GDP figures to account for declines in the value of global natural capital assets[14], the generally accepted "advance of human technology" is called into question[15].

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[13] A variation of the broadly recognized I=PAT formula, where C is equivalent to the A (affluence) in the original IPAT. A statistical version of the IPAT is STIRPAT (Stochastic estimation of impacts via Regression on Population Affluence, and Technology); see http://stirpat.msu.edu .

[14] Unfortunately the world as a whole has not yet adopted improved indicators of economic well-being; with few exceptions we rely on GDP statistics as THE indicator of economic 'progress.' Metrics such as the index of sustainable economic well-being (ISEW) or the genuine progress indicator (GPI) are calculated in only a select few nations around the world. So, to account for non-economic growth at the macro-global level, we observed the trend line divergence between GDP and ISEW statistics for individual nations (as available), and using this information, estimated a generalized-weighted average trend divergence for the world as a whole.

[15] In other words, when our assessment methodology accounts for degradation of global natural capital assets, and as the total scale of human economic activity moved into the regime of global resource over-shoot, it is

Technological optimism and techno-fixes, the drivers of "business-as-usual," do not provide viable solutions to the challenge of global resource overshoot. On the contrary, historical data show that technological gains stimulate economic growth, accelerate material throughput and enable further exploitation of resources rather than induce conservation. So, while technology is a useful 'lever' that humanity can deploy to improve the efficiency of everything we do, it does not provide us with a viable solution to global resource overshoot. We are therefore left with the variables of consumption and population to address this global challenge.

There has been much debate over the relative importance of population vs. consumption in the quest for a more sustainable global future. Indeed, if we view the problem at the global scale, trend analysis shows that humanity's average consumption of resources (per capita footprint) has been relatively flat over the last few decades. This may seem surprising given the rapid growth of the emerging economies (e.g. China) which provides opportunity for large increases in consumption. However, economic progress in many developing countries has slowed in the past few years, high population growth continues, and rates of severe poverty have increased. So, on balance, per capita consumption of resources at the global scale has remained relatively constant. A flat per capita resource consumption trend for the average global citizen, strengthens the argument that population is the primary cause of global resource overshoot.

The debate between population and consumption, however, is not a particularly fruitful exercise. Overshoot is clearly the product of both population numbers and consumption practices and the global sustainability challenge must be addressed in both arenas. The advancement of human well-being on the planet will be best served if the sustainable production and consumption advocates join forces with those working in the field of population and development[16], and acknowledge each-other's important contributions.

That population persists as one of the true challenges of sustainability is made clear in the report by the HLP[17]:

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intuitively reasonable that true economic progress for the world as a whole is more difficult to achieve. In an undersubscribed empty-world economic model, technology advancements that simply allowed us to exploit resources at ever increasing rates, greatly facilitated global economic expansion. And this expansion appeared to have very little cost associated with it. By not including the net degradation of natural capital assets in the GDP calculation, we have been under-reporting the costs of our economic progress, and thereby understating the resource intensity of our activities.

[16] There are numerous cross references between Agenda 21, the comprehensive program of action that came out of the UNCED (Earth Summit), and the Programme of Action that was produced by the International Conference on Population and Development (ICPD). These cross-references acknowledge the importance of integrated thinking and keeping human development initiatives in total balance with environmental constraints [e.g. Agenda 21, section 5.0 and especially paragraph 5.5, and the ICPD Programme of Action, section C; "Population and the Environment," and especially paragraph 3.28 (a) and (b)]. While both 'silos' of activity have recognized the cross-interdependence, the administration of their respective action programs do not 'operationalize' the needed bridges between the two.

[17] See footnote 8, re: page 4, item 7 of that global report

"But what then, is to be done if we are to make a real difference for the world's people and the planet? We must grasp the dimensions of the challenge. We must recognize that the drivers of that challenge include unsustainable lifestyles, production and consumption patterns, and the impact of population growth."

The World Economic Forum has recently made an even stronger connection between the population factor and global sustainability[18]. In a recently issued report[19] they cite unsustainable population growth as the "Center of Gravity" for trends and uncertainties in their 'societal risk' category. They go on to say:

"Unsustainable population growth shares important interconnections with risks from all categories, with the exception of technological risks. While the societal Centre of Gravity clusters together with the majority of societal risks in likelihood and potential impact, it is most strongly associated with ***food shortage crises****. Along with* ***water shortage****, they both stand out from other societal risks as having a relatively high likelihood and potential impact in the next 10 years. Strongly connected to* ***mismanaged urbanization*** *and* ***severe income disparity****, unsustainable population growth also shares important direct connections to three Critical Connectors, as well as the Centers of Gravity in the economic, environmental and geopolitical categories. This positioning underscores its systemic importance."*

We assert that a broad range of population issues, concerns and policies, must be urgently infused into the international sustainable development discourse, and that the population factor must be considered alongside technology and consumption in achieving sustainability. While population must be addressed in a rights-based framework, it cannot be ignored.

F. Empowering women and expanding access to family planning information and services must be part of the global sustainable development dialogs and solution.

Sustainability assessments and corrective policies must include consideration of all factors contributing to overshoot, including population numbers and growth. Empowering women and expanding access to reproductive information and family planning services, being essential to preventing unwanted pregnancies and achieving sustainability, must be part of the global sustainable development dialogs and solution.

The resource sufficiency evaluations called for in sections D and E above, institutionalize the need to consider population numbers and demographic characteristics as we plan for a more sustainable world. But beyond this approach that indirectly forces us to include the population factor in our sustainability thinking, we should also recognize that sizeable gains in human well-being can be achieved simply by devoting more resources to voluntary family planning, along with programs that serve to keep girls in school, delay age of marriage, and empower women. Every woman must be able to decide, free from male domination, social pressures, or religious

[18] The cited WEF report actually uses the word 'security' rather than 'sustainability.'
[19] WEF's recent 'insight' report; "Global Risks 2012 (seventh edition)," page 42.

mandates, the number and timing of her pregnancies. Doing so is critical to human sustainability. Decades of experience have demonstrated that expanding family planning services and information inevitably leads to families that are smaller, healthier, more prosperous, and ultimately more sustainable. Smaller families are good for people… and the planet. We must support all programs and approaches that all help to reduce fertility rates and to stabilize (and ultimately reduce) our global numbers[20].

Projected population growth is not a fixed trajectory. Even small changes in fertility can significantly reduce population growth rates and hasten the day when world population begins to decline. Doing so will help us to achieve a more sustainable world and, ultimately, bring human resource demands into balance with what nature can provide, *but we must act now!*

As highlighted by a recent UNFPA intervention[21] in the UNCSD (Rio+20) preparatory process:

> *"Demography is not destiny. Population dynamics can be addressed through human- rights based policies… We must ensure universal access to reproductive healthcare and family planning, increase investment in education, and effectively support the empowerment of women and youth. Together these measures improve the quality of life of populations. They reduce infant, child and maternal mortality and help arrest the spread of communicable diseases. They also help to meet the unmet needs for family planning, reduce fertility and slow population growth, and thereby create the conditions for the best balance between populations and the environment."*
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> *"Sustainable development cannot be separated from population dynamics… The neglect of these linkages… will undermine a credible agenda on sustainable development."*

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[20] The connection between high fertility rates, population growth, and sustainable human development has long been recognized. However, global leaders need to be reminded that expanding family planning options for women is critical to improving maternal health, and that slowing population growth is necessary to achieve other global development goals. Please also refer to; "Return of the Population Growth Factor – Its impact upon the millennium development goals," Report of Hearings by the All Party Parliamentary Group on Population, Development and Reproductive Health.

[21] UNFPA intervention at the initial consultations on the Zero Draft of the Rio+20 Outcome Document New York, 26 January 2012, delivered by Michael Herrmann.

Summary

The total scale of the human endeavor on the planet today demands more resources than the planet can sustainably supply. Business-as-usual for the global economy is clearly unsustainable. In this paper we discuss this global condition, often referred to as 'resource overshoot,' and we recommend appropriate policy responses to the growing challenges associated with anthropogenic over-use of planetary resources.

The worldview discussed in this paper is unfortunately missing from the mainstream international discourse on sustainable development, despite the fact that there has been a fundamental transformation in humanity's relationship with nature; a shift from an 'empty-world' economic model to global natural resource overshoot. This transformation remains largely out of the public eye, even though it has significant policy implications.

After over-viewing this scale problem, and citing a number of literature references that conclusively support it, we briefly comment on how this important global resource imbalance impacts the progress and long-term viability of human development. We then recommend three appropriate policy responses:

1. Resource sufficiency evaluations must be done by all nations and at the global scale; in the form of aggregated biophysical resource 'balance sheets.' These balance sheets must be made public and widely distributed to increase awareness of the global overshoot challenge, to inform policy at all levels of governance, and to build political support for needed policy changes. **Sufficiency** planning represents a paradigm shift in policy administration; but one that is now urgently needed in response to the global reality of, and ever increasing development challenge associated with, resource overshoot.
2. The population factor (referring to population numbers, demographic characteristics, and continuing growth in many countries) is just one factor in sustainability, but it happens to be a critical one. Population must be fully integrated into the international discourse on sustainable development, and must become a prominent and fully vetted component of the global sustainability solution.
3. Projected human population growth is often considered an inescapable 'given.' In truth however, a large variety of rights-based population programs (e.g. family planning, reproductive health, and empowerment of women and girls through education) are available to proactively reduce average fertility rates. The global development community should dramatically increase investments in these proven programs, as a cost effective and non-coercive approach to stabilizing (and ultimately reducing) human population numbers, and to build a more sustainable global future.