THE ECOLOGICAL FOOTPRINT ATLAS 2008

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Global Footprint Network
Advancing the Science of Sustainability

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Competition for ecological services will play a critical role in the 21st century. If we continue business-as-usual, peak energy and climate change will combine with food shortages, biodiversity loss, depleted fisheries, soil erosion and freshwater stress to create a global supply-demand crunch of essential resources. Humanity is already in "overshoot," using more resources than Earth can renew. In a post "peak everything" world, if consumption trends in today's wealthy nations and in the emerging economies continue at current rates, overshoot will increase dramatically (Heinberg 2007). This will mean further degradation of the Earth's capacity to generate resources, continuing accumulation of greenhouse gases and other wastes, and the likely collapse of critical ecosystems.

But these issues are not intractable. The good news is that solutions need not wait for a global consensus. While the current climate debate assumes that those who act first may be at a competitive disadvantage, the opposite is often true. Acting aggressively now to implement sustainable solutions will reward the pioneers with lower resource costs, greater resiliency in the face of supply chain perturbations and better positioning to take advantage of opportunities presented by a rapidly changing economy.

Many opinion leaders are trapped in the misconception that advancing sustainability is detrimental to the economy, an expense that will only be affordable at some later date. Unfortunately, later is now, and the consequences of putting off change until later is that countries, and humanity as a whole, will be unprepared for the challenge of living within the limits of our natural resources.

Resource accounting is therefore as vital to the self-interest of any country, state, or city as is financial accounting. Those who prepare for living in a resource-constrained world will fare far better than those who do not. In an age of growing resource scarcity, the wealth of nations increasingly will be defined in terms of who has ecological assets, and who does not. Preparing for this new economic "truth" will take time, making it urgent to begin as quickly as possible. Strategies will need to be simultaneously put in place to better manage and protect ecological reserves while minimizing or reducing a nation's demand on ecosystem services — its "Ecological Footprint". Stimulating and supporting technological innovations and services that promote well-being without draining resources will play a key role in this effort. Cities, regions, or countries that are not able to provide a high quality of life on a low Footprint will be at a disadvantage in a resource-constrained future.

Without significant change, countries that depend extensively upon ecological resources from abroad will become particularly vulnerable to supply chain disruptions, and to rising costs for greenhouse gas emissions and waste disposal. At the same time, countries and states with sufficient ecological reserves to balance their own consumption or even export resources will be at a competitive advantage. This also holds true for cities and communities such as BedZed in the UK and Masdar in the UAE, which can operate on small Ecological Footprints, and are more likely to be able to maintain or even improve the well-being of their residents.

The political challenge is to demonstrate that this is not an "inconvenient truth" to be resisted, but rather a critical issue that demands bold action in the direct self interest of nations. It is a case of pure economics: Prosperity and well-being will not be possible without preserving access to the basic ecological resources and services that sustain our economy, and all of life.

The Role of Metrics

Without a way of comparing the demand on ecological services to the available supply, it is easy for policy makers to ignore the threat of overshoot, and remain entangled in ideological debates over the "affordability of sustainability". Clear metrics are needed to change these ideological debates into discussions based on empirical facts. This will lead to an understanding of what the real risks are, and facilitate building consensus over the actions needed to address them.

Responding to this need for a metric, the Ecological Footprint was developed over 15 years ago. Since that time, it has become an increasingly mature and robust way of capturing human demand on nature. But its evolution is not yet complete. With growing recognition of the value of this metric and its adoption by more governments and businesses, it has become clear that development of the Ecological Footprint needs to be significantly accelerated.

In 2003, Global Footprint Network was established to address this need. In addition to improving the scientific rigor and transparency of the Ecological Footprint methodology, this international NGO works to promote a sustainable economy by making ecological limits central to decision-making. The goal is to assure human well-being by ending overshoot, decreasing pressure on critical ecosystems so they remain robust, while continuing to provide humanity with essential ecological services. Global Footprint Network does this by advancing the Ecological Footprint in collaboration with more than 100 partner organizations that comprise the network. It coordinates research, develops methodological standards, and provides decision makers with extensive resource accounts to help the human economy operate within the Earth's ecological limits. At the heart of this effort are the National Footprint

Accounts, which provide a detailed accounting of ecological resource demand and supply for all nations with populations over 1 million. Results of the 2008 Edition of the Accounts are summarized in this report, and some of their implications are explored.

Global Footprint Network and its partners alone cannot bring about the shift to a sustainable economy. All the key stakeholders—especially nations, international agencies, regions and companies—need to engage, for it is they who are at ever-increasing risk if they cannot monitor their ecological performance. One thing is clear: As natural capital becomes scarcer than financial capital, good governance will depend on resource accounts such as the Ecological Footprint as much as it depends on Gross Domestic Product (GDP) and other financial accounts.

In an increasingly resource-constrained world, it is a government's fiduciary responsibility to know how much ecological capacity it has and how much it is using. Global Footprint Network, therefore, is working to have national governments institutionalize the Ecological Footprint metric, and use it as an indicator for planning and policy decisions in parallel with financial indicators such as GDP. While this effort focuses on nations, the goal will not be achievable without active participation by the business sector, civil society and academic institutions. Therefore, the Network is working with these entities as well.

Use of the Footprint by National Governments

As an initial step in working with a national government, Global Footprint Network invites the nation to collaboratively review the underlying data in its National Footprint Accounts for accuracy and completeness. This due diligence helps ensure that the Footprint results for that country are valid and reliable, and also increases the reliability and robustness of the Footprint methodology for all nations. The verified national results can then be put to use by the government for a wide variety of purposes, including to:

- Create an enhanced understanding of the country's Ecological Footprint and biocapacity. Specifically, this can:
  - Identify resource constraints and dependencies;
  - Recognize resource opportunities (e.g. forests).
- Explore policy creation to:
  - Protect national interests and leverage existing opportunities;
  - Bring the economy in line with global limits, including planning for a low-carbon future;
  - Further innovation that maintains or improves quality of life while reducing dependence on ecological capacity.
- Leverage trade opportunities to:
  - Create a strong trade position for exports by better understanding who has ecological reserves and who does not;
  - Minimize and prioritize external resource needs.
- Create a baseline for setting goals and monitoring progress toward lasting and sustainable economic development. In particular, to guide investment in infrastructure that is both efficient in its use of resources, and resilient if supply disruptions materialize.
- Provide a complementary metric to GDP that can help lead to a new way of gauging human progress and development.

Seizing the Opportunity

All is not gloom and doom. The good news is that with Ecological Footprint accounting, we now know something we did not know before—the extent to which we are overdrawing our ecological accounts, and how far we need to go to rebalance this budget. This information provides a hopeful perspective, suggesting that even working with what we have now, it is well within our ability to secure long-term well-being for all of society. In addition, future-proofing our economies and refocusing our investment efforts can have tremendous payback. Sustainability doesn't simply mean robust ecosystems, it ensures a long-term revenue stream for pioneer investors, those with the foresight to plan and make changes now to prepare for future resource constraints. In fact, if we reverse population trends, fasttrack resource efficiency measures, sufficiently reduce consumption and better manage our ecological assets to increase yields, then demand will no longer exceed supply. If we end overshoot, resource constraints by definition disappear.

This is the message Global Footprint Network is committed to promoting. The Ecological Footprint communicates the challenges of a resource-constrained world. At the same time, it invites people to participate and figure out solutions themselves. Setting collective targets that people and organizations can both understand and invest in has a catalytic effect. Working together, society can pursue its essential self-interests, while ensuring human well-being that is both inclusive and lasting.

Mathis Wackernagel, PhD
Executive Director
Global Footprint Network
Oakland, October 2008

Purpose of this Report

This Atlas summarizes the Ecological Footprint and biocapacity results from the 2008 Edition of the National Footprint Accounts, which are produced by Global Footprint Network on behalf of its partners and others in the world community who wish to use these results. The Accounts now cover 201 countries, including 150 whose populations exceed 1 million. Footprint and biocapacity data for these 150 countries are presented in the tables in Appendix 6. The Atlas explains the purpose behind Ecological Footprint Analysis, the research question it addresses, basic concepts and science underlying the Accounts, and the method used for calculating the results[1]. It also describes ways Ecological Footprint Analysis is currently being applied in a variety of domains.

For the technical reader, the Atlas includes more detailed notes about calculation of the results, explains recent advances to enhance the consistency, reliability and resolution of the National Footprint Accounts, and reviews the evolution of the National Footprint Accounts methodology.

Why We Need Resource Accounting

In recent years, much of the discussion about finite global resources has focused on the depletion of non-renewable resources, such as petroleum. However, it is increasingly evident that renewable resources, and the ecosystem services they provide, are also at great or even greater risk (UNEP 2007, WRI 2007, UNDP 2008, UNEP 2007, World Bank 2000, Millennium Ecosystem Assessment 2005).

Global economies depend on the biosphere for a steady supply of the basic requirements for life: food, energy, fibre, waste sinks, and other life-support services. Any depletion of these services is particularly risky since human demand for them is still growing, which can accelerate the rate at which natural assets are being liquidated. Out of this concern, the sustainability proposition emerges. Sustainability is a simple idea. It is based on the recognition that when resources are consumed faster than they are produced or renewed, the resource is depleted and eventually exhausted, and wastes are no longer sequestered and converted back into resources fast enough to keep them from accumulating in the biosphere.

The elimination of essential renewable resources is fundamentally problematic, as substitution can be expensive or impossible, especially when the problem is global in scale. When humanity's ecological demands in terms of resource consumption and waste absorption exceed what nature can supply, this ecological "overshoot" is a critical threat to society's well-being. Just as constant erosion of business capital weakens an enterprise, ecological overshoot erodes the planet's "natural capital", our ultimate means of livelihood.

The debate over how to make the human enterprise sustainable has accelerated since the widely cited Brundtland Report from the UN World Commission on Environment and Development was released over two decades ago (UN 1987). The Commission defined sustainable development as that which "meets the needs of the present without compromising the ability of future generations to meet their own needs" (UN 1987). This definition recognized that the goal of rewarding lives for all on the planet requires that ecosystems be able to continuously supply the resources and waste absorption services necessary for society to flourish.

For sustainable development to go from concept to action, it needs to become specific and accountable. The "ability of future generations to meet their own needs" cannot be directly measured because we cannot know how many people there will be in future generations, and what their needs will be. But some of the underlying conditions that must be met if this development is to become a reality can be specified. If possibilities for future generations are not to be diminished, the most fundamental condition is that we not erode, but rather protect, our collective ecological wealth.

With natural capital at the foundation of every value chain, tracking the health of ecological assets is critical for sustainable development. Regardless of whether the goal is to maintain existing assets, or to ensure that the loss of one form assets is compensated by another, we need robust natural capital accounts (Dietz and Neumayer 2007). These accounts must be able to assess both human demand on ecological assets, as well as the ability of these assets to meet this demand.

We cannot make meaningful decisions about where we need to go before we know where we stand. Just as national governments currently use GDP as a benchmark to gauge economic performance, natural capital accounts allow governments to gauge their ecological performance. The Ecological Footprint provides such an accounting, allowing a direct comparison of demand on and supply of ecological assets that makes clear when limits have been transgressed.

Ecological Footprint Accounting

The Ecological Footprint is a measure of the demand human activity puts on the biosphere. More precisely, it measures the amount of biologically productive land and water area required to produce all the resources an individual, population, or activity consumes, and to absorb the waste they generate, given

1. For a more complete description of the method, please see *Calculation Methodology for the National Footprint Accounts, 2008 Edition.* Further detail on how the methods are implemented in the 2008 edition of the National Footprint Accounts can be found in the *Guidebook to the National Footprint Accounts 2008.* Both of these publications can be downloaded from http://www.footprintnetwork.org/atlas. Calculation templates for each country are available under license. Free academic licenses of the accounts are available for Hungary and the world. For more information, please contact data@footprintnetwork.org.

prevailing technology and resource management practices. This area can then be compared with biocapacity, the amount of productive area that is available to generate these resources and to absorb the waste. If a land or water area provides more than one of these services it is only counted once, so as not to exaggerate the amount of productive area actually available.

Land and water area is scaled according to its biological productivity. This scaling makes it possible to ecosystems with differing bioproductivity and in different areas of the world in the same unit, a global hectare. A global hectare represents a hectare with world average productivity.

Ecological Footprint accounting is based on six fundamental assumptions (Wackernagel 2002):

- The majority of the resources people or activities consume and the wastes they generate can be tracked.
- Most of these resource and waste flows can be measured in terms of the biologically productive area necessary to maintain them. Resource and waste flows that cannot be measured in terms of biologically productive area are excluded from the assessment, leading to a systematic underestimate of the total demand these flows place on ecosystems.
- By scaling each area in proportion to its bioproductivity, different types of areas can be converted into the common unit of average bioproductivity, the global hectare. This unit is used to express both Footprint and biocapacity.
- Because a global hectare of demand represents a particular use that excludes any other use tracked by the Footprint, and all global hectares in any single year represent the same amount of bioproductivity, they can be summed. Together, they represent the aggregate demand or Ecological Footprint. In the same way, each hectare of productive area can be scaled according to its bioproductivity and then added up to calculate biocapacity.
- As both are expressed in global hectares, human demand (as measured by Ecological Footprint accounts) can be directly compared to global, regional, national or local biocapacity.
- Area demanded can exceed the area available. If demand on a particular ecosystem exceeds that ecosystem's regenerative capacity, the ecological assets are being diminished. For example, people can temporarily demand resources from forests or fisheries faster than they can be renewed, but the consequences are smaller stocks in that ecosystem. When the human demand exceeds available biocapacity, this is referred to as overshoot[2].

Ecological Footprint accounting tracks the regenerative capacity of an ecosystem in terms of historical flows of natural resources. A "flow" corresponds to an amount per time unit, for instance, the number of tonnes of roundwood grown in a given area over a one-year period. A "stock" is the standing balance of resources at any specific time, for instance, the tons of roundwood available for harvest in a hectare of forest at the end of a given year. Ecological Footprint accounts capture flows rather than stocks, and thus do not specify when overshoot will result in the total depletion of accumulated resources in an ecosystem[3].

Humanity is using the regenerative capacity of the Earth each year—the "flow" of resources"—while at the same time eating into the standing stock of resources that has been building over time and accumulating waste in the environment. This process reduces our ability to harvest resources at the same rate in the future and leads to ecological overshoot and possible ecosystem collapse.

History of the Ecological Footprint

The Ecological Footprint concept was created by Mathis Wackernagel and William Rees at the University of British Columbia in the early 1990's (Rees 1992, Wackernagel 1991, Wackernagel 1994, Rees 1996, Wackernagel and Rees 1996). Responding to then-current debates surrounding carrying capacity (e.g., Meadows 1972, Ehrlich 1982, Tiezzi 1984, 1996, Brown and Kane 1994), Ecological Footprint accounting was designed to represent human consumption of biological resources and generation of wastes in terms of appropriated ecosystem area, which could then be compared to the biosphere's productive capacity in a given year. In focusing only on bioproductive area[4] and on resources presently extracted and wastes presently generated, the method provided a focused historical assessment of human demand on the biosphere and the biosphere's ability to meet those specific demands (Wackernagel et al 1999a).

The Footprint has been applied in a wide variety of ways. It can provide a global perspective on the current extent of ecological overshoot, as well as a more localized perspective on city and regional resource issues. Global and national accounts have been reported in headlines worldwide, and over 100 cities or regions have assessed their Ecological Footprint. In the United States,

2. When assessing the Footprint of global, national or other populations, the Footprint of consumption is typically reported. This Footprint reflects the final consumption of all members of that population, regardless of where the goods being consumed were produced. For example, a car produced in Germany but purchased by a resident of Paris is included in France's consumption Footprint. As a consequence, a country's Footprint of consumption can be larger than its own biocapacity, without this necessitating overshoot of local ecosystems. This is the case when the difference results from a net import of ecological services, rather than from liquidating local ecological assets.

3. The Footprint does not capture how much timber is left in the forest (the stock) – only how much is taken compared to how much is renewed (the flow). Future Footprint research will explore how overshoot affects the stock of ecological assets.

4. The Footprint was specifically designed to measure human demand on the environment, rather than that of other species. Bioproductive area was therefore defined anthropocentrically as the land and water (both marine and inland) area that supports significant photosynthetic activity and biomass accumulation that is *used by humans*. Non-productive areas, as well as marginal areas with patchy vegetation were not included when calculating the Footprint or biocapacity. Biomass that is not of use to humans was also not included.

for example, Sonoma County, California's Footprint project "Time to Lighten Up" inspired every city in the county to join the Climate Saver Initiative of the International Council for Local Environmental Initiatives (ICLEI) (Redefining Progress 2002).

At the national level, by 2003 Wales had adopted the Ecological Footprint as its headline indicator for sustainability. The Swiss government has incorporated the Footprint into the nation's sustainable development plan. Japan includes the Footprint as a measure in its Environmental Plan. Among NGOs, WWF International, one of the world's most influential conservation organizations, uses the Ecological Footprint in its communication and policy work for advancing conservation and sustainability. WWF recently established a target of bringing humanity out of overshoot by 2050, and is actively pursuing this goal through its "One Planet" programs.

National Footprint assessments have been completed for many nations, with some nations analyzed multiple times under different methods (Wackernagel and Rees 1996, Bicknell et al. 1998, Fricker 1998, Simpson et al. 2000, van Vuuren and Smeets 2000, Ferng 2001, Haberl et al. 2001, Lenzen and Murray 2001, 2003, McDonald and Patterson 2004, Monfreda et al. 2004, Bagliani et al. 2005, Medved 2006, Venetoulis and Talberth 2007, World Wildlife Fund for Nature, Global Footprint Network, and Zoological Society of London 2006). Since UN agencies collect and publish national data sets and advance the standardization of such reporting across the world, and these data sets form the basis of the National Footprint Accounts, country-level calculations are more directly comparable than assessments at other scales. For instance, only national-level statistics systematically document production, imports, and export. Therefore, the national Ecological Footprint results serve as the basis of all other Footprint analyses[5].

With a growing number of government agencies, organizations and communities adopting the Ecological Footprint as a core indicator of sustainable resource use, and the number of Ecological Footprint practitioners around the world increasing, different approaches to conducting Footprint studies could lead to fragmentation and divergence of the methodology. This would reduce the ability of the Footprint to produce consistent and comparable results across applications, and could generate confusion.

The value of the Footprint as a sustainability metric depends not only on the scientific integrity of the methodology, but also on consistent application of this methodology across analyses. It also depends on results of analyses being communicated in a manner that does not distort or misrepresent findings.

To address these needs, Global Footprint Network initiated a consensus, committee-based process for ongoing scientific review of the methodology, and for the development of standards governing Footprint applications.

The National Accounts Committee supports continual improvement of the scientific basis of the National Footprint Accounts, which provide conversion factors that translate quantities of resources used into the bioproductive land or sea area required to generate these resources. These conversion factors serve as the reference data for Footprint applications at all scales. Research contributions to further improve the Accounts are solicited from the global community of Footprint researchers (Kitzes et al. 2007a).

The Standards Committee, comprised of representatives from Global Footprint Network partner organizations, issued the first Ecological Footprint Standards in 2006. These focus on issues that include the use of source data, derivation of conversion factors, establishment of study boundaries, and communication of findings. A key requirement of these standards is that analyses be consistent with the Footprint and biocapacity data, components and conversion factors found in the National Footprint Accounts. While the first version of the standards focused on the Footprint of populations, the next version will be expanded to address organizational Footprints, as well as the Footprint of products, processes and services.

Current Methodology: 2008 Edition, National Footprint Accounts

The National Footprint Accounts track nations' use of ecological services and resources as well as the biocapacity available in each nation. As with any accounts, they are static, quantitative descriptions of outcomes, for any given year in the past for which data exist. The details of the most updated accounting method, the 2008 Edition, are described in *Calculation Methodology for the National Footprint Accounts, 2008 Edition* (Ewing et al. 2008). The actual implementation of the National Footprint Accounts through database-supported templates is described in the *Guidebook to the National Footprint Accounts 2008* (Kitzes et al. 2008).

The National Footprint Accounts aim to:

- Provide a scientifically robust and transparent calculation of the demands placed by different nations on the regenerative capacity of the biosphere;
- Build a reliable and consistent method that allows for international comparisons of nations' demands on global regenerative capacity;
- Produce information in a format that is useful for developing policies and strategies for living within biophysical limits; and

5. The National Accounts are also used directly for communication and policy purposes (e.g., WWF 2006, von Stokar et al. 2006), and data extracted from these accounts often serve as a starting point for smaller-scale analyses (e.g., Chambers et al. 2000, Lewan and Simmons 2001, Wiedmann et al. 2006b).

- Generate a core dataset that can be used as the basis of sub-national Ecological Footprint analyses, such as those for provinces, states, businesses, or products.

The 2008 Edition of the National Footprint Accounts calculates the Ecological Footprint and biocapacity for 201 countries, from 1961 to 2005. Of these 201 countries, 150 had populations over 1 million in 2005, and were covered consistently by the UN statistical system. Data for the latter countries are included in this report.

Ecological Footprint Assessment

The 2008 Edition of the National Footprint Accounts tracks human demand for ecological services in terms of six major land-use types. Each is described in detail below. With the exception of built-up land and forest for carbon sequestration, the Ecological Footprint of each major land-use type is calculated by summing the contributions of a variety of specific products. Forest for carbon sequestration represents the waste absorption capacity; built-up land reflects the bioproductivity compromised by urban land and roads.

Consumers use resources from all over the world. The Ecological Footprint calculates the combined demand for ecological resources wherever they are located and presents them as the global average area needed to support a specific human activity. This quantity is expressed in units of global hectares, defined as hectares of bioproductive area with world average bioproductivity. By expressing all results in a common unit, biocapacity and Footprints can be directly compared against each other and across the world.

Demand for resource production and waste assimilation are translated into global hectares by dividing the total amount of a resource consumed by the yield per hectare, or dividing the waste emitted by the absorptive capacity per hectare. Yields are calculated based on various international statistics, primarily those from the United Nations Food and Agriculture Organization (FAO ResourceSTAT Statistical Databases). Yields are mutually exclusive: If two crops are grown at the same time on the same hectare, one portion of the hectare is assigned to one crop, and the remainder to the other. This avoids double counting. This follows the same logic as measuring the size of a farm: Each hectare is only counted once, even though it might provide multiple services.

The Ecological Footprint is calculated by the following equation:

Ecological Footprint = annual demand / annual yield

Yield is expressed in global hectares. The way global hectares are calculated is explained in more detail below after the various area types are introduced. But in essence, global hectares are estimated with the help of two factors: the yield factors (that compare national average yield per hectare to world average yield in the same land category) and the equivalence factors (which capture the relative productivity among the various land and sea area types).

Therefore, the formula of the Ecological Footprint of any consumption activity becomes:

Ecological Footprint = (annual demand in tonnes / national yield in annual tonnes per ha) x Yield Factor x Equivalence Factor

Annual demand for manufactured or derivative products (e.g. flour or wood pulp), is converted into primary product equivalents (e.g. wheat or roundwood) through the use of extraction rates. These quantities of primary product equivalents are then translated into an Ecological Footprint. The Ecological Footprint also embodies the energy required for the manufacturing process.

Consumption Footprint, Production Footprint and Trade

The National Footprint Accounts calculate the Footprint of a population from a number of perspectives. Most commonly reported is the Ecological Footprint of consumption of a population, typically just called the Footprint of a population. The consumption Footprint of a country measures the biocapacity demanded by the final consumption of all the residents of the nation. This includes their household consumption as well as their collective consumption, such as schools, roads, fire brigades, etc., which serve the household, but may not be directly paid for by the households.

In contrast, a nation's primary production Footprint is the sum of the Footprints for all resources harvested and all waste generated within the nation's geographical borders. This includes all the area within a country necessary for supporting the actual harvest of primary products (cropland, pasture land, forestland and fishing grounds), the country's built-up area (roads, factories, cities), and the area needed to absorb all fossil fuel carbon emissions generated within the country.

The difference between the production and the consumption Footprint is trade.

Ecological Footprint of consumption = Ecological Footprint of Production + Ecological Footprint of Imports – Ecological Footprint of Exports

In order to estimate the Footprint of imports and exports, one needs to know both the amounts traded as well as the embodied resources (including energy – and associated CO_2 emissions) in all the categories. The embodied Footprint is measured as the number of global hectares required to make a tonne per year of a given product. The Footprint intensity of any primary product is by definition the same anywhere in the world since it is expressed in global hectares. However, the embodied Footprint of secondary products will depend on transformation efficiencies ("extraction rates"), and these vary between countries.

The 2008 Edition of the National Footprint Accounts tracks the embodied Ecological Footprint of over 700 categories of traded agricultural, forest, livestock and fish products. The embodied energy in more than 600 categories of products is used with trade flows from the United Nation's COMTRADE database (UN Commodity Trade Statistics Database 2007)[6] to generate estimates of the embodied carbon Footprint in traded goods.

Throughout the 2008 Edition of the National Footprint Accounts, the embodied Footprint of trade is calculated assuming world average Footprint intensities for all products. Using world-average efficiencies for all traded goods in the 2008 Edition results in an overestimate of the export Footprint for countries with higher-than-average production efficiency. In turn, it underestimates that country's consumption Footprint. For countries with below-average transformation efficiencies for secondary products, the opposite is true: An underestimate of the embodied Footprint in exports yields an exaggerated consumption Footprint.

Biocapacity Assessment

A national biocapacity calculation starts with the total amount of bioproductive land available. "Bioproductive" refers to land and water that supports significant photosynthetic activity and accumulation of biomass, ignoring barren areas of low, dispersed productivity. This is not to say that areas such as the Sahara Desert, Antarctica, or Alpine mountaintops do not support life; their production is simply too widespread to be directly harvestable by humans. Biocapacity is an aggregated measure of the amount of land available, weighted by the productivity of that land. It represents the ability of the biosphere to produce crops, livestock (pasture), timber products (forest) and fish, as well as to sequester waste such as CO_2. It also includes how much of this regenerative capacity is occupied by infrastructure (built-up land). In short, it measures the ability of available terrestrial and aquatic areas to provide ecological services.

Biocapacity is measured in terms of the surface area of each area type, expressed in global hectares. In other words, the areas are adjusted for their productivity. This is done using the two aforementioned factors:

Biocapacity = Area x Yield Factor x Equivalence Factor

How yield and equivalence factors are calculated is described in the section at the end of this chapter.

Area types of the National Footprint Accounts

The National Footprint Accounts include six main land use types: copland, grazing land, fishing ground, forests for timber fuelwood, forests for carbon uptake) and built-up land. For all land use types there is a demand on the area, as well as a supply of such an area.

6. How this is done is explained in detail in *Calculation Methodology for the National Footprint Accounts, 2008 Edition*, and only in a more cursory way here.

In 2005, the area of biologically productive land and water on Earth was approximately 13.4 billion hectares. World biocapacity is also 13.4 billion global hectares, since the total number of average hectares equals the total number of actual hectares. But the relative area of each land type expressed in global hectares differs from the distribution in actual hectares as shown in Figure 1.

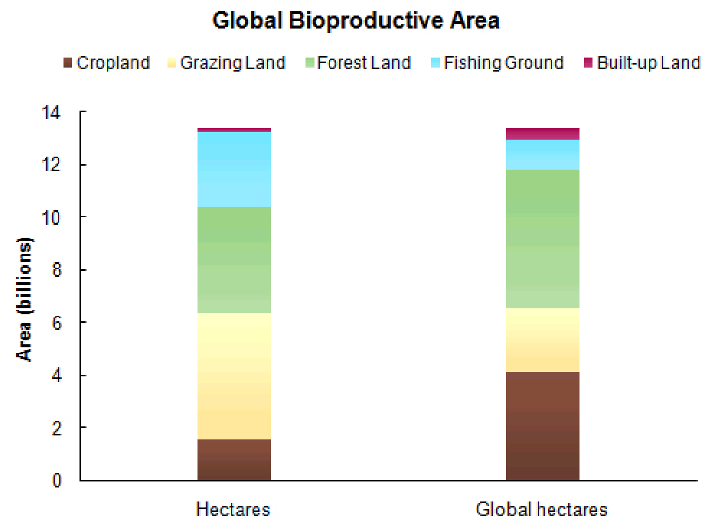


Figure 1. Relative area of land types worldwide in hectares and global hectares, 2005.

In 2005, the world had 4.1 billion global hectares of cropland biocapacity as compared to 1.6 billion hectares of cropland area (Figure 1). This difference is due to the relatively high productivity of cropland compared to other land types. This is not surprising since agriculture typically uses the most suitable and productive land areas, unless they have been urbanized. Thus, cropland affords more biologically productive services to humans than the same physical area of other land types.

Cropland

Cropland is the most bioproductive of all the land types and consists of areas used to produce food and fibre for human consumption, feed for livestock, oil crops and rubber. Worldwide in 2005 there were 1.5 billion hectares designated as cropland (FAO ResourceSTAT Statistical Database 2007); the National Footprint Accounts calculate the Footprint of cropland according to the production quantities of 195 different crop categories. Cropland Footprint calculations do not take into account the extent to which farming techniques or unsustainable agricultural practices cause long-term degradation of agricultural land or soil.

Grazing land

Globally in 2005, there were 4.8 billion hectares of land classified as grazing land or other wooded land, defined as areas that contain a low overall percentage of canopy cover, scattered trees and shrubs (FAO ResourceSTAT Statistical Database 2007). Grazing land is used to raise livestock for meat, dairy, hide and wool products. The grazing Footprint is calculated by comparing the amount of livestock feed available in a nation with the amount of feed required for the livestock produced in that year, with the remainder of feed demand assumed to come from grazing land. Since the yield of grazing land represents the amount of above-ground primary production available in a year, overshoot is not physically possible over extended periods of time for this land type. For this reason, a country's grazing Footprint of production, in the 2008 Edition of the National Footprint Accounts, is not allowed to exceed its biocapacity. The calculation of the grazing Footprint in the 2008 Edition was significantly improved over that in the 2006 Edition with the help of the Social Ecology Institute of University of Klagenfurt in Vienna. Please see Appendix A for details.

Forest for timber and fuelwood

The forest Footprint is calculated based on the amount of lumber, pulp, timber products and fuelwood consumed by a nation on a yearly basis. FAO ResourceSTAT places the total area of world forests at 3.95 billion hectares (FAO ResourceSTAT Statistical Database 2007). Estimates of timber productivity are derived from the UNEC and FAO "Forest Resource Assessment," the FAO "Global Fiber Supply" and the Intergovernmental Panel on Climate Change (UNEC, 2000, FAO 2000, FAO 1998, IPCC 2006), and give a world average yield of 2.36 m^3 of harvestable wood per hectare per year. These sources also provide information on plantation type, coverage, timber yield, and areas of protected and economically inaccessible forest.

Fishing ground

The fishing ground Footprint is calculated using estimates of the maximum sustainable catch for a variety of fish species (Gulland 1971). These sustainable catch estimates are converted into an equivalent mass of primary production based on the various species' trophic levels. This estimate of maximum harvestable primary production is then divided amongst the continental shelf areas of the world. Globally, there were 2.4 billion hectares of continental shelf and 430 million hectares of inland water areas in 2005 (World Resources Institute and FAO ResourceSTAT Statistical Database 2007). The fishing grounds Footprint is calculated based on the estimated primary production required to support the fish caught. This primary production requirement (PPR) is calculated from the average trophic level of the species in question. Fish that feed higher on the food chain (at higher trophic levels) require more primary production input and as such are associated with a higher Footprint of consumption. The 2008 Edition of the National Footprint Accounts includes primary production requirement estimates for more than 1,300 different marine species and more than 200 freshwater species.

Built-up land

The built-up land Footprint is calculated based on the area of land covered by human infrastructure — transportation, housing, industrial structures and reservoirs for hydropower. Built-up land occupied 165 million hectares of land worldwide in 2005, according to rough resolution satellite imaging and research data sets (FAO 2005 and IIASA Global Agro-Ecological Zones 2000). The 2008 Edition of the National Footprint Accounts follows the 2006 Edition in assuming that built-up land occupies what would previously have been cropland. This assumption is based on the theory that human settlements are generally situated in highly fertile areas. For lack of data on the types of land inundated, all hydroelectric dams are assumed to flood land with global average productivity.

Forest for carbon sequestration

CO_2 emissions, primarily from burning fossil fuels, are the only waste product included in the 2008 Edition of the National Footprint Accounts. On the demand side, the carbon Footprint is calculated as the amount of forest land required to absorb given carbon emissions. It is the largest portion of humanity's current Footprint – in some countries though, it is a minor contribution to their overall Footprint.

The first step in calculating the carbon Footprint is to sum the atmospheric emissions of CO_2 from burning fossil fuels, land-use change (deforestation, for example), and emissions from the international transport of passengers and freight. This total is the amount of anthropogenic emissions of CO_2 into the global atmosphere in a given year. Second, after subtracting the amount of CO_2 sequestered in the world's oceans each year from the anthropogenic total, the remaining CO_2 is translated into the amount of bioproductive forest that would be needed to store it that year. Since timber harvest leads to a release of the stocked carbon, using forest land for carbon sequestration and using it for timber or fuel-wood provision are considered to be mutually exclusive activities (see forest area for timber and fuelwood).

Normalizing Bioproductive Areas – From Hectares to Global Hectares

Ecological Footprint results are expressed in a single measurement unit, the global hectare. To achieve this, Ecological Footprint accounting scales different types of areas to account for productivity differences among land and sea area types. Equivalence factors and yield factors are used to convert actual areas of different land types (in hectares) into their global hectare equivalents. Equivalence and yield factors are applied to both Footprint and biocapacity calculations.

Yield factors account for differences in productivity of a given land type between a nation and the global average in this area type. A hectare of pasture in New Zealand, for example, produces more grass on average than a world average pasture hectare. Inversely, a hectare of pasture in Jordan produces less. Hence, the New Zealand hectare is potentially capable of supporting more meat production than the global average hectare of pasture. These differences are driven by natural factors, such as precipitation or soil quality, as well as by management practices. To account for these differences, the yield factor compares the production of a specific land type in a nation to a world average hectare of the same land type. Each country and each year has its own set of yield factors. For example, Table 1 shows that New Zealand's pastures are on average 2.5 times as productive as world average pastures. The yield factor for built-up land is assumed to be the same as that for cropland since urban areas are typically built on or near the most productive agricultural lands.

	Cropland	Forest	Grazing Land	Fishing Ground
World average yield	1.0	1.0	1.0	1.0
Algeria	0.6	0.9	0.7	0.9
Guatemala	0.9	0.8	2.9	1.1
Hungary	1.5	2.1	1.9	0.0
Japan	1.7	1.1	2.2	0.8
Jordan	1.1	0.2	0.4	0.7
New Zealand	2.0	0.8	2.5	1.0
Zambia	0.5	0.2	1.5	0.0

Table 1: Sample Yield Factors for Selected Countries, 2005.

Equivalence factors translate a specific area type (i.e. world average cropland, pasture, forest, fishing ground) into a universal unit of biologically productive area, a global hectare. In 2005, for example, cropland had an equivalence factor of 2.64 (Table 2), indicating that world-average cropland productivity was more than double the average productivity for all land combined. This same year, pasture had an equivalence factor of 0.50, showing that pasture was, on average, half as productive as the world-average bioproductive hectare. The equivalence factor for built-up land is set equal to that for cropland. Equivalence factors are calculated for every year, and are identical for every country in a given year.

Area Type	Equivalence Factor (gha/ha)
Primary Cropland	2.64
Forest	1.33
Grazing Land	0.50
Marine	0.40
Inland Water	0.40
Built-up Land	2.64

Table 2: Equivalence Factors, 2005.

Account Templates and Guidebook

The *Guidebook to the National Footprint Accounts: 2008 Edition* provides a detailed description of the 2008 Edition of the National Footprint Accounts[7]. The National Footprint Accounts for each country and year are contained in a Microsoft Excel workbook with 70 separate worksheets that interact and together make up the model. They are also powered by underlying databases that provide the input for the calculation templates.

The Guidebook is written for the intermediate to advanced National Footprint Accounts user interested in extracting data from the 2008 Edition or in understanding, in detail, both the methodology and accounting underlying the model.

The 2008 Edition of the National Footprint Accounts for each country and year from 1961 to 2005 are available under license. Free academic licenses of the accounts cover Hungary and the world. Also available are special research licenses which permit modification of the accounts. For details, visit http://www.footprintnetwork.org/en/index.php/GFN/page/licenses/ or contact data@footprintnetwork.org.

What information is in the Guidebook?

The *Guidebook for the National Footprint Accounts: 2008 Edition* contains explanations of each of the 70 worksheets, detailing the format of the sheet, how calculations are performed within the sheet, and how it interacts with the other worksheets in the model. The 70 worksheets are grouped by component (forest, carbon, cropland, grazing land, built-up land, and fishing ground). Each component then is broken into subcomponents along a four-layer hierarchy linking the calculation back to the primary input data. Figure 2 shows the set-up of the Guidebook and how it structures the description for each worksheet. Table 3 is an example of the references for each component of the Ecological Footprint, in this case the carbon Footprint, and the worksheet in the 2008 Edition of the National Footprint Accounts that information is drawn from.

7. The Guidebook is freely downloadable at www.footprintnetwork.org/atlas.

Worksheet Name: This is the name of the worksheet, which is found in the tabs at the bottom of the National Footprint Accounts template.

Level: This describes how the worksheet fits into the 5-level hierarchy used to describe interactions between worksheets. Level 1 is the highest-order worksheet, containing a summary of all Footprint and biocapacity components, while Level 5 worksheets generally contain source data.

5.2.1 Ef_crop

Level 2 (Only cropland worksheet at this level)

Ef_crop summarizes the cropland Footprints of Production, Import, Export, and Consumption.

Layout: This worksheet begins with one identifying column. The 'Name' column reports the names of the considered groups of products summarized in this worksheet: 'crop products,' 'cropland in livestock,' and 'unharvested cropland.' This identifying column is followed by four columns that report the Footprints of Production ('EF_P'), Imports ('EF_I'), Exports ('EF_E'), and Consumption ('EF_C') for each products' group.

Data and Calculation: For the 'crop products' group, the 'EF_P', 'EF_I', and 'EF_E' columns report values directly from the Level 3 worksheets, *crop_efp*, *crop_efi*, and *crop_efe*, respectively. For the 'cropland in livestock' group, two grazing land-related Level 3 worksheets, *livestock_efi* and *livestock_efe*, are used as value sources for the 'EF_I', and 'EF_E' columns. These worksheets are used to estimate the amount of cropland embodied in traded livestock. For the 'unharvested cropland' group, the 'EF_P' column reports values to adjust for the land locally left fallow. Finally, for each group, the 'EF_C' column is calculated using the **Equation 2_1**.

The final row in the *ef_crop* table totals the Footprints of Production, Imports, Exports, and Consumption to obtain total Footprints for the crop land use type. The total Footprint of Production for the 'crop products' group is calculated by summing only the Footprint of Production of primary products to avoid double counting. The total Footprint of Consumption is calculated by applying Equation 2_1 to the total EFP, EFI, and EFE.

Refers to: *crop_efp* (L3), *crop_efi* (L3), *crop_efe* (L3), *livestock_efi* (L3), *livestock_efe* (L3), *crop_unharv_efp* (L3)

Referenced by: *summary* (L1)

Summary: This summarizes what information the worksheet contains.

Layout: This section describes how the worksheet is laid out and what the different column headings mean.

Data and Calculation: This section describes what information the worksheet draws from other worksheets. It also describes calculations performed within the worksheet. For worksheets with raw data, this section also describes how this information is used in other worksheets.

Equations: In the calculation sections, equations are often referenced. These equations are fully explained elsewhere in the Guidebook.

References: These show how the worksheet is connected to other worksheets in the National Footprint Accounts. Levels shown in parenthesis.

Figure 2. Example template from the Guidebook for the National Footprint Accounts: 2008.

Data	Worksheet Referenced	Data Source
Emissions from fossil fuels, by nation and economic sector	iea_fossil_n	IEA CO2 Emissions from Fuel Combustion Database. 2007. http://wds.iea.org/wds/ (accessed October 2008).
Emissions from fossil fuels, by nation	cdiac_fossil_n	Marland, G., T.A. Boden, and R. J. Andres. 2007. Global, Regional, and National Fossil Fuel CO2 Emissions. In Trends: A Compendium of Data on Global Change. Oak Ridge, TN: Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory and U.S. Department of Energy.
International trade quantities by commodity	comtrade_n	UN Commodity Trade Statistics Database. http://comtrade.un.org/ (accessed January 2007).
Embodied energy of commodities	fossil_efi, fossil_efe	PRé Consultants Ecoinvent Database, version 7.1. http://www.pre.nl/ecoinvent/default.htm (accessed May 2008).
Carbon sequestration factor	cnst_carbon	IPCC. 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4: Agriculture Forestry and Other Land Use. http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html (accessed September 2008).
Ocean sequestration	cnst_carbon	IPCC. 2001. Climate Change 2001: The Scientific Basis. Cambridge, UK: Cambridge University Press, 2001.
World heat and electricity carbon intensity	cnst_carbon	IEA CO2 Emissions from Fuel Combustion Database. 2007. http://wds.iea.org/wds/ (accessed October 2008).

Table 3. Example of table with sources from Guidebook for the National Footprint Accounts: 2008

Limitations of the Ecological Footprint Method

The Ecological Footprint is designed to answer a specific research question: How much of the biosphere's regenerative capacity is occupied by human activities? The method is limited in three ways: Some aspects of sustainability are excluded from its scope; some aspects of demand are hard to quantify; and like any method, errors can occur in the implementation.

The Ecological Footprint Standards[8] require that Footprint studies specify the limitations of the assessment. In particular, the Standards emphasize that the Footprint is not a complete indicator of sustainability, and needs to be complemented by other measures.

What the Footprint Does Not *Measure*

- *Non-ecological aspects of sustainability.* The Footprint is, by design, not a complete sustainability measure. A single metric that includes all aspects of sustainability, even if possible, would produce results that would have little utilitarian value. Having a Footprint smaller than global biocapacity is a necessary minimum condition for humanity's sustainability, but is not sufficient. For instance, social well-being also needs to be tracked, but this is not measured by the Footprint. The Ecological Footprint also makes no attempt to evaluate the long-term viability of social structures, economies, or political systems. Neither does it identify the drivers – it simply documents one particular ecological outcome: the demand on nature resulting from human activities that occurred at a given time.
- *Depletion of non-renewable resources.* The Footprint does not track the amount or the depletion of non-renewable resource stocks, such as oil, natural gas, coal or metal deposits. It focuses on regenerative capacity as the limiting factor, and captures the use of fossil fuels and minerals in as far as this makes a demand on the biosphere's regenerative capacity.
- *Inherently unsustainable activities.* Activities that are inherently unsustainable, such as the release of heavy metals, radioactive materials and persistent synthetic compounds (chlordane, PCBs, CFCs, PVCs, dioxins, etc.), do not enter into Footprint calculations. Nature does not have any significant capacity to break down and process these compounds, so the recycling of these materials cannot be

8. The Ecological Footprint Standards are freely downloadable at http://www.footprintnetwork.org/en/index.php/GFN/page/application_standards.

associated with ecological services or a land area. Because the biosphere cannot assimilate any of these materials within human timescales, integration of these factors into Footprint calculations would result in infinitely large, and therefore meaningless, values.

- *Ecological degradation.* The Footprint does not directly measure ecological degradation, such as increased soil salinity from irrigation, that could affect future productivity. However, if degradation leads to reductions in biological productivity, this loss is captured in future biocapacity accounts. The Footprint is not predictive in this sense, but documents effects as they occur. This avoids making Footprint assessments speculative.
- *Resilience of ecosystems.* Ecosystems have the capacity to tolerate some disturbance without collapsing. Excessive disturbance, leading to collapse, does not mean extermination of life, but rather a shift of the ecosystem into a qualitatively different state, with a new species composition.[9]

What the Footprint does not measure well

- *Waste flows.* For many waste flows, inadequate data sets exist for Footprint calculations. For example, SOx emissions from fossil fuel-based power plants contribute to the acidification of rainwater, which has detrimental effects on forests, fish and wildlife. However, at this time, globally comparable data on the relationship between SOx concentration and biocapacity are lacking. Acid rain does not yet enter into Footprint calculations, but may in the future if better data become available.
- *Freshwater use.* Freshwater use is only indirectly included in the Footprint due to lack of data that link freshwater use with loss in bioproductivity. Some local Footprint assessments have included freshwater use, but national assessments do not yet do so. Freshwater shortages that do result in declining bioproductivity are reflected in biocapacity measurements. Making Ecological Footprint assessments more relevant to freshwater issues is a research task.
- *Nuclear power.* The challenges with nuclear power are poorly captured with the Ecological Footprint, and hence the Footprint is ill-suited to analyze the utility or risk of nuclear power. When analyzing nuclear power one needs to consider wider issues, such as costs, nuclear waste, military proliferation, and operational risks. The 2008 Edition no longer includes nuclear energy at par with fossil fuel.[10]
- *Aspects of demand for which data are sparse.* Most of the underlying data sets used to calculate national Footprints and biocapacities come from the United Nations, namely from the UN Food and Agriculture Organization (UN FAO). These data sets do not include assessments of the uncertainty or reliability of included data. Accordingly, Footprint results must be interpreted with the proviso that they assume the underlying data is correct. When there is doubt about data values, Footprint calculations generally exclude or use lower estimates for demand on nature, and use optimistic biocapacity accounts. This is done to avoid exaggerating ecological deficits. Results, therefore, most likely underestimate the extent of humanity's ecological overshoot.

Potential errors in the implementation of the 2008 Edition

As with any other scientific measurement tool, the results need to be evaluated in terms of reliability and validity. This becomes a more complex task with accounts that aggregate an extensive array of data. This is particularly true for data such as that from the UN FAO, which does not specify confidence limits. Considerable care is taken to minimize any data inaccuracies or calculation errors that might distort the Ecological Footprint accounts, including inviting national governments to collaboratively review the accuracy of the assessment for their country, and develop improvements in the method either specific to their country or that generalize for all countries.[11] In addition, efforts are continually being made to improve the transparency of the National Footprint Accounts, allowing for more effective internal and external quality assurance.

Overall, the accounts are designed to err on the side of over-reporting Biocapacity and under-reporting Ecological Footprints, making it less likely that any errors will significantly undermine the conservative bias of the accounts. Six potential sources of error have been identified:

- Conceptual and methodological errors. These include:
    - *Systematic errors in assessing the overall demand on nature.* Some demands, such as freshwater consumption, soil erosion and toxic release are excluded or incompletely covered in the calculations. This typically leads to underestimates of ecological deficit. One particular issue is that the demand on biocapacity resulting from emission of greenhouse gases other than carbon dioxide is not currently included in Ecological Footprint

9. For more on resilience of social and ecological systems, visit the Resilience Alliance at http://www.resalliance.org. Since the Ecological Footprint does not predict but document past outcomes, it does not say anything about future resilience of ecosystems. If though, there is an ecosystem collapse (and the productivity shift can be measured), this collapse will be tracked by Footprint accounts in terms of the decreasing biocapacity of that ecosystem. If production Footprints are large, or even exceed, local biocapacity, the likelihood of an ecosystem collapse gets higher. However, Footprint accounts cannot determine the timing or kind of collapse the ecosystem will undergo. Therefore, as Deutsch et al. (2000) correctly point out, "when trying to answer questions on how to manage ecosystems in a sustainable way, or how to best distribute the goods and services generated by ecosystems, there are other methods better suited for the task" (Deutsch 2000).

10. For more detail on why nuclear energy is no longer included in Footprint accounts as a separate component, see Appendix A.

11. For more detail, see section on research collaboration in Appendix D.

accounts. Incomplete scientific knowledge about the fate of greenhouse gases other than carbon dioxide makes it difficult to estimate the biocapacity required to neutralize their climate change potential, even though it might be useful to build on greenhouse gas equivalents as a first approximation (Ewing et al. 2008). Further, more research is needed to understand how non-CO_2 greenhouse gases are contributing to each final consumption category.

  - *Allocational errors.* Incomplete or inaccurate trade and tourism data distort the distribution of the global Footprint among producing and consuming nations. This means, for example, that the consumption of a Swedish tourist to Mexico is currently allocated to Mexico rather than Sweden.[12] However, this does not affect the calculation of humanity's overall demand on nature.

- *Structural and data entry errors in the calculation sheets.* Error detecting algorithms, the modular architecture of the calculation sheets, automatic cross-checks, tests for outliers in data time series and other techniques are used to identify and correct these potential errors. Minor errors are more difficult to detect, but also have a lower impact on the accuracy of the accounts.

- *Erroneous assumptions for estimating missing data.* In the carbon trade section of the 2008 Edition of the National Footprint Accounts, less than 10 data points are estimated out of more than 8 million carbon trade data points. Other data points might be missing, but are assumed to have a minor effect on the results. There may be ways to improve consistency checking of the underlying data sets before they are integrated into the templates in future editions of the National Footprint Accounts. UN data sets are currently taken at face value.

- *Data errors in statistical sources for one particular year.* Errors in printed or electronically published data can be spotted by comparison with similar data reported for other years.

- *Systematic misrepresentation of reported data in UN statistics.* Distortions may arise from over-reported production in planned economies, under-reported timber harvests on public land, poorly funded statistical offices, and subsistence, black market, and non-market (or informal) activities. Since most consumption occurs in the affluent regions of the world, these data weaknesses may not distort the global picture significantly.

- *Systematic omission of data in UN statistics.* There are demands on nature that are significant but are not, or are not adequately, documented in UN statistics. Examples include data on the biological impact of water scarcity or pollution, and the impact of waste on bioproductivity. Including these aspects would increase the Footprint size.

Some of the aforementioned distortions generate margins of error on both sides of the data point, but errors leading to an under-reporting of global ecological overshoot almost certainly overshadow the other errors.

With every round of improvement in the accounts and the use of more comprehensive data sets and independent data sources, the consistency and reliability of data can be checked more effectively, and the robustness of the calculations will improve. Overall, Ecological Footprinting and its data sources have improved significantly since 1990, as additional digitized data were added to the accounts and internal cross-checking and data set correspondence checks have been introduced.

There is significant opportunity for methodological improvement. A research paper written by more than a dozen Footprint researchers, including members of the National Accounts Committee, identified open research topics for improving the existing National Footprint Account methods (Kitzes et al. 2007a). A similar research agenda was echoed by a 2008 report commissioned by DG Environment (Best et al. 2008). Many of these suggested improvements address standing criticisms of current methods from both within and outside this group of authors.

Results from the 2008 Edition of the National Footprint Accounts

Overshoot: The Global Context

Natural resource wealth and material consumption are not evenly distributed worldwide. Some countries and regions have a net demand on the planet greater than their own capacity to meet this demand, while others use less than their available capacity. Humanity as a whole, however, is not living within the means of the planet. In 2005, humanity's total Ecological Footprint worldwide was 17.5 billion global hectares (gha); with world population at 6.5 billion people, the average person's Footprint was 2.7 global hectares. But there were only 13.6 billion gha of biocapacity available that year, or 2.1 gha per person. This *overshoot* of almost 30 percent means that in 2005 humanity used the equivalent of 1.3 Earths to support its consumption (Figure 3). It took the Earth approximately a year and four months to regenerate the resources used by humanity in that year.

12. Early research indicates that for the United Kingdom, a popular tourism destination, foreign tourists may account for up to 5 percent of the country's total Footprint (personal communication with John Barrett, SEI).

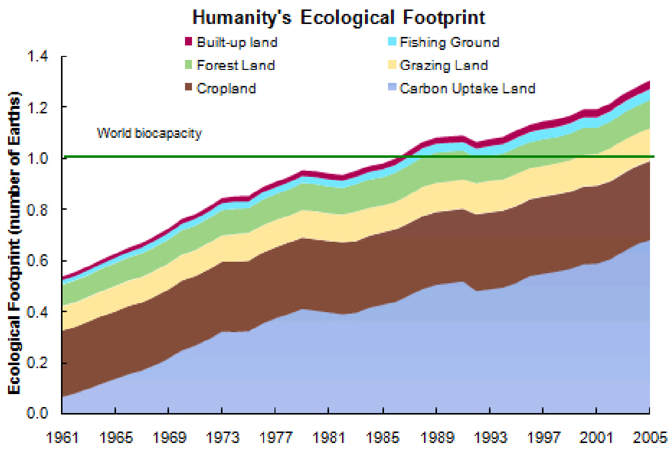


Figure 3. Humanity's Ecological Footprint by component, 1961—2005.

In 1961, the first year for which Footprint accounts are available, humanity's Footprint was about half of what the Earth could supply—it was living off the planet's annual ecological interest, not drawing down its principal. Human demand first exceeded the planet's ability to meet this demand around 1986, and this state of overshoot has characterized every year since.

As these annual deficits accrue into an ever larger ecological debt, ecological reserves are being depleted, and wastes such are carbon dioxide are accumulating in global sinks — the atmosphere and the oceans. The carbon component of the Footprint grew most rapidly over this period, increasing more than tenfold.

It is possible for the global economy to function while in ecological overshoot for a limited period of time, but not forever. Ultimately, ecological stocks will be exhausted and ecosystems will collapse, with possible permanent loss of productivity. At the same time, the accumulation of wastes will impact the health of organisms and alter, perhaps irreversibly, the physiochemical properties of the world on which nature's ability to sustainably provide ecological services depends. Scientists cannot yet say with full certainty when ecological thresholds were or will be passed, but a growing body of evidence, such as the rapid decline in global biodiversity and the warming of the planet, suggests that some of these critical limits have already been exceeded.

Regional and National Footprints

Regions and nations differ greatly in both their demand on biocapacity, and on the biocapacity they have available within their borders. Half of the global Footprint was attributable in 2005 to just 10 nations (Figure 4), with the United States and China alone each using 21 percent of the Earth's biocapacity.

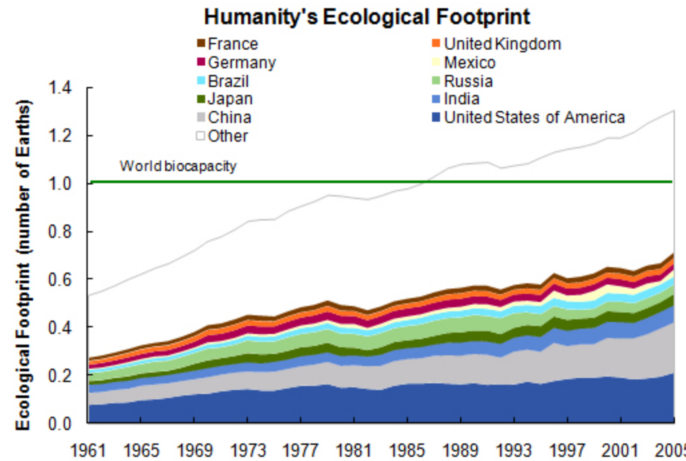


Figure 4. Humanity's Ecological Footprint by nation, 1961—2005.

Many nations use more biocapacity than they have. This comes in part from import of resources, but typically to a greater extent through use of the global commons as a dumping ground for CO_2 emissions. For fossil fuels, the actual area used for extraction, refining and production of power is relatively small compared to the bioproductive area needed to absorb the waste products from burning these fuels. The latter area constitutes the carbon component of the Ecological Footprint.

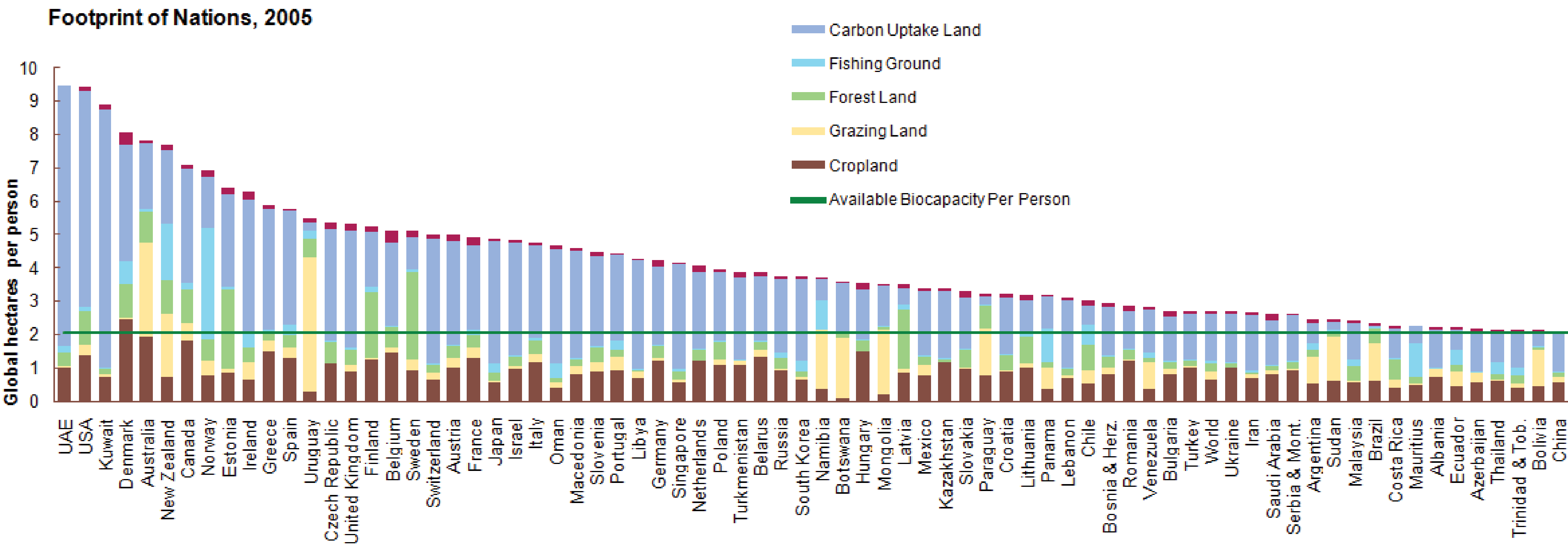


Figure 5. Ecological Footprint by nation, 2005.

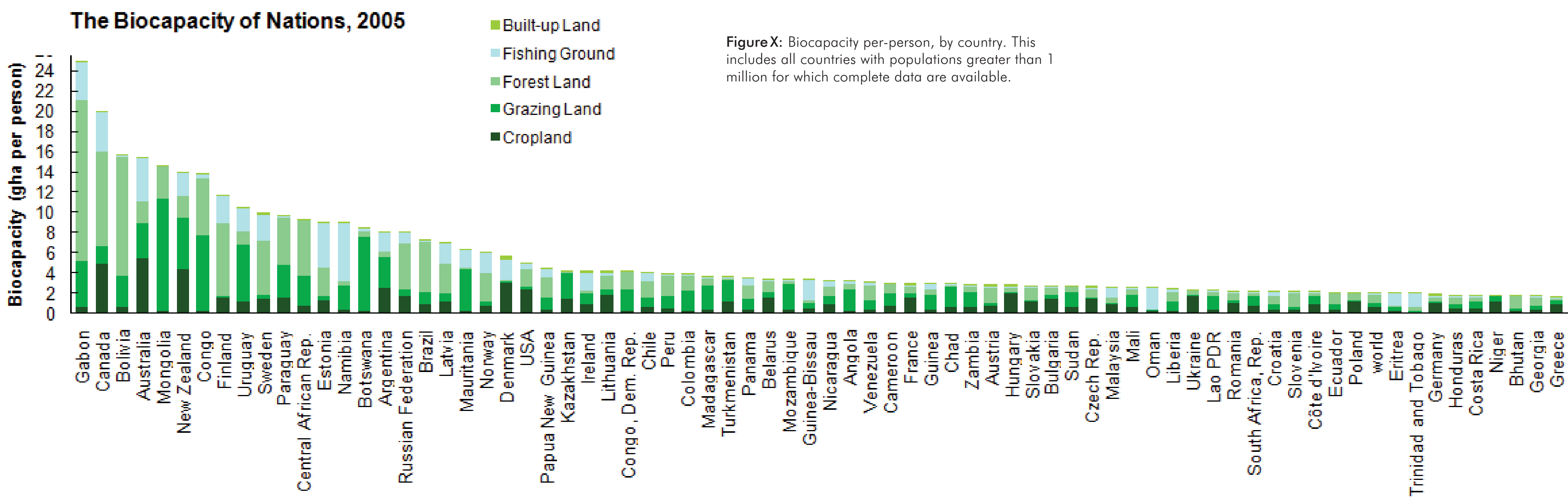
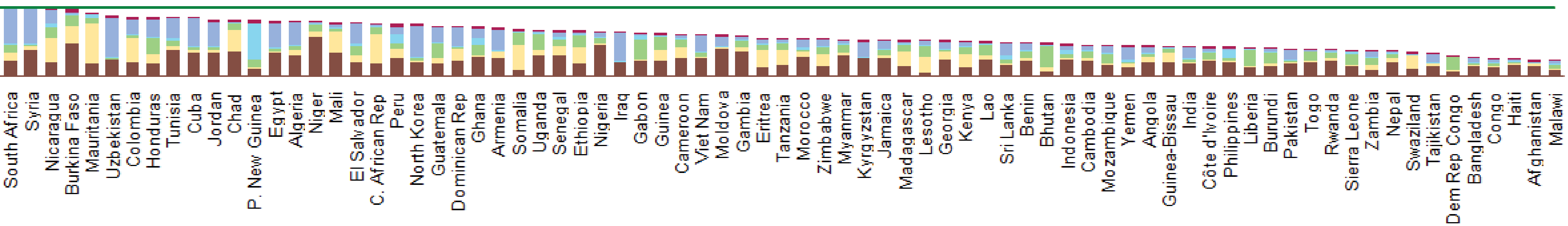
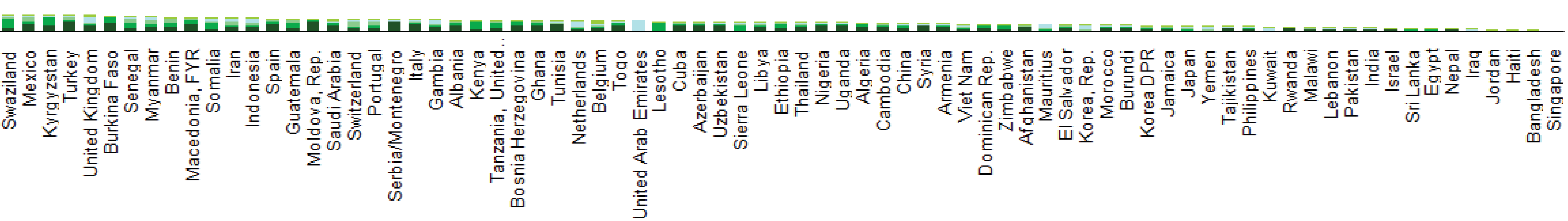


Figure X: Biocapacity per-person, by country. This includes all countries with populations greater than 1 million for which complete data are available.

Figure 6. Biocapacity by nation, 2005.

Figure 5 shows the average per-person consumption Footprint in 2005 for all nations with a population greater than 1 million. Of the 12 nations with the highest per-person Footprints, only Australia, New Zealand, Estonia and Canada had more biocapacity than they were using. Figure 6 shows the average per-person biocapacity for these same nations. While having high per-person biocapacity is not a pre-requisite for a large average Footprint, the converse is also true. Gabon, for example, has the most biocapacity per-person of any nation in the world, while its consumption Footprint per person is less than half the global average.





If everyone in the world lived like an average resident of the United States or the United Arab Emirates, the biocapacity of more than 4.5 Earths would be required to support humanity's consumption rates. If instead the world were to live like the average South Korean, only 1.8 planets would be needed. And if the world lived like the average person in India did in 2005, humanity would be using less than half the planet's biocapacity.

Figure 7 shows both perperson Footprint and population size for seven key regions of the world in 1961 and 2005; Figure 8 shows the same for regional biocapacity. While the Asia-Pacific region had a low average per person Footprint in 2005, it housed more than half of the world's population and thus had the largest total Footprint of all regions. The region's total Footprint was almost twice its biocapacity in that year. The opposite was true for the Latin America and the Caribbean region, whose biocapacity was approximately twice the size of its Footprint. In addition to the Asia-Pacific region, the North America, European Union and the Middle East-Central Asia regions were also ecological debtors, with total Footprints exceeding their biocapacity. This means these regions were relying on the biocapacity of the other areas of the world, in addition to their own, for provision of resources and for waste assimilation.

Figure 10 shows per person biocapacity by country in 1961 and 2005. Over the last 45 years, population growth has been a more significant contributing factor in decreasing per person biocapacity than losses due to mismanagement or gains due to agricultural productivity revolutions. The change in the per person Footprint of countries (Figure 9) was, on average, considerably smaller than the change in per person biocapacity of countries.

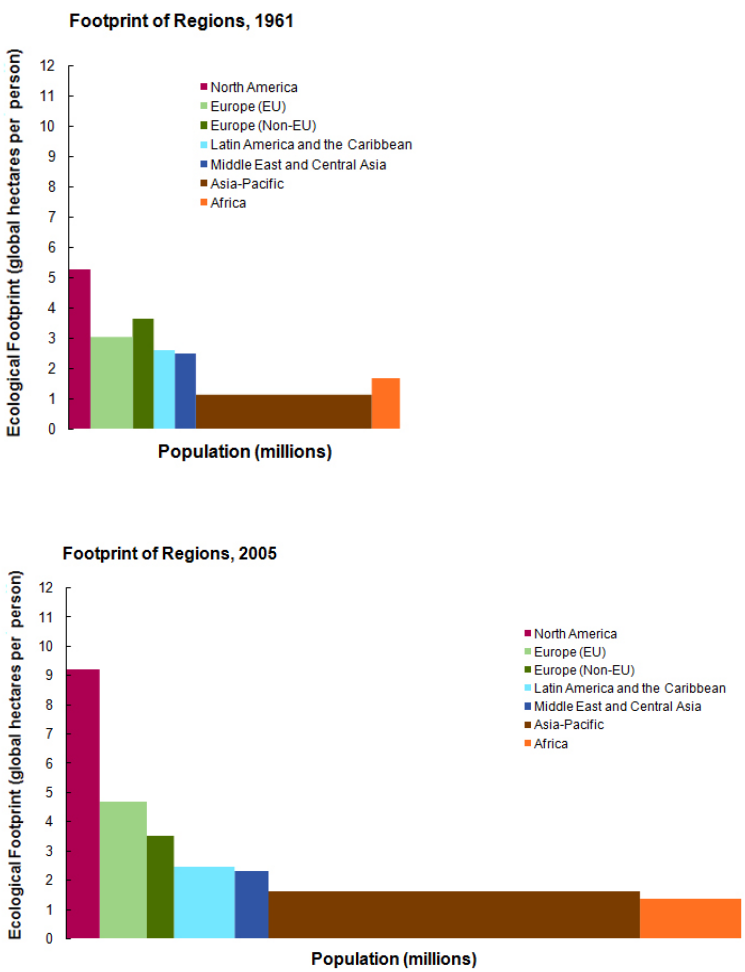


Figure 7. Ecological Footprint by region, 1961 and 2005.

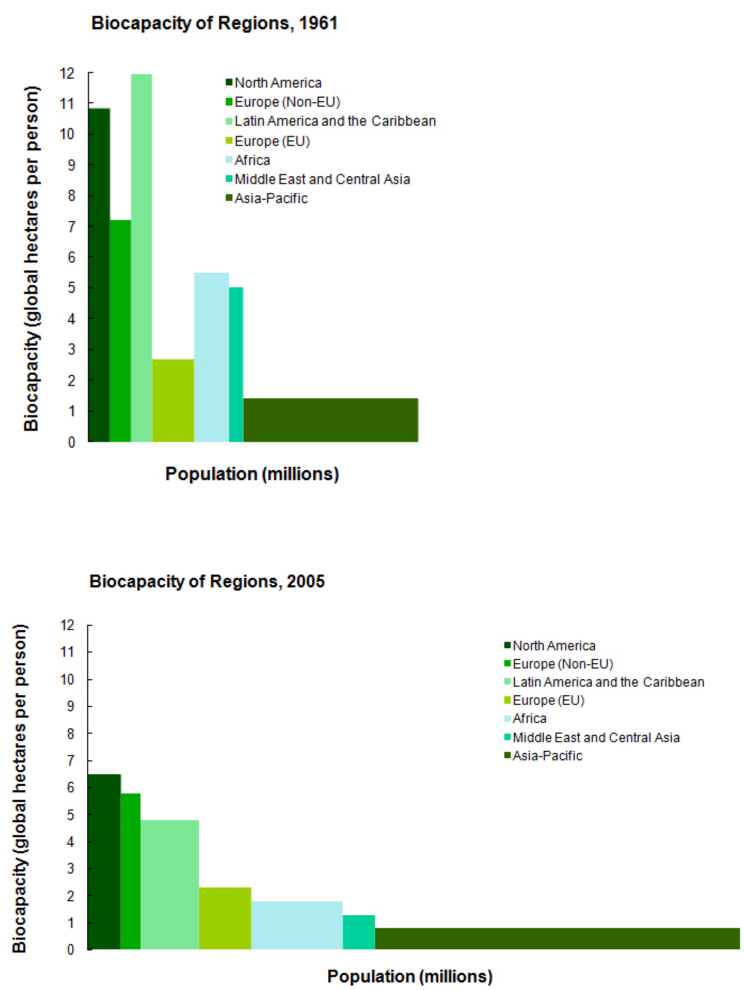
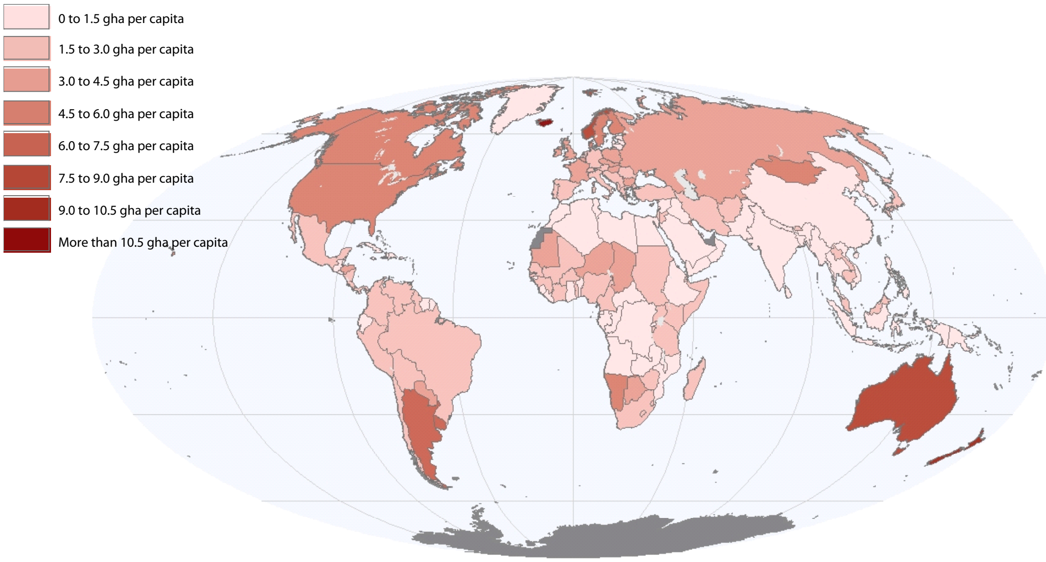
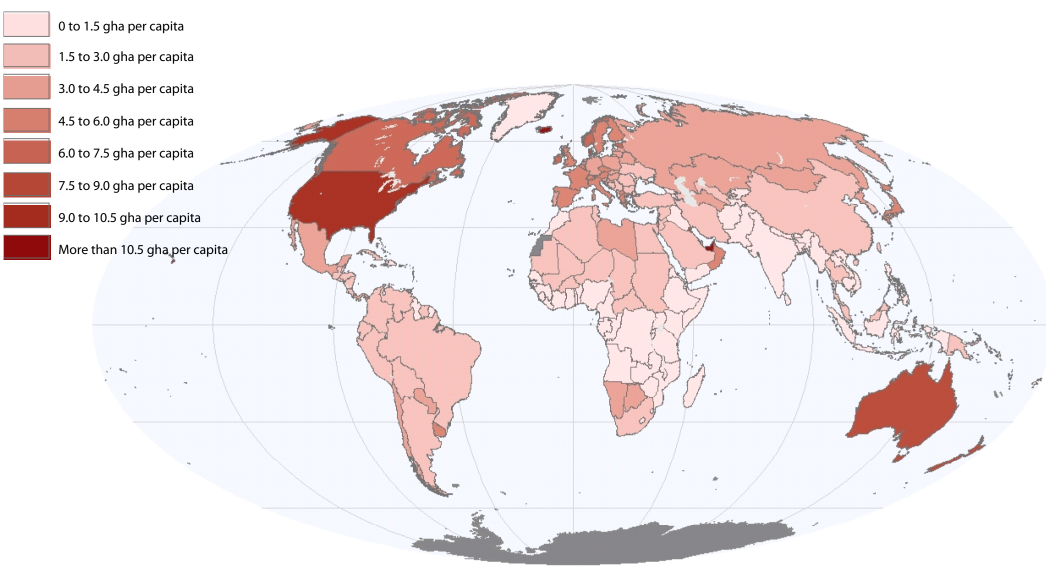


Figure 8. Biocapacity by region, 1961 and 2005.

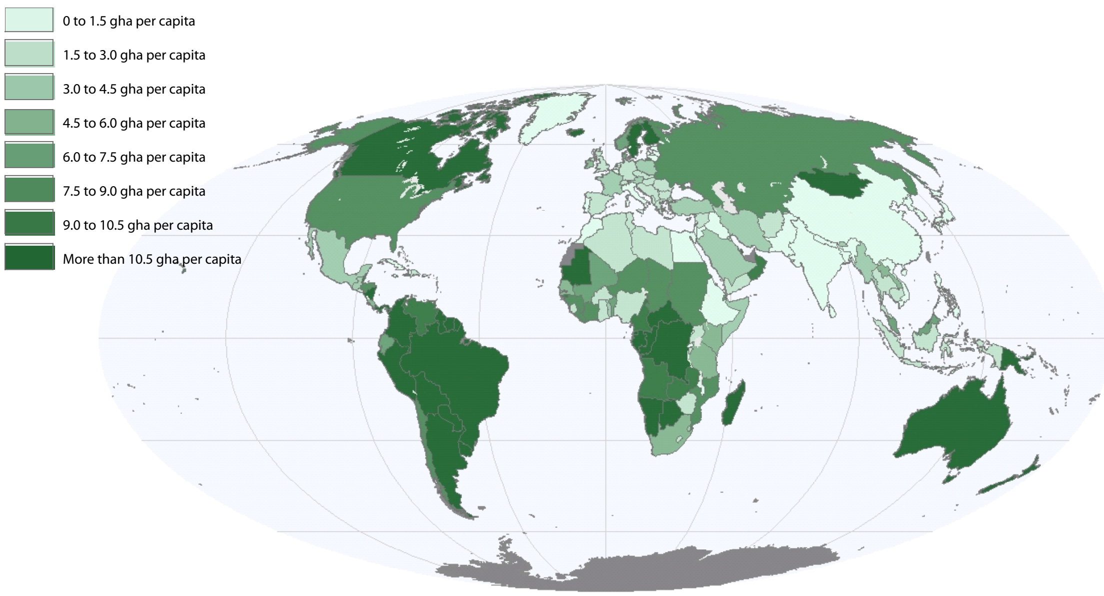


1961

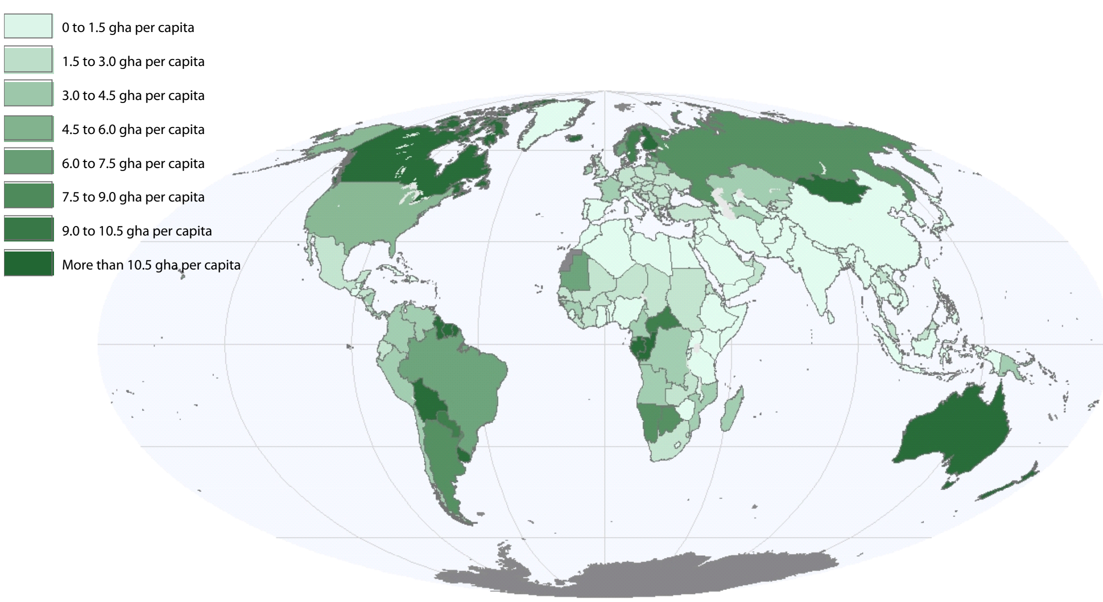


2005

Figure 9. Ecological Footprint by country, 1961 and 2005.



1961



2005

Figure 10. Biocapacity by country, 1961 and 2005.

Figure 11 shows the top 10 countries in terms of absolute amount of biocapacity. Half the world's biocapacity is found within the borders of just eight countries. The United States has the most biocapacity of any country, followed in decreasing order by Brazil, Russia, China, Canada, India, Argentina and Australia.

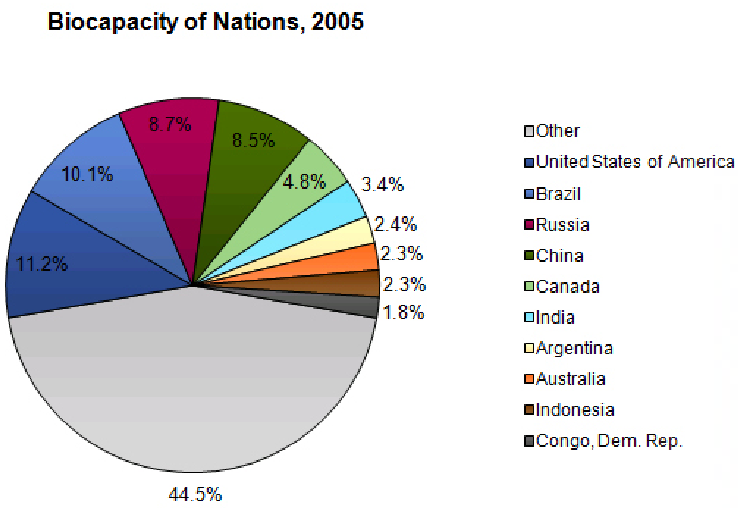
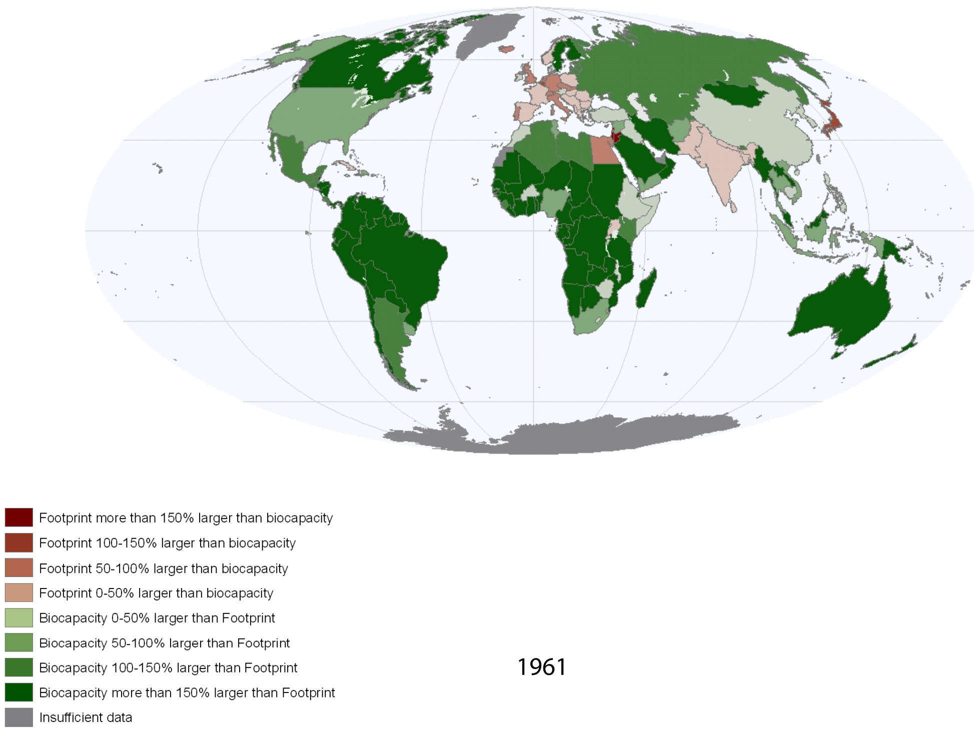


Figure 11. Countries with the largest total biocapacities, 2005.

In 1961, most countries were ecological creditors, with more biocapacity than they were using. By 2005, the global situation had reversed dramatically, with a majority of countries now ecological debtors, their Footprints exceeding their own biocapacity (Figure 12). A net surplus of biocapacity in ecological creditor nations does not necessarily mean these countries are managing their ecological assets in a manner that ensures long-term sustained productivity. Nor does it mean this biocapacity is going unused, as it may be providing resources that are exported.

Ecological debtor countries can maintain resource consumption levels despite a negative biocapacity balance through some combination of depleting their own natural resource stocks (overfishing or overharvesting forests, for example), importing resources from other countries, and releasing their carbon dioxide emissions into the global atmosphere.



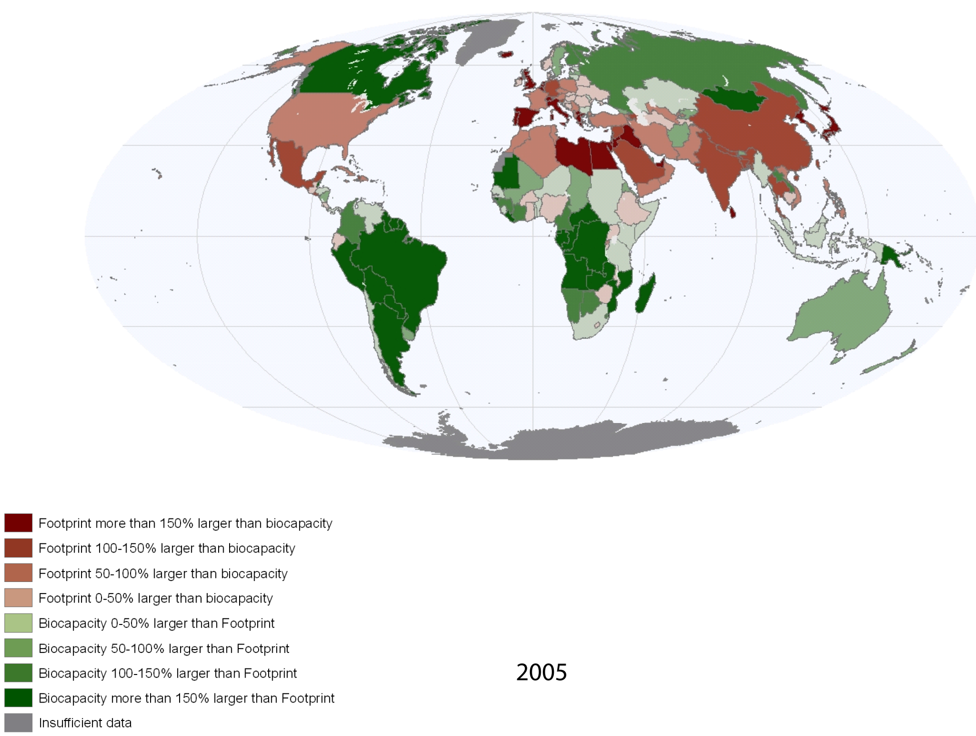


Figure 12. Ecological creditor and debtor countries, 1961 and 2005.

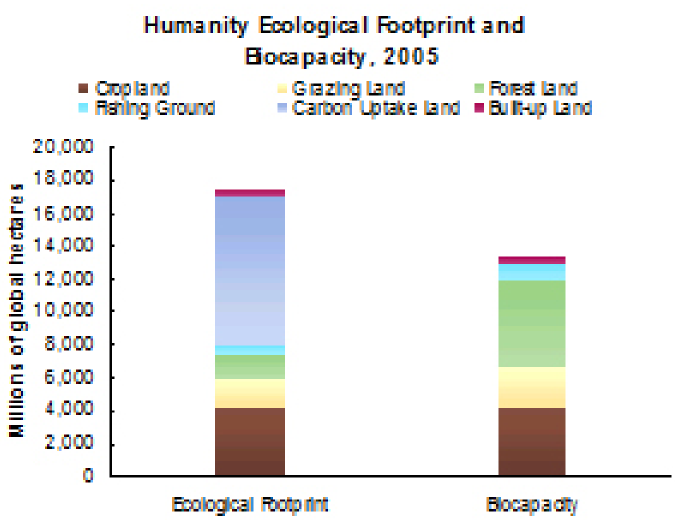
Ecological Footprint of Trade

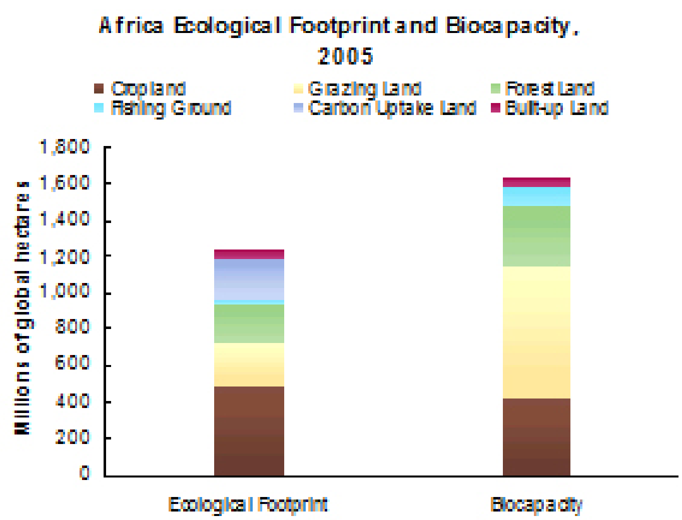
Tracking international trade in terms of the Ecological Footprint can help quantify the growing global pattern of reliance on foreign biocapacity to meet domestic demand.

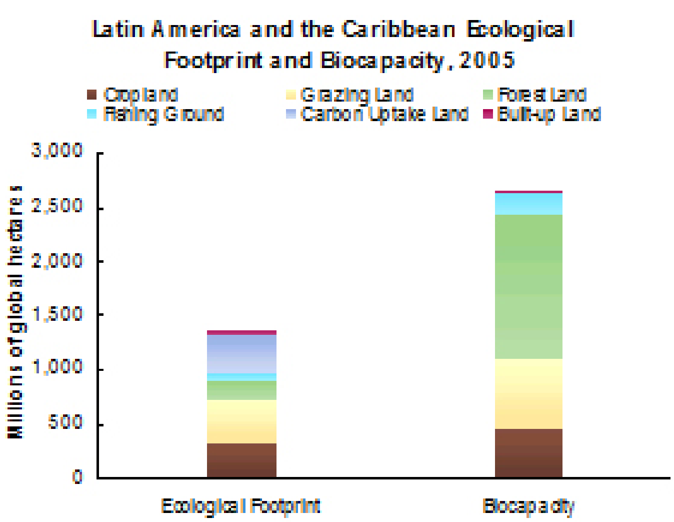
In 1961, the Footprint of all goods and services traded between nations was equal to 8 percent of humanity's total Ecological Footprint. By 2005, this had risen to more than 40 percent. Both ecological debtor and creditor countries are increasingly relying on the biocapacity of others to support their consumption patterns and preferences. Some imported resources are consumed in the importing country, while others are processed and re-exported for economic gain. Carbon emissions associated with the production of imported goods and services are included in the Footprint of imports.

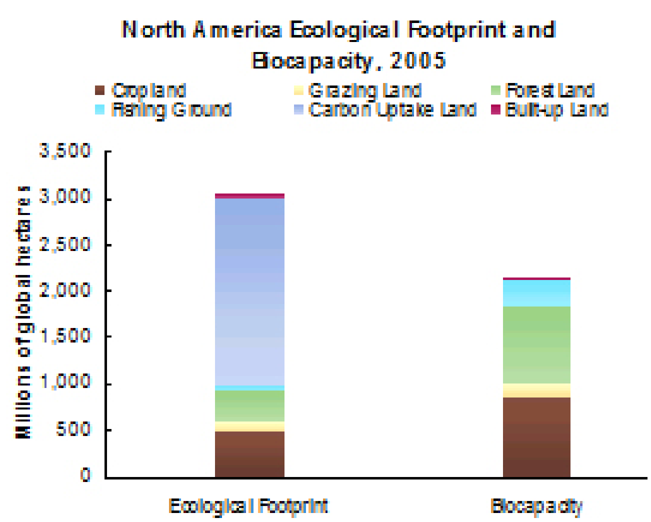
The United States of America had the largest export Footprint of any nation in 2005, followed by Germany and China. It also had the largest import Footprint, with China second and Germany third.

Figure 13 compares Ecological Footprint and biocapacity by component for each geographic region and for the world. For components other than carbon, where a region's Footprint exceeds its biocapacity the net deficit is made up by depleting its own ecosystem resource stocks, or by importing resources from elsewhere. At a national level, this latter option is less available to countries with fewer financial resources.









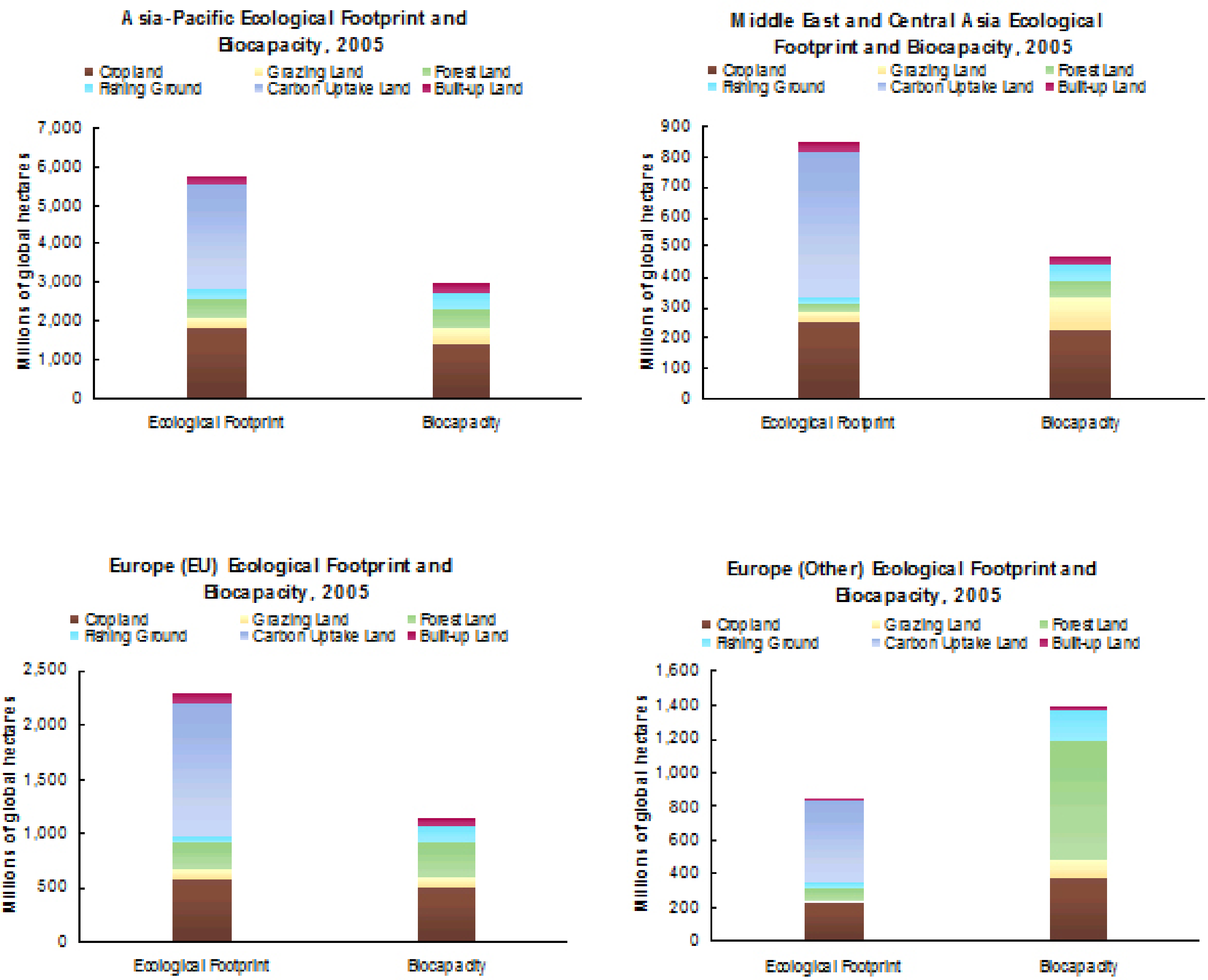
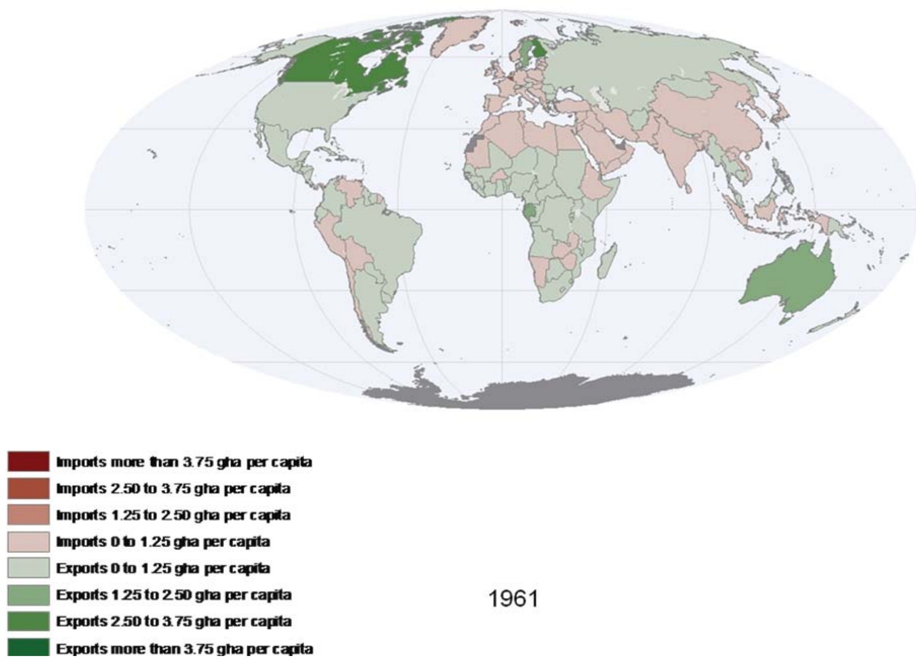


Figure 13. Ecological Footprint and biocapacity components, by region, 2005. [Note that the graphs are not drawn to the same scale.]

At the national level, Footprint trade data tracks physical as opposed to the more familiar financial trade flows between countries. Figure 14 shows the per person Footprint of imports and exports for each nation. For the European Union and for China, Table 4 shows the Footprint of imports and exports with their major trading partners in greater detail. In 2005, the European Union's imports were equivalent to 5.4 percent of the total global Footprint, or 827 million global hectares, from nations outside the EU. That same year, the Footprint of its exports was 629 million global. China's Footprints of imports and exports in 2005 were, respectively, 541 million gha, equivalent to 3.6 percent of the total global Footprint, and 375 million gha.



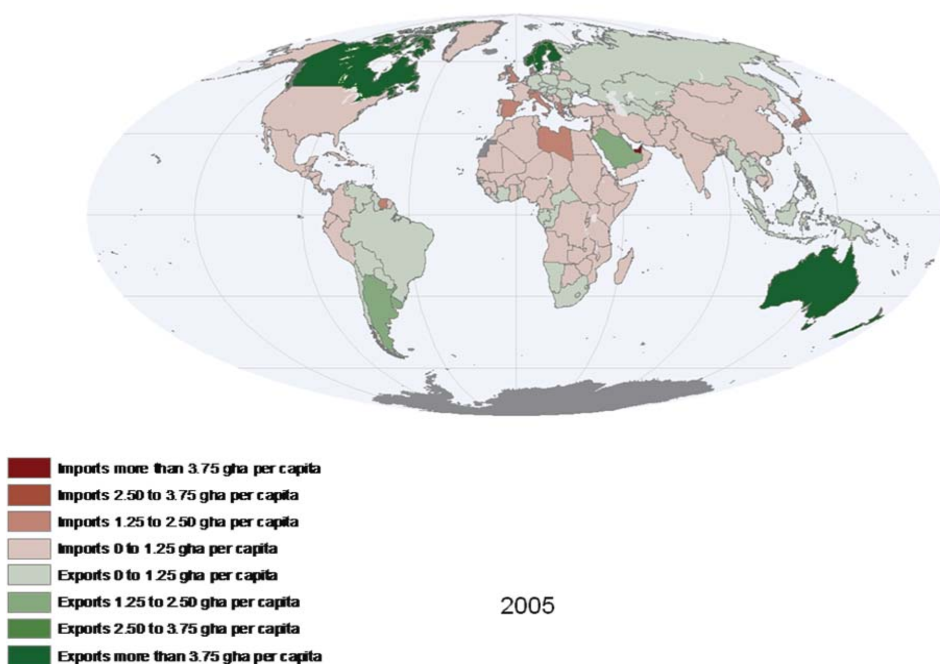


Figure 14. Footprint of imports and exports by country, 1961 and 2005.

EU			
Partner	**Imports**	**Partner**	**Exports**
Russian Federation	85,456,259	United States of America	79,430,443
China	79,091,515	China	42,757,913
Brazil	71,168,105	Turkey	41,116,142
United States of America	57,308,398	Switzerland	34,547,789
Norway	44,043,822	Russian Federation	31,560,842
Argentina	25,204,954	Norway	21,383,788
Turkey	23,200,055	India	13,020,806
Canada	21,242,309	Canada	12,102,301
Ukraine	20,154,898	Saudi Arabia	11,576,609
Switzerland	18,767,066	Japan	11,301,101

China			
Partner	**Imports**	**Partner**	**Exports**
United States of America	63,493,133	United States of America	81,387,038
Japan	50,430,937	EU	79,091,515
Korea DPR	49,020,149	Japan	44,534,389
EU	42,757,913	Korea, Rep.	41,838,289
Australia	34,926,921	India	22,127,363
Brazil	33,352,357	United Arab Emirates	9,827,536
Argentina	23,116,747	Indonesia	9,162,077
Russian Federation	21,620,518	Thailand	8,634,667
Thailand	18,005,619	Canada	7,260,200
Indonesia	17,886,074	Malaysia	6,811,312

Table 4. Footprint of imports from and exports to major trading partners, EU and China, 2005.

Footprint Scenarios: Looking at the Future

Ecological Footprint accounts document past performance. These resource flow accounts do not predict future demand on, nor the supply of, ecological assets, in the same way that bank accounts do not predict the future performance of financial assets.

Footprint accounts can, however, be used to explore the ecological implications of a wide variety of consumption and ecosystem management scenarios. Figures 15 and 16 show two different sets of business-as-usual scenarios. Both incorporate moderate projections from international agencies including the UN Population Division, UN FAO and the IPCC that have been combined with other projections and then translated into Footprint and biocapacity trends. If the moderate projections in either of these scenarios prove to be correct, by 2050 humanity's total Footprint will be more than double globally available biocapacity.

The following projections were used in creating the business-as-usual scenarios:

- *Population.* The UN has four different projections. The "Medium variance" projection, which assumes a global population of 9 billion people by 2050 (UN Population Division Population Database 2006), was used in these business-as-usual scenarios
- *Carbon.* Carbon is both the largest and the most uncertain component of the Footprint. For this reason, business-as-usual scenarios are presented using both Intergovernmental Panel on Climate Change (IPCC) projections (Nakicenovic et al. 2000) and International Energy Agency (IEA) projections (IEA 2007) (Figures 15 and 16, respectively). The IPCC has published several carbon emissions projections through 2100. These in turn come from scenarios that differ in the degree of global versus local economy, rate of adoption of technology, population growth, and other variables. For example, the IPCC A1B scenario incorporates the UN Median variance population projection, as well as assumptions of rapid global economic growth and a shift to a larger mix of energy sources. In this scenario, the IPCC projects that annual carbon emissions will reach 18 GtC in 2050, 2.4 times what they were in 2005. The A1B Scenario also assumes a balanced emphasis on all energy sources.

Figure 15 shows Footprint trends reflecting emissions projections from the four different IPCC scenario families (A1, B1, A2, B2). Figure 16 shows Footprint trends based on emissions projection from the IEA Alternative and Reference scenarios, which use implementation of policy variables as model inputs rather than economic and geo-political variables. The IEA Reference scenario assumes successful implementation of all currently signed policy, whereas the Alternative scenario assumes successful implementation of all currently proposed legislation as well. Because the IEA projections only extend through 2030, Figure 16 only shows Footprint trends through that year, rather than to mid-century.

In both Figures 15 and 16, the IPCC or IEA scenarios provide only the carbon emissions values that are input into the model used to calculate the Footprint trends. The model also incorporates inputs of the following additional projected variables:

- *Agriculture/Livestock.* The FAO provides projections to 2050 for consumption of several key food groups (i.e. meat, cereals, pulses, roots and tubers) (FAO 2006). For excluded food groups, a weighted average of the projections given was applied to all other crops.
- *Forest.* The FAO projects future demand for roundwood (FAO 2002), but provides no other numerical projections for forest products. Consumption of all other forest products was therefore assumed to scale with population growth. Forest productivity was assumed to remain constant. This may prove to be optimistic, since with climate change forest productivity may decline. However, it is also possible that more intensive forest management will counterbalance this decline.
- *Fish.* A recent paper published in *Science* projected collapse of global fisheries (90 percent depletion) by 2048 (Worm et al. 2006) with business-as-usual. It was therefore assumed that both the biocapacity and Footprint of fish would decline to 10 percent of 2005 levels by 2050. Additional meat consumption was also assumed, in order to account for the quantity of protein that would be needed to compensate for the elimination of fish from the global diet.
- *Built-up land.* For lack of data, built-up land was scaled with population.
- *Biocapacity.* In addition to the above demand-side assumptions, on the supply side it was assumed that cropland biocapacity would continue to increase through 2050 by 1.12 percent per year, as it has over the past 20 years (Global Footprint Network 2008). This 66 percent gain in cropland biocapacity is assumed to come largely from an increase in farm yields. Forest and grazing land biocapacity were assumed to remain constant.

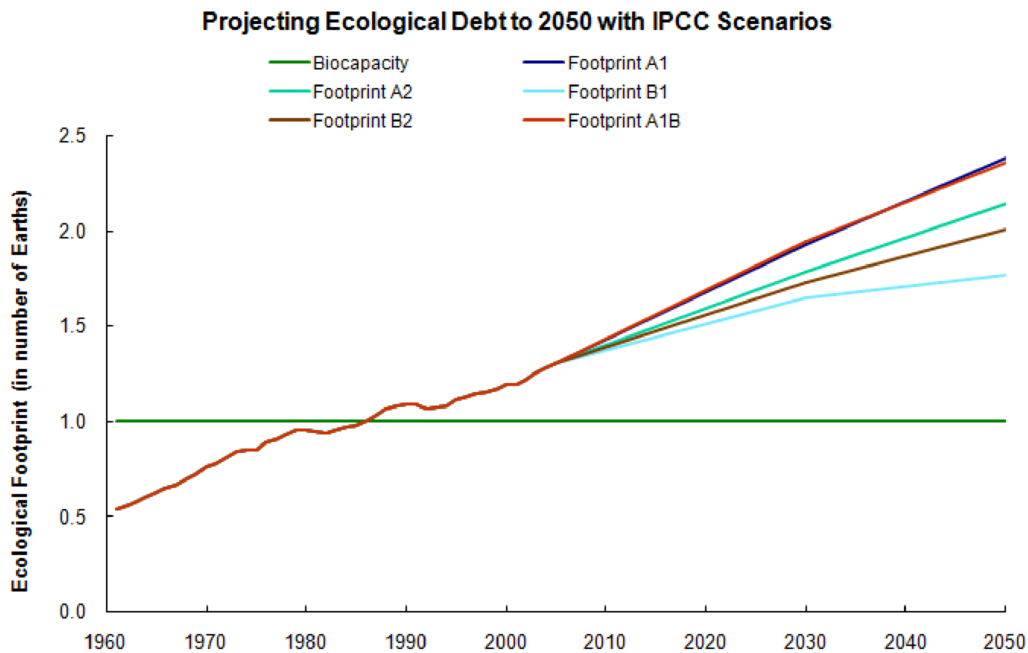


Figure 15. Footprint scenarios based on IPCC projections, 1961-2050.

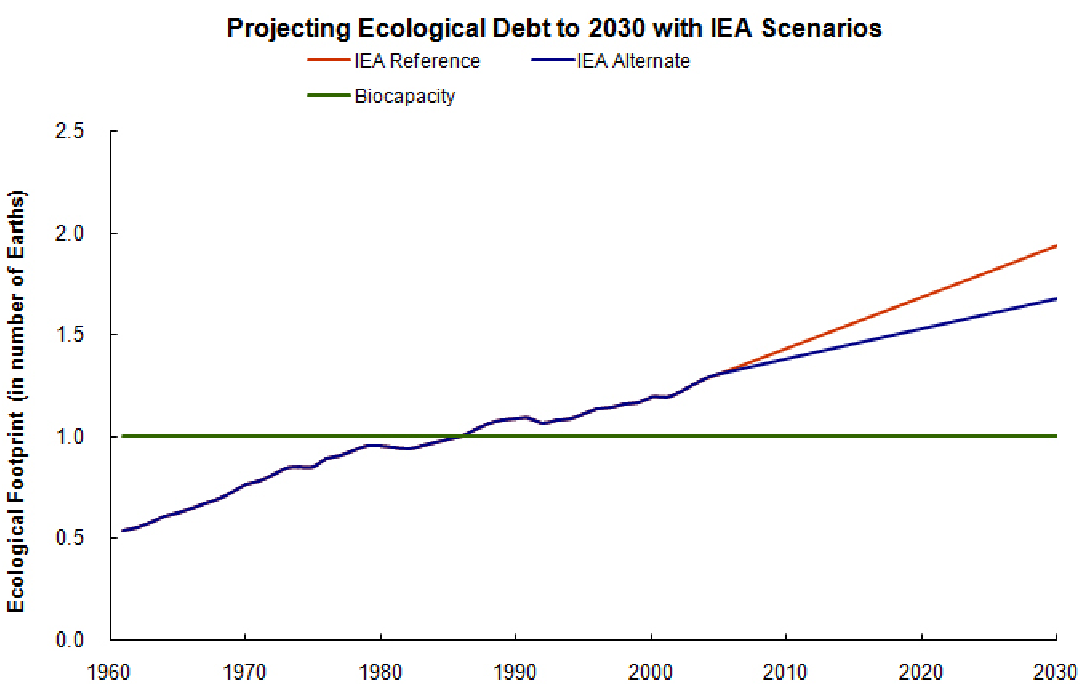


Figure 16. Footprint scenarios based on IEA projections, 1961-2030.

By 2050, in these scenarios the total cropland Footprint increases by 10 percent, and built-up land by nearly 50 percent. The forest Footprint doubles, the carbon Footprint grows nearly two and a half-fold, and the grazing land Footprint almost triples its current size.

Projecting out to 2050, the IPCC B1 scenario results in the lowest Footprint value, with carbon making up 47.4 percent of the total Footprint. The A1 scenario represents the highest value, with carbon comprising 60.9 percent of the total Footprint. Thus even if the most aggressive IPCC carbon reduction scenario is realized, the level of overshoot is still projected to be more than 1.5 times what is was in 2005. Unfortunately, recent data shows that carbon emissions are accelerating, and are now close to the IPCC worst-case scenario (IPCC 2006), while other data suggests the capacity of global carbon sinks may be declining (IPCC 2006).

The IEA Reference scenario and the IPCC A1B scenarios are very closely aligned, with only a 0.07 percent difference between the two projections in 2030. The IEA Alternative scenario falls 2 percent above the IPCC B1 scenario. Figure 17 shows the projected trends in Footprint components through 2050, using the carbon projection from the IPCC A1B scenario.

The level of overshoot shown in these scenarios may or may not be physically possible. For example, the scenarios assume that by 2050 a growing ecological debt will not have resulted in depletion and collapse of the resource base to an extent that would limit some of the projected growth in demand. The model also fails to take into account feedback loops that exist in many biophysical systems. For example albedo changes accompanying the loss of Arctic ice, methane released from warming tundra, and the declining carbon sink capacity of a warming and acidifying ocean all have the potential to accelerate the rate of climate change, even if anthropogenic emissions of carbon are held constant or are reduced. A more rapidly changing climate may then render future estimates of available biocapacity overoptimistic.

Unlike financial capital, one type of which can easily be exchanged for another of matching monetary value, ecological assets are not readily interchangeable. The overuse of fisheries, for example, cannot be offset by decreasing demand on forests. Further, these assets are often in competition, with additional cropland expanding into forest land and subsequently compromising fuelwood and timber resources, and carbon storage capacity. This lack of substitutability makes the challenge of ending overshoot even greater.

Wealthier countries may temporarily buffer themselves from overshoot by importing resources and exporting wastes. Early adopters of aggressive sustainability strategies may be able to eliminate local overshoot, not only enhancing their own well-being but also potentially being able to derive economic benefit from an ability to provide resources to others in need. Thus, addressing overshoot early is in the self-interest of individual nations, as well as in the interest of the world as a whole. The alternative, failing to address overshoot, means accepting its consequences, with the greatest initial impact on the world's poorest and most vulnerable nations.

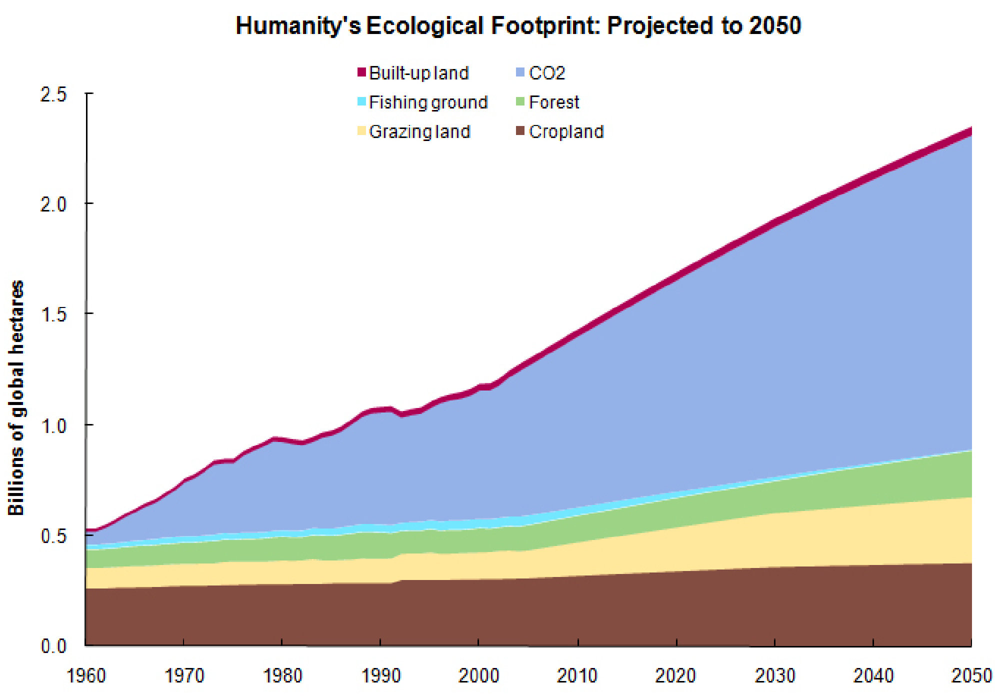


Figure 17. Estimated ecological overshoot in 2050 based on IPCC A1B and other projections (see text).

APPENDIX A: Methodology Differences between the 2006 and 2008 National Footprint Accounts

A formal process is in place to assure continuous improvement of the National Footprint Accounts (NFA) methodology. Coordinated by Global Footprint Network, this process is supported by its partners and by the National Footprint Accounts Committee, as well as other stakeholders.

FAO ResourceSTAT

The most extensive change from the 2006 edition of the National Footprint Accounts to the 2008 edition was in response to a revision in the structure of the United Nations Food and Agriculture Organization's Corporate Statistical Database (FAO ResourceSTAT Statistical Databases 2007). This database, which serves as the basis for the national Footprint calculations, formerly aggregated all products into 10 groups, the Food Balance Sheets. FAO no longer provides these aggregated product groups, so in the 2008 edition of the NFA raw, non-aggregated data was used instead. This substantially altered the lists of commodities for which production and trade data are available, leading to more detailed accounts but also requiring the use of additional conversation factors to determine the primary product equivalents of processed products. These new conversion factors were compiled from a variety of FAO and other United Nations sources.

Cropland

Due to these updates in FAO ResourceSTAT, the cropland section of the National Footprint Accounts now tracks 195 different agricultural commodities. This is an increase from approximately 80 in the 2006 edition of the NFA.

The changes to the list of agricultural products reported in FAO ResourceSTAT included the addition of several new categories of crops for animal fodder. The production of these crops carries with it a cropland Footprint, even though the crops themselves are consumed by livestock and thus play a more direct role in the grazing land Footprint calculation. The overall effect of this has been a slight increase in the cropland Footprint, accompanied by a slight decrease in the grazing land Footprint, since the Accounts now show more of a nation's livestock feed requirement being met by cropped fodder.

Grazing Land

The methodology for calculating the grazing land Footprint has changed substantially in the 2008 edition of the NFA. The overall calculation now follows a methodology set forth by Helmut Haberl and colleagues (Haberl et al. 2007). Starting with the total feed requirement for all domestic livestock, the quantity of feed provided by crop residues, cropped grass and other crop-derived market feed is subtracted. The remaining feed requirements are then assumed to be met by pasture grass. The area of grazing land required to produce this quantity of grass, multiplied by an equivalence factor, yields the grazing land Footprint.

Since the new FAO ResourceSTAT database does not report the fractions of produced crops used for feed except in those categories of crops used exclusively for feed, it was assumed that these fractions have remained constant since 2003, the last year in which they were reported.

In addition, the 2008 edition of the NFA tracks the embodied cropland and grazing land Footprint of 59 traded products derived from livestock, up from approximately 10 in the 2006 edition. This change again was necessary because of changes in the FAO ResourceSTAT datasets.

Fishing Grounds

In the 2006 edition of the NFA, fish catches were calculated in only 10 different categories. The list has since been expanded; in the 2008 edition, catch tonnages for more than 1500 different marine species allowed calculation of a fishing grounds Footprint for each. This very significant increase in resolution means that for many countries, their fishing grounds Footprint in the 2008 edition of the NFA differed substantially from that reported in the 2006 edition.

The estimate of the quantity of sustainable catch, measured in terms of primary production per hectare of continental shelf, has also been recalculated, based on an estimate of sustainable fisheries yields from the FAO (Gulland 1971).

The fish section of the NFA is still in need of further improvement. A grant from the Oak Foundation will allow Global Footprint Network to revisit this section of the Accounts in the coming year.

Forest Land

The forest Footprint calculation has undergone two major revisions. The first was an increase in the number of forest products tracked in the NFA from 6 to 33, following a change in the FAO ResourceSTAT data. The second change involved national average forest growth rates, which are now calculated from a smaller number of data sources. Harvest rates are also no longer used as substitutes for forest growth rates anywhere in the Accounts. In addition, some marginal forest areas which were previously excluded from the NFA calculations are now included as bioproductive areas.

Carbon Uptake Land

Several new sources of carbon dioxide emissions, in addition to those from combustion of fossil fuels, are now accounted for. These other emissions include those from industrial processes such as cement production, flaring of gas releases during oil and natural gas production, tropical forest fires, and the production of certain biofuels (IEA Statistics and Balances 2008). These non-fossil fuel emissions contribute to the total global carbon Footprint, but are omitted from national calculations due to insufficient data to accurately allocate these emissions to individual nations.

The NFA now track the embodied energy in fossil fuels traded between nations. This is not the energy content of the traded fuels themselves, but the energy invested in producing the fuels and making them available for trade. In general, this means that in the 2008 edition the carbon Footprint of net exporters of fossil fuels will be smaller than if calculated using the 2006 edition methodology, and larger for net importers.

The assumed average rate of carbon uptake by the biosphere has been revised slightly downward, resulting in an approximately 3 percent increase in the Footprint associated with a given quantity of carbon dioxide emissions.

Built-up Land

The built-up land methodology remains largely the same as in the 2006 edition of the NFA, with the exception of the Footprint of hydroelectricity. The estimated Footprint per MWh is now approximately three times that used in the 2006 accounts. This is due to a combination of two changes. First, based on an IEA study (IEA 2008), dams are now assumed to produce on average only 45 percent of their maximum possible power output, rather than 100 percent. Second, the 2006 edition calculations relied on what now appears to have been a typographical error in a draft working paper from WWF. The Goodland (2002) report, which the WWF study cites, is now used as the basis for the calculation. This slightly increases the area estimated to be inundated per megawatt of production capacity.

Equivalence Factors

Equivalence factors, the number of global hectares per physical hectare of a given land type, have been recalculated. These factors are used in the calculations to take into account inherent differences in the productivity of different types of productive area. Equivalence factors for forest and grazing land are now lower, while the factor for cropland has increased.

Nuclear Energy

Beginning with the initial 1997 edition of the NFA, a new energy component, nuclear land, was included in the Ecological Footprint along with the carbon land component. From 1997 to 2006, the NFA tracked and reported seven categories of demand on biocapacity — cropland, grazing land, forest, fishing grounds, carbon land, nuclear land, and built-up land. These were summed to calculate the global Footprint, as well as the Footprints of individual countries. The nuclear Footprint was introduced as an approximation of the demand on the environment associated with the production of electricity using nuclear energy. It was assumed that the Footprint of generating a unit of electricity in a nuclear power plant was the same as that for generating a unit of electricity by a power plant using a world-average mix of fossil fuels.

In 2007 the National Footprint Accounts Committee concluded that this emissions proxy approach was not a scientifically justifiable method for calculating the Footprint of nuclear electricity. This decision, which was preceded by numerous meetings and two public comment periods, and had an 82 percent approval rating in Global Footprint Network's public surveys, is based on the following:

- There is no scientific basis for assuming parity between the carbon Footprint of fossil fuel electricity and the demands associated with nuclear electricity. This assumed equivalency method was reducing the scientific robustness of the National Footprint Accounts.
- The most important concerns related to nuclear electricity are often cited as future waste storage, financial cost, the risk of a plant accident, and weapons proliferation. All of these concerns fall outside the research question addressed by the Ecological Footprint. Consideration of future Ecological Footprints or biocapacity is predictive and thus not consistent with the historical focus, or capital maintenance perspective, of the NFA methodology. Future demands on biocapacity associated with the production of nuclear electricity (e.g., to address waste proliferation and storage, or as a consequence of accident, leakage, terrorist acts or war) should be treated in the same manner as other future risks such as biodiversity loss or the persistence of toxics: If these risks become manifest and cause a loss of biocapacity or an increase in Footprint, these losses or increases will be reflected in future NFA after the events occur.
- The carbon Footprint of the activities currently required to generate electricity from nuclear energy is already included in the NFA. For example, carbon emissions during uranium mining and refining, and carbon emissions during cement production for reactors are already included in the Ecological Footprint of each nation that generates nuclear electricity. Similarly, the built-up land Footprint of the physical area occupied by nuclear power plants, and the Footprint of current material use in nuclear waste storage operations are also included in the Footprint of those using this electricity. Using a carbon proxy to estimate the Footprint of nuclear energy would therefore be double counting.

It is worth noting that the decision to remove the nuclear component from the National Footprint Accounts methodology does not reflect a particular stance on the desirability of nuclear power. The decision was made solely in the interest of increasing the scientific credibility of the NFA and to ensure that the methodology was not deviating from its focus on the core research question, "How much of the Earth's regenerative capacity is humanity currently using?" More generally, the Committee felt that the Footprint method alone was not sufficient to address the pros and cons of nuclear power. In addition to demand on biocapacity, other dimensions need to be considered, such as the risks to the future associated with long-term waste storage, plant and transportation accidents, security breaches that could lead to releases of radioactive materials, and escalating costs.

The global nuclear Footprint was approximately 4 percent of the total global Footprint in 2003, the last year reported in the 2006 edition of the NFA. For most countries, removal of the nuclear component in the 2008 edition had a negligible effect on their total Ecological Footprints. However, for nations such as France, Japan, Belgium, Switzerland, Sweden and Finland, where nuclear power is a prominent source of electricity generation, this methodological change had a larger impact on their national Footprint results.

Overall, despite the changes in methodology, the 2006 and 2008 editions of the National Footprints provide very similar results. This can be seen in Figure 18, which shows the extent of global overshoot calculated using the older and newer methodologies.

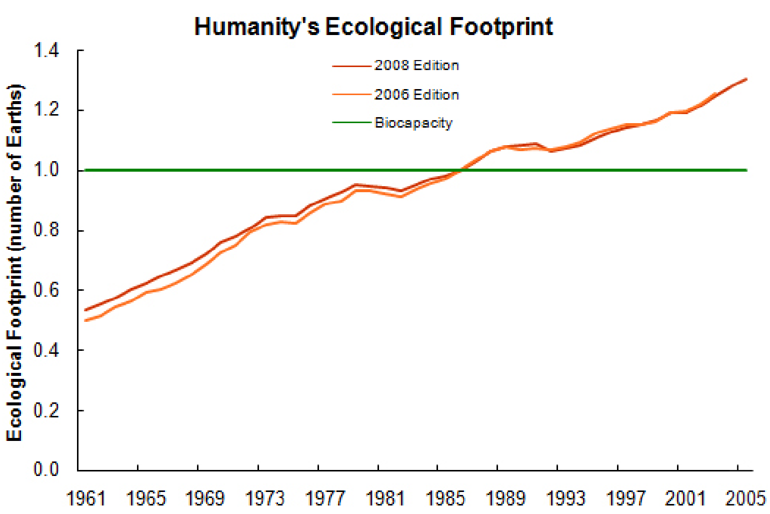


Figure 18. Global overshoot in the 2006 and 2008 editions of the National Footprint Accounts.

APPENDIX B: Standards and National Footprint Accounts Committees

In 2004, Global Footprint Network initiated a consensus, committee-based process to achieve two key objectives:

- Establish a scientific review process for the Ecological Footprint; methodology
- Develop application and communication standards.

These committees, which began operating in the spring of 2005, are comprised of members drawn from the Network's partner organizations, and represent government, business, academia, and NGOs.

Two committees are now overseeing scientific review procedures for the National Footprint Accounts and developing standards for Footprint applications. The Committees Charter provides more detail on the objectives and procedures for each of the committees.

- The National Accounts Committee supports continual improvement of the scientific basis of the National Footprint Accounts, which provide conversion factors that translate quantities of resources used or wastes emitted into the bioproductive land or sea area required to generate these resources or absorb these wastes. These conversion factors serve as the reference data for Footprint applications at all scales.
- The Standards Committee develops standards and recommends strategies to ensure that the Footprint is applied and reported in a consistent and appropriate manner in all key domains, at a variety of scales, and over time.

The Committees draft protocols and develop standards which are then circulated for feedback. This is an iterative process, managed by the Committees with the support of Global Footprint Network staff. Pilot testing of protocols and standards helps refine them and confirm their applicability to real-world Footprint projects.

In order to guarantee both transparency and the best possible standards, standards development follows the ISEAL guidelines, with opportunities for both partner and public comment during the development process.

The first standards were published in 2006. Ecological Footprint Standards 2006 addresses the use of source data, derivation of conversion factors, establishment of study boundaries and communication of findings. It focuses on applications that analyze the Footprint of sub-national populations.

Development of the next edition of Ecological Footprint Standards is currently underway. This work will expand the Standards to more specifically address Footprint analysis of organizations, products, processes and services. Global Footprint Network partners are required to comply with the most recent Ecological Footprint Standards.

Regular Review

Protocols and standards are reviewed on a regular basis, and revised as necessary. The goal is to establish continuous improvement in both the scientific basis and transparency of the methodology, and the quality and consistency with which Ecological Footprint applications are conducted and findings communicated.

Future Standardization Plans

Future plans include the development of a third-party certification system whereby practitioners can have their applications audited for adherence to the standards. Certification will ensure that assessments are accurate, consistent, and up-to-date, and are using methodology and conversion factors from the most recent edition of the National Footprint and Biocapacity Accounts.

The current members of the committees are as follows:

Standards Committee

John Barrett, SEI York
Simone Bastianoni, University of Siena, Ecodynamics Group
Stuart Bond, WWF UK
Sharon Ede, ZeroWaste
Stefan Giljum, SERI
Natacha Gondran, Ecole Nationale Superieur des Mines de Saint-Etienne
Miroslav Havranek, Charles University Environment Center
Jane Hersey, Bioregional
Sally Jungwirth, EPA Victoria
Justin Kitzes, Global Footprint Network
Laura de Santis Prada, Ecossistemas Design Ecologico
Andreas Schweitzer, Borawind Ag
Craig Simmons, Best Foot Forward
Philip Stewart, WSP Environment
Jorgen Vos, Natural Logic
John Walsh, Carbon Decisions
Lisa Wise, The Center for a New American Dream

Moderator: Simon Cordingley, Compass

Coordinator: Brad Ewing, Global Footprint Network

National Accounts Committee

Marco Bagliani, Research Institute on Economy and Society of Piedmont (Italy)
John Barrett, Stockholm Environment Institute at York
Karlheinz Erb, University of Vienna
Chris Hails, WWF International
Justin Kitzes, Global Footprint Network
Aili Pyhälä, Finnish Ministry of the Environment

APPENDIX C: Quality Assurance Procedures for Raw Data and Results

The Ecological Footprint and biocapacity assessment for any given country and year relies on over 5,400 raw data points. This leaves much potential for missing or erroneous source data to contribute to implausible Footprint estimates or abrupt year-to-year changes in a country's Footprint that do not reflect actual changes in consumption. In some cases the solution to this problem has been to systematically estimate missing data points based on data for surrounding years, as described below.

The methodology for the National Footprint Accounts has been applied consistently to all countries in the 2008 edition, with some specific exceptions as documented here. The next section describes the few modifications that were applied to source data, as well as country-specific adjustments of the Footprint calculation. This is followed by an example that uses the Netherlands to illustrate issues that would potentially need to be addressed in developing Footprint assessments that are more country-specific.

The primary procedure used to test the 2008 edition templates and identify potential template errors was to compare results from the 2008 and the 2006 editions of the Accounts for the same data years. In the initial screening, country rankings for biocapacity and Footprint were compared across the two editions. The second step was to compare time series for the six land-use types as well as for total biocapacity, Footprint of consumption and Footprint of production. This comparison was done for all 150 countries over the 1961-2005 time period. In addition, abrupt inter-annual shifts in any of the Footprint or biocapacity components were identified.

When large discrepancies were identified, tests were conducted to determine whether they originated from template errors, the underlying data set, or the methodological improvements in the later edition of the Accounts. These tests also helped identify methodological issues that will need to be explored through further research. For example, one issue that was identified as needing additional consideration is the question of which crops need to be put in a separate category of lower productivity crops in order not to skew national yield factors. Because millet and sorghum may generally be planted on dryer, less productive land rather than on average crop land, not treating them separately may lead to biocapacity overestimates for countries with significant millet and sorghum harvests.

Country-Specific Adaptations of the National Footprint Accounts

Calculating the Ecological Footprint of a country over time utilizes a large number of data points from a wide variety of sources. In the course of compiling the National Accounts, inconsistencies and gaps in the raw data were identified and in some cases corrected. This section will detail all measures taken to address missing raw data, as well as country-specific adaptations that were applied in calculating the 2008 National Footprint Accounts.

The goal of this section is not to identify every potentially erroneous result in the National Accounts. Rather, it is to outline all alterations to raw data used in the 2008 Edition of the National Footprint Accounts, in sufficient detail to render the results described in this document reproducible.

Missing Data

Most of the data sources used in the National Footprint Accounts encompass countries for which one or more years' data are missing. For the UN COMTRADE database, the basis for calculating the embodied carbon Footprint of traded goods, missing years were filled in by copying the previous year's trade quantities forward. If the previous year's date was also missing, values were left blank. The following list gives all countries and years for which data were copied from the previous year, if available:

Country	Year(s)
Armenia	1998
Bangladesh	1999, 2005
Bulgaria	1992
Burkina Faso	2005
Cambodia	1995
Central African Republic	1972, 1989, 2004
Chad	1995
Czechoslovakia	1981
Eritrea	2002, 2004, 2005
Ethiopia	1994, 1996
Gabon	1995
Gambia	1964
Ghana	1992
Guinea-Bissau	1995
Indonesia	1962
Iraq	1963
Jordan	1996
Kenya	1989
Kuwait	1985, 2002, 2003, 2004, 2005
Kyrgyzstan	1997
Lebanon	1977, 2005
Lesotho	2005
Libya	2005
Lithuania	1992
Malawi	1989, 1992, 1993
Mali	1973
Morocco	1969
Mozambique	1998
Myanmar	1991, 1992
Nepal	1988, 1989, 2001, 2002, 2004, 2005
Nicaragua	1987
Nigeria	2004, 2005
Norway	1986, 1987
Pakistan	1994
Papua New Guinea	1999, 2005
Peru	1981
Poland	1984
Rwanda	2000
Saudi Arabia	1968, 1969, 1997
Senegal	1976, 1988, 1995
Serbia and Montenegro	1992, 2003, 2005
Sierra Leone	1963, 1964, 2002
Slovenia	1994
Somalia	1962, 1966
Sri Lanka	1973, 2000
Sudan	1962, 1983
Syria	1988, 1991, 1993, 1994
Tajikistan	2000
Togo	1982, 1984, 1985, 1992, 1993
United Arab Emirates	1990, 2002, 2003, 2004
Zambia	1994
Zimbabwe	1998, 2003

In data from FAO ResourceSTAT, only livestock population figures were filled in where missing. Missing values were estimated using linear interpolation. These estimates were as follows:

Country	Animal(s)	Year(s)
Angola	Cattle, goats, sheep	2005
Belize	Cattle, goats, sheep	2005
Bolivia	Goats	2000, 2001, 2002
Burundi	Goats	2005
Costa Rica	Sheep	2005
Cuba	Goats	1990, 1991, 1992
Dominican Republic	Cattle, goats, sheep	2005
El Salvador	Goats, Sheep	2005
Gabon	Cattle, Goats, Sheep	2005
Germany	Sheep	2001
Greece	Buffaloes	2002
Guatemala	Goats, Sheep	2005
India	Cattle, Goats, Sheep	2004, 2005
Iran	Buffaloes, Cattle	2005
Jamaica	Cattle, Goats, Sheep	2005
Lesotho	Cattle, Goats, Sheep	2000, 2001, 2004, 2005
Madagascar	Goats	2005
Malawi	Sheep	2005
Malta	Goats, Sheep	2001
Mozambique	Cattle, Goats, Sheep	2005
Mauritius	Buffaloes, Goats, Sheep	2005
Netherlands	Goats, Sheep	2005
Netherlands	Goats	1981, 1982
Nicaragua	Goats, Sheep	2004
Niger	Cattle	2001 - 2005
Niger	Goats, Sheep	2002 – 2005
Philippines	Goats	2003
Portugal	Sheep	1984 - 1987
Saudi Arabia	Goats, Sheep	2003 – 2005
Sierra Leone	Cattle, Goats	1995 – 2001
Sierra Leone	Goats	2000, 2001
Switzerland	Goats	2001 - 2005

Embodied Carbon

Singapore, Mexico and Kenya each showed large spikes in their carbon Footprint component for a single year. These spikes were caused by anomalously large reported trade in a particular commodity, suggesting a factor 10, 100 or 1000 error. These particular commodity trade figures were rescaled accordingly.

Individual Country Patches

For a few countries, specific variations on the standard assumptions or calculation methodology were applied. These are detailed here.

Australia and New Zealand

Both these countries had zero crop Footprints in some years, probably due to overestimates of the embodied cropland Footprint in livestock. To address this, exported livestock were assumed to be fed entirely on grass.

Grazing land biocapacity was not allowed to exceed the grazing land production Footprint for Australia and New Zealand. This reflects the assumption that both these countries are at grazing capacity. This assumption needs to be verified.

Finland

Country-specific extraction rates (ratios of secondary/primary product) for forest products were made available by the Finnish government. These were used instead of global averages in calculating the Footprint intensities of domestic production and of exports.

Israel

Israel's grazing Footprint spikes drastically in 1999, clearly due to a factor 1000 error in reported trade in a single livestock derived commodity: wool tops. The imported quantity for this commodity and year were adjusted accordingly.

Norway

Apparent underestimates of Norway's carbon Footprint were addressed by lowering the assumed embodied energy in crude petroleum exports.

United Arab Emirates

The Footprint of built-up land was set to zero, since most land development in the UAE occurs on very low productivity land, whereas the standard assumption it than land development is occupying cropland.

Reviewing Country Results, Using the Netherlands as an Example

The sheer quantity of input data used in Footprint calculations means there is a distinct chance of problems either with source data or with specific methodological assumptions that are inadequate for a particular country, potentially leading to spurious results.

The Netherlands, for instance, has large trade flows compared to its production Footprint. Hence estimates of the embodied resources and energy in trade flows can significantly alter estimates of the Netherlands' consumption Footprint. As a consequence, the 2008 Edition of the National Footprint Accounts for the Netherlands rendered unlikely results for its fish and grazing land Footprint components – both were zero.

While such a result is theoretically possible (if exports exceeded domestic production plus imports), this is unlikely to be the case for the Netherlands in the year 2005. Some of these unlikely results, their sources, and possible solutions are outlined below. The aim here is to shed light on potential sources of distortion in Footprint estimates. This analysis of the results will also serve to guide future research.

The Netherlands was selected for this analysis because WWF-Netherlands asked Global Footprint Network to review the results for their country in the Dutch edition of WWF's Living Planet Report 2006. The Dutch edition of the report presents more detail on the Dutch Footprint than is included in the global edition. The discussion here is based on Global Footprint Network's (2008) report to WWF-Netherlands, *Review and Revision of The Netherlands' Ecological Footprint Assessment – 2008 Edition: 2008 bis Edition with Trade Adjustments*. This review led to a slightly modified and more realistic Footprint assessment for the Netherlands.

Description of Potential Irregularities

Grazing Land: The grazing land Footprint of consumption for the Netherlands is low or zero from 1979 onward. A zero Footprint of consumption indicates that no grass-fed livestock or livestock products are being consumed in the Netherlands (i.e., that the entire consumption of beef and dairy would, in net terms, originate from cattle grown on feed rather than grazing). This is most likely incorrect.

Fishing Grounds: The fishing grounds Footprint drops steeply from 2003 onward, reaching nearly zero in 2005. Again, this could suggest a drastic drop in Dutch fish consumption, which does not appear to reflect reality. Fish consumption in the Netherlands has stayed at about 20 kg per person per year.

Cropland: The cropland Footprint for the Netherlands drops sharply from 1995 to 1997, then returns to its previous value.

Carbon: The Netherlands' carbon Footprint drops sharply in 1997, rebounding the following year. In some fairly isolated cases, misreported trade in one particular commodity can lead to apparently sharp shifts in carbon Footprint.

Investigation of Source Data and Calculations, and Suggested Solutions

Grazing land: The grazing land Footprint of consumption is zero for a number of consecutive years, while the Footprint of production remains relatively stable. This indicates that the estimated Footprint of exports exceeds the combined Footprints of domestic production and imports.

The Netherlands is a net exporter of livestock. Hence, it is also a net exporter of biocapacity embodied in livestock. The problem here lies in the assumed embodied Footprint of exported livestock products.

The Ecological Footprint of domestic production for grazing is prevented from exceeding available biocapacity. This capping is necessary because grazing biocapacity represents the total biomass available in a year, so overshoot is not physically possible from one year to the next (overgrazing would reduce biocapacity in the next year). In the particular case of the Netherlands, grazing land biocapacity is only 13% of the estimated Footprint of production. It is likely that this inconsistency stems from an underestimate of the amount of crops and other commercial feed that supports Dutch livestock, or of the metabolic requirements of the livestock themselves.

The capping makes the grazing land Footprint of production for the Netherlands appear to be less than the grazing land Footprint of net exports. As a result, the Footprint of consumption in the accounts comes out to less than zero. This is physically unlikely and could only be explained if there were significant stocks carrying over from one year to the next. This indicates that the embedded assumptions about the composition of exported livestock and dairy products are inadequate for the Netherlands.

The 2008 Edition of the National Footprint Accounts assumes that all traded goods of grazing land products have world average Footprint intensities. In most situations, this is a valid assumption since primary products have equal Footprint intensities regardless of local yields. However, in this particular case the Footprint intensity of domestic production is sufficiently different from the world average that this must be accounted for in calculating the embodied Footprint in trade.

In the absence of full bilateral trade data, calculation of the embodied Footprint in exported livestock and dairy for the Netherlands was altered. Rather than using world averages, the Footprint intensity of exports for each product was calculated as the weighted average of the intensities of imports and domestic production. This calculation yields a grazing land Footprint of 0.1 gha per person for 2005.

Fishing Grounds: The fishing grounds component of the National Footprint Accounts uses domestic production Footprint intensities to calculate the Footprint intensity of exports. In the particular case of the Netherlands, with large import and export flows relative to its own production, this approach leads to improbable results. This may occur since the export figures are highly sensitive to the assumed composition of exported products such as "fish filet," whose Footprint intensity was estimated from the Dutch production Footprint. Considering the large trade flows, it makes more sense to use the world average intensities in this case, which results in a more credible result for the Netherlands (Figure 19).

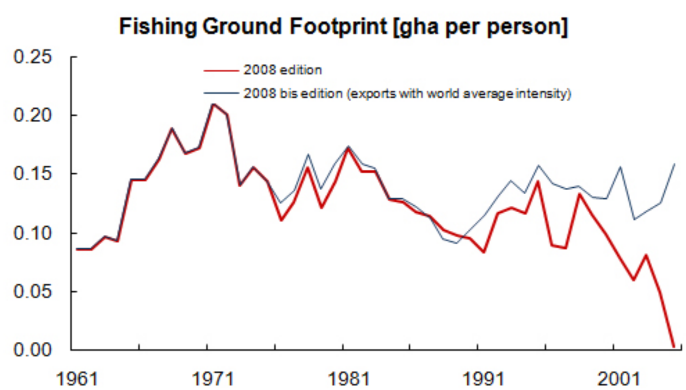


Figure 19. Netherlands per person consumption Footprint for fish: Comparison of 2008 Edition National Footprint Accounts results with 2008 bis results. Using the global average for trophic levels leads to more stable and potentially more realistic results.

The National Footprint Accounts utilize catch data for over 1,300 species of fish. However, only a few of these species are explicitly reported as traded goods. A large portion of international trade in fish is reported in categories of secondary fish products. The composition of these categories, and therefore their Footprint intensities, need to be estimated. This estimate is based on the weighted average of the trophic levels of all species caught that year, but which are not specifically listed as traded commodities. The question is which reference group should be used for the weighting, domestic catch or world average.

For the Netherlands the Footprint intensities of these generic fish categories fluctuate substantially from year to year. In addition, the Netherlands reported large increases in exports of these secondary fish products. Since these are such a large part of the total reported trade tonnage, fluctuations in calculated production intensity substantially affect the estimated Footprint from year to year. Using world average intensities to calculate the embodied Footprint of exports yields a much more stable time trend for the Netherlands, particularly for the 1990s and onwards.

Cropland: The drop in the calculated cropland Footprint for the Netherlands between 1995 and 1997 is primarily due to a drop in the Footprint of imports. The Footprints of production and exports do not change much over these years. In some cases, an abrupt shift in the cropland Footprint occurs when trade or production data for a particular good was not available prior to a given year. In this case, however, the list of goods traded is consistent between years: it is a decrease in the reported import quantities rather than a change in the composition of imported crops that reduces the Footprint. In other words, the Footprint results are consistent with the underlying UN data – it is not driven by a particular assumption embedded in the National Footprint Accounts methodology. Whether this drop is real cannot be answered with the available data set. It could be that the Netherlands carries significant grain stocks from one year to the next, or it could be stemming from statistical tracking problems by the UN or Dutch statistical agencies.

Carbon: The Netherlands' carbon Footprint of consumption drops sharply in 1997, while its Footprint of production remains steady. Again, this is an indication that the calculated Footprint embodied in trade has changed abruptly. In some rare cases it is possible to identify a single commodity that has a reported trade quantity orders of magnitude different from those in other years, which is then driving an abrupt shift in the carbon Footprint. This is not the case for the Netherlands. Here the drop in carbon Footprint is driven by a spike in exports of a variety of traded goods in that particular year. Again, this drop reflects the underlying data set, not any particular assumptions within the National Footprint Accounts.

The 2008 bis edition shows a slightly different time trend for the Netherlands, resulting from changes to the grazing and fish sections. Figure 20 compares the 2008 National Footprint Accounts results with those of the 2008 bis edition. While for most years the difference is small, the 2005 Dutch Footprint reported in the 2008 bis edition was nearly 8 percent larger than that calculated in the National Footprint Accounts.

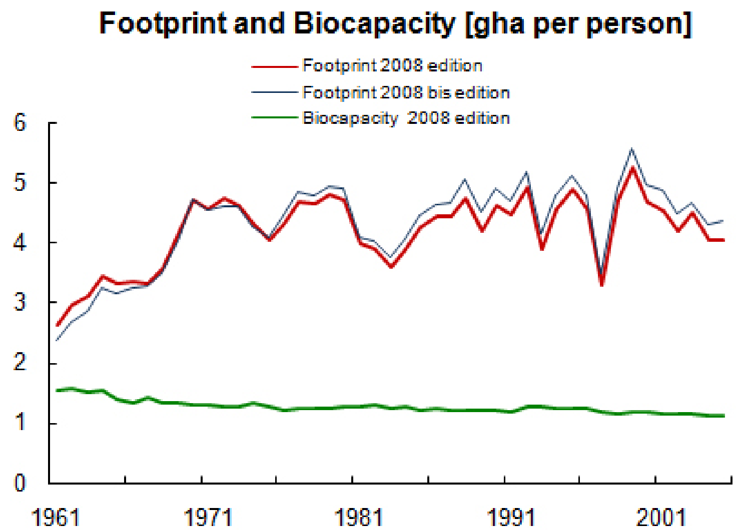


Figure 20. Netherlands per person consumption Footprint: Comparison of 2008 Edition National Footprint Accounts results with 2008 bis results. The grazing land and fishing ground components are relatively small contributors to the Netherlands' overall per person Ecological Footprint of consumption, so the adjustments made to these components do not substantially impact the overall time trend.

APPENDIX D: Research Collaborations

Global Footprint Network serves as the steward of the National Footprint Accounts, which record both a country's resource availability and its resource use. In an effort to make these accounts as accurate and complete as possible, Global Footprint Network invites national governments to participate in research collaborations to improve their own National Footprint Accounts. With improved data and methodology the Ecological Footprint can provide relevant and robust resource-use information that national, regional and local decision-makers can use to establish policy and budget priorities that take into account the supply of and demand on ecological assets.

For example, Global Footprint Network is currently engaged in a research initiative with the United Arab Emirates, in collaboration with the UAE Ministry of Environment and Water (MoEW), the Abu Dhabi Global Environmental Data Initiative (AGEDI), the Emirates Wildlife Society, and the World Wide Fund for Nature (EWS-WWF). Called Al Basama Al Beeiya (Ecological Footprint), this initiative involves multiple stakeholders across the nation working together to improve the UAE's National Footprint Accounts data and to extend Ecological Footprint analysis into national policy by developing guidelines for more a resource-conscious and resource-efficient nation.

By providing these leaders with a common framework and metric that works at all geographic scales, the Ecological Footprint enables comparisons, communication, and concerted action — all in the service of sustainability. In 2005 Global Footprint Network established its "Ten-in-Ten" initiative, with the goal of 10 countries adopting and using the Ecological Footprint as a national indicator by 2015. The ultimate goal is for the Ecological Footprint to become as prominent a metric for countries around the world as GDP, helping to ensure that ecological limits become a central consideration in all decision-making.

For more information on resource collaborations, please contact data@footprintnetwork.org.

APPENDIX E: Research Priorities

The 2008 Edition of the National Footprint Accounts is calculated using more than 5,400 raw data points per country and year. The Accounts include more than 200 countries, where data is available from 1961 to 2005. Results are not reported indvidually for countries with populations under 1 million since results for smaller economies are more prone to distortion.

These National Footprint Accounts, from the first national assessments in 1992 (for Canada) and the first consistent multi-national assessments in 1997 (for the Rio+5 Forum) have been continually improved. Since 2005 this process has been guided by Global Footprint Network's National Accounts Committee. In May of 2007, Ecological Footprint researchers and practitioners from around the world gathered at the International Ecological Footprint Conference at Cardiff University to present and discuss the current state of Ecological Footprint methodology, policy and practice. One outcome of the conference was the publication of *A Research Agenda for Improving National Ecological Footprint Accounts*, with 28 leading Footprint researchers and practitioners as authors (Kitzes et al. 2007a). This paper set forth a comprehensive list of 26 research topics that reflected the major concerns and suggestions of the authors. Many of these same topics were confirmed as research priorities in a review of the Ecological Footprint commissioned by DG Enviornment and released in June 2008, *Potential of the Ecological Footprint for monitoring environmental impact from natural resource use*, available at http://ec.europa.eu/environment/natres/studies.htm (Best et al. 2008).

This appendix provides a brief discussion of nine research topics included in the Research Agenda paper that have been addressed over the past year, or may be addressed in future research. The methodological changes and research priorities in the coming years at Global Footprint Network will continue to follow the suggestions of the National Accounts Committee and leading Footprint researchers and practitioners. By publishing this appendix in *The Ecological Footprint Atlas 2008*, Global Footprint Network continues to improve the scientific rigor and transparency that are required to develop a robust resource accounting tool such as the Ecological Footprint.

Detailed Written Documentation

The Research Agenda paper called for improved documentation of the manner in which the Footprint methodology is implemented in the National Footprint Accounts, and of how the methdology and implementation may have changed from previous editions. In response, Global Footprint Network has published the *Guidebook to the National Footprint Accounts: 2008 Edition* and *Calculation Methodology for the National Footprint Accounts:* 2008, in addition to *The Ecological Footprint Atlas: 2008.* These publications significantly advance documentation of the detailed National Account calculations templates, and "describe, and justify where necessary, differences between current calculation methods and previous methods" (Ewing et al. 2008). In future years, Global Footprint Network anticipates publishing even more detailed and comprehensive documentation to further improve the transparency and scientific rigor of the National Footprint Accounts. These documents, along with greater transparency and clarity in the actual programming of the accounts, are important components of the Quality Assurance process for the Accounts.

Trade

As recommended in the Research Agenda paper, Global Footprint Network, in collaboration with partner organizations, is reviewing the potential of Input-Output Analysis (I-O) for improving the estimation of the Ecological Footprint embodied in traded goods. The Ecological Footprint embodied in traded goods can be estimated using life cycle assessments (LCA), I-O or a hybrid approach. In the 2008 Edition of the National Footprint Accounts, and all previous National Footprint Accounts, the embodied Footprint in traded goods was calculated by multiplying the reported weights of product flows between nations by Footprint intensities in global hectares per tonne to calculate total global hectares imported or exported (e.g., Monfreda et al. 2004). According to the Research Agenda paper,

> "These intensities are derived from ecosystem yields combined with embodied material and energy values usually drawn from LCA product analyses.
>
> An alternative "Input-Output" framework for assessing Footprint trade has also been proposed (Bicknell 1998, Lenzen and Murray 2001, Bagliani et al 2003, Hubacek and Giljum 2003, Turner et al 2007, Wiedmann et al 2007). The I-O based approach "allocate(s) the Ecological Footprint, or any of its underlying component parts, amongst economic sectors, and then to final consumption categories, using direct and indirect monetary or physical flows as described in nation-level supply and use or symmetric I-O tables. By isolating the total value or weight imports and exports by sector, and combining these with Footprint multipliers, total Footprint imports and exports can be calculated. I-O tables are provided by national statistical offices (e.g., ABS 2007) or international organizations (e.g., OECD 2006b)…
>
> Within an LCA framework, the most important priority will be to locate more robust country-specific embodied energy and resource figures to more accurately capture the carbon embodied in traded goods. These "Footprint intensities" could be calculated using an I-O approach.
>
> In addition, although these data have historically been

lacking, the increasing global focus on carbon and carbon markets could potentially lead to increasing research in this area. Many newer LCA databases derive their estimates using I-O frameworks, which may lead to convergence between these two methods (Hendrickson et al. 1998, Joshi 1999, Treloar et al. 2000, Lenzen 2002, Suh and Huppes 2002, Nijdam et al. 2005, Heijungs et al. 2006, Tukker et al. 2006, Weidema et al. 2005, Wiedmann et al 2006a).

Some authors (e.g. Weisz and Duchin 2006) have argued that the best approach for environmentally-related I-O analysis would be the use of hybrid I-O tables comprising both physical and monetary data. Such a hybrid approach may overcome some of the shortcomings of an I-O based framework, such as long time delays between the publication of tables, large categories (particularly for agricultural sector) and other documented error types associated with general I-O analysis (Bicknell 1998). Although the use of monetary input output frameworks can help to establish a direct link between economic activities and environmental consequences, questions remain about how accurate monetary tables are as proxies for assessing land appropriation (Hubaceck and Giljum 2003).

Although in the past I-O tables have been available only for a subset of countries, newer multi-sector, multi-region I-O analyses could be applied to Ecological Footprint analysis. The theoretical basis for these models has been discussed, (Turner et al. in press, Wiedmann et al. 2007), but such an analysis has not yet been completed. The application of such models will need to explicitly consider the production recipe, land and energy use as well as emissions (OECD 2006a). A recently awarded EU grant to partner organizations of Global Footprint Network should generate some pioneering work in this area within the next couple of years.

Monetary I-O based frameworks also may provide the additional benefit of accounting more accurately for the embodied Footprint of international trade in services. As many services traded across borders require biocapacity to operate but have no physical products directly associated with them (e.g., insurance, banking, customer service, etc.), trade in these services could only be captured by non-physical accounts. The current omission of trade in services has the potential to bias upward the Footprint of service exporting nations, such as those with large telecommunications sectors, research and development, or knowledge-based industries" (Kitzes et al. 2007a).

Equivalence Factors

Methodological discussions in the coming year may focus on the basis for the equivalence factors, and specifically whether new global net primary production (NPP) estimates will allow these calculations to be based on usable NPP (as they have been previously) instead of the current suitability indices method.

One possible update would be to overlay the Global Land Cover map (GLC 2000) with the Global Agro-Ecological Zones (GAEZ 2000) map of potential productivity. This method could replace the current calculation, which is not spatial, but rather assumed that the best land is allocated to cropland, the next best to forest, and the poorest to grazing land using GAEZ. The spatial method will be more accurate at reflecting the actual "quality" of the land currently used to support each land cover type.

The final results from the spatial analysis are similar to the GAEZ method. It would also be possible through this method to calculate a separate equivalence factor for built-up land based on the potential productivity of the land that it covers (rather than assuming all built-up land covers average cropland).

Nuclear Footprint

As noted in *Appendix A: Methodology Differences Between the 2006 and 2008 Editions of the National Footprint Accounts,* the emissions proxy component of the nuclear Footprint was removed from the 2008 accounts. This component used a carbon-intensity proxy that the Committee concluded was not a scientifically defensible approach to calculating the Footprint of nuclear electricity. Research on how nuclear energy production could be included in Footprint assessments is still under way. Please refer to *Appendix A: Methodology Differences Between the 2006 and 2008 Editions of the National Footprint Accounts* for greater detail on this decision.

Carbon Footprint

Currently, carbon dioxide emissions represent the most significant human demand on the biosphere. As the largest component of the Ecological Footprint, any methodological changes made in calculating the carbon Footprint have the potential of signifcantly changing the total Footprint. There are may ways the Footprint associated with carbon dioxide emissions could be calculated; several of these are discussed in *A Research Agenda for Improving National Ecological Footprint Accounts* (Kitzes et al. 2007a).

Within the sequestration approach currently used, a number of issues still need to be addressed. Further research is needed, for example, to decide if and how non-CO_2 greenhouse gases should be included in the calculation, how to more accurately calculate the ocean and forest absorption of carbon dioxide, how to take into account differences between coniferous and deciduous carbon dioxide absorption, and whether below ground biomass accumulation should also be included, as recommended in the 2006 IPCC accounting manuals.

Emissions from Non-Fossil Fuels and Gas Flaring

As noted in *Appendix A: Methodology Differences Between the 2006 and 2008 Editions of the National Footprint Accounts,* carbon dioxide emissions from land use change have been added to the 2008 Edition of the National Footprint Accounts. In this edition they are only allocated to the global total, not yet to individual countires.. Fugitive emissions from flaring of associated gas in oil and gas production, industrial emissions from cement production, emissions from tropical forest fires and from some forms of biofuel production are also now included in the accounts (IEA 2007).

Fisheries Yields

Research in the coming year will focus on improving the accuracy of the fishing ground Footprint; initial work has been sponsored by the Oak Foundation. The measurement of fisheries is fraught with methodological and data challenges. This initial research will review the conceptual foundation for calculating the fishing ground Footprint and biocapacity, and identify more effective ways to calculate upper harvesting limits.

Constant Yield Calculations

In order to more meaningfully interpret time trends, a method will be developed to convert global hectares, which represent an amount of actual productivity that varies each year, into constant global hectares. The latter would reflect productivity increases over time by pegging productivity against a global hectare of a fixed year. This would also have implications for the calculation of equivalence factors, which might then more accurately reflect changes over time in the relative productivity of the various area types.

Policy Linkages and Institutional Context

The link between the National Footprint Accounts and other existing standards for economic and environmental accounts needs to be made more explicit. These latter standards include the System of National Accounts, the System of Environmental and Economic Accounting (United Nations et al. 2003), the European Strategy for Environmental Accounting, spatial and remote sensing databases, existing ecosystem and natural capital accounting frameworks, and greenhouse gas and carbon reporting conventions. This is particularly relevant when the National Footprint Accounts are disaggregated by consumption components. It also is pertinent the assessment of trade flows. One step in this process was the adoption of standard product codes, such as HS2002 or SITC rev.3 (UN Comtrade 2007b), for product classification in the 2008 Edition of the National Footprint Accounts.

APPENDIX F: Tables

Table 1: *Per-Person Ecological Footprint of Production, Imports, Exports, and Consumption, by Country, 2005*

Country/Region	Population [millions]	Ecological Footprint of Production [gha per person]	Ecological Footprint of Imports [gha per person]	Ecological Footprint of Exports [gha per person]	Ecological Footprint of Consumption [gha per person]	Biocapacity [gha per person]	Ecological Deficit or Reserve [gha per person]
World	**6475.63**	**2.69**	**-**	**-**	**2.69**	**2.06**	**-0.63**
High Income Countries	**971.82**	**5.98**	**-**	**-**	**6.40**	**3.67**	**-2.71**
Middle Income Countries	**3097.93**	**2.27**	**-**	**-**	**2.19**	**2.16**	**-0.03**
Low Income Countries	**2370.63**	**0.95**	**-**	**-**	**1.00**	**0.88**	**-0.12**
Africa	**901.97**	**1.32**	**-**	**-**	**1.37**	**1.80**	**0.43**
Algeria	32.85	1.29	0.82	0.45	1.66	0.93	-0.73
Angola	15.94	0.78	0.12	0.00	0.91	3.24	2.33
Benin	8.44	0.91	0.21	0.11	1.01	1.47	0.46
Botswana	1.77	2.85	1.12	0.37	3.60	8.45	4.85
Burkina Faso	13.23	1.97	0.10	0.07	2.00	1.60	-0.41
Burundi	7.55	0.77	0.08	0.02	0.84	0.69	-0.15
Cameroon	16.32	1.26	0.21	0.21	1.27	3.07	1.80
Central African Rep.	4.04	1.60	0.04	0.06	1.58	9.37	7.79
Chad	9.75	1.70	0.02	0.01	1.70	2.98	1.28
Congo	4.00	0.56	0.12	0.14	0.54	13.89	13.34
Congo, Dem. Rep.	57.55	0.59	0.02	0.00	0.61	4.17	3.56
Côte d'Ivoire	18.15	1.23	0.11	0.45	0.89	2.18	1.28
Egypt	74.03	1.27	0.52	0.12	1.67	0.37	-1.29
Eritrea	4.40	0.93	0.57	0.35	1.15	2.06	0.91
Ethiopia	77.43	1.32	0.06	0.03	1.35	1.00	-0.35
Gabon	1.38	2.28	0.74	21.30	1.30	24.97	23.68
Gambia	1.52	0.95	0.29	0.04	1.20	1.22	0.02
Ghana	22.11	1.32	0.40	0.23	1.49	1.17	-0.32
Guinea	9.40	1.26	0.04	0.02	1.27	3.03	1.76
Guinea-Bissau	1.59	1.05	0.04	0.19	0.90	3.41	2.51
Kenya	34.26	1.02	0.13	0.08	1.07	1.20	0.13
Lesotho	1.80	0.91	0.22	0.05	1.08	1.06	-0.02
Liberia	3.28	0.92	0.09	0.14	0.86	2.50	1.63
Libya	5.85	2.79	1.49	0.01	4.28	1.01	-3.28
Madagascar	18.61	1.01	0.10	0.03	1.08	3.74	2.66
Malawi	12.88	0.41	0.12	0.05	0.47	0.47	0.00
Mali	13.52	1.56	0.11	0.05	1.62	2.57	0.95

Country/Region	Population [millions]	Ecological Footprint of Production [gha per person]	Ecological Footprint of Imports [gha per person]	Ecological Footprint of Exports [gha per person]	Ecological Footprint of Consumption [gha per person]	Biocapacity [gha per person]	Ecological Deficit (-) or Reserve [gha per person]
Mauritania	3.07	1.79	0.47	0.36	1.90	6.38	4.47
Mauritius	1.25	0.43	2.82	0.99	2.26	0.72	-1.53
Morocco	31.48	1.01	0.72	0.61	1.13	0.69	-0.44
Mozambique	19.79	0.73	0.25	0.05	0.93	3.43	2.49
Namibia	2.03	3.84	1.06	1.20	3.71	8.98	5.27
Niger	13.96	1.58	0.06	0.01	1.64	1.84	0.20
Nigeria	131.53	1.30	0.05	0.01	1.34	0.96	-0.38
Rwanda	9.04	0.77	0.04	0.01	0.79	0.47	-0.32
Senegal	11.66	1.20	0.34	0.19	1.36	1.52	0.16
Sierra Leone	5.53	0.76	0.03	0.01	0.77	1.01	0.24
Somalia	8.23	1.36	0.04	0.01	1.40	1.42	0.02
South Africa, Rep.	47.43	3.06	0.64	1.62	2.08	2.21	0.13
Sudan	36.23	2.20	0.28	0.04	2.44	2.79	0.35
Swaziland	1.03	1.23	1.38	3.37	0.74	1.68	0.95
Tanzania, United Rep.	38.33	1.10	0.11	0.06	1.14	1.20	0.05
Togo	6.15	0.86	0.19	0.24	0.82	1.08	0.26
Tunisia	10.10	1.38	1.23	0.85	1.76	1.15	-0.61
Uganda	28.82	1.36	0.08	0.06	1.37	0.94	-0.43
Zambia	11.67	0.68	0.24	0.15	0.77	2.86	2.09
Zimbabwe	13.01	1.10	0.22	0.20	1.12	0.75	-0.37
Middle East and Central Asia	**365.65**	**2.17**	**-**	**-**	**2.32**	**1.28**	**-1.04**
Afghanistan	29.86	0.45	0.04	0.01	0.48	0.73	0.25
Armenia	3.02	0.99	0.60	0.15	1.44	0.82	-0.62
Azerbaijan	8.41	1.86	0.64	0.33	2.16	1.02	-1.14
Georgia	4.47	0.91	0.59	0.43	1.08	1.76	0.68
Iran	69.52	2.56	0.56	0.44	2.68	1.42	-1.26
Iraq	28.81	1.15	0.19	0.00	1.33	0.28	-1.06
Israel	6.73	3.01	3.31	1.47	4.85	0.40	-4.44
Jordan	5.70	1.27	1.79	1.35	1.71	0.27	-1.43
Kazakhstan	14.83	4.31	1.00	1.95	3.37	4.28	0.91
Kuwait	2.69	8.23	3.03	2.37	8.89	0.53	-8.36
Kyrgyzstan	5.26	0.95	0.35	0.21	1.10	1.66	0.56
Lebanon	3.58	1.72	2.10	0.74	3.08	0.43	-2.65
Oman	2.57	3.91	2.34	1.57	4.68	2.55	-2.13
Saudi Arabia	24.57	4.36	2.15	3.89	2.62	1.27	-1.35
Syria	19.04	1.58	0.86	0.37	2.08	0.84	-1.23
Tajikistan	6.51	0.73	0.03	0.05	0.70	0.56	-0.15
Turkey	73.19	2.09	1.34	0.72	2.71	1.65	-1.06
Turkmenistan	4.83	3.92	0.02	0.08	3.86	3.68	-0.18
United Arab Emirates*	4.50	7.52	11.34	9.41	9.46	1.08	-8.38

Country/Region	Population [millions]	Ecological Footprint of Production [gha per person]	Ecological Footprint of Imports [gha per person]	Ecological Footprint of Exports [gha per person]	Ecological Footprint of Consumption [gha per person]	Biocapacity [gha per person]	Ecological Deficit (-) or Reserve [gha per person]
Uzbekistan	26.59	1.87	0.02	0.08	1.81	1.02	-0.79
Yemen	20.97	0.67	0.38	0.13	0.91	0.58	-0.33
Asia-Pacific	**3562.11**	**1.56**	**-**	**-**	**1.62**	**0.82**	**-0.80**
Australia	20.16	12.69	2.58	7.46	7.81	15.42	7.62
Bangladesh	141.82	0.47	0.12	0.02	0.57	0.25	-0.32
Bhutan	2.16	0.99	0.02	0.01	1.00	1.83	0.84
Cambodia	14.07	0.88	0.15	0.08	0.94	0.93	-0.01
China	1323.35	1.98	0.41	0.28	2.11	0.86	-1.25
India	1103.37	0.86	0.13	0.09	0.89	0.41	-0.48
Indonesia	222.78	1.44	0.27	0.77	0.95	1.39	0.44
Japan*	128.09	3.29	2.82	1.22	4.89	0.60	-4.29
Korea DPR	22.49	1.50	0.07	0.01	1.56	0.64	-0.92
Korea, Rep.	47.82	3.38	3.61	3.25	3.74	0.70	-3.04
Lao PDR	5.92	1.09	0.01	0.05	1.06	2.34	1.28
Malaysia	25.35	3.36	2.78	3.72	2.42	2.67	0.25
Mongolia	2.65	3.29	0.43	0.22	3.50	14.65	11.15
Myanmar	50.52	1.18	0.01	0.09	1.11	1.50	0.39
Nepal	27.13	0.74	0.03	0.01	0.76	0.37	-0.39
New Zealand	4.03	13.11	3.52	8.94	7.70	14.06	6.36
Pakistan	157.94	0.72	0.19	0.09	0.82	0.43	-0.40
Papua New Guinea	5.89	2.15	0.08	0.54	1.69	4.45	2.76
Philippines	83.05	1.02	0.39	0.54	0.87	0.54	-0.33
Singapore	4.33	2.94	12.46	11.23	4.16	0.03	-4.13
Sri Lanka	20.74	0.69	0.50	0.16	1.02	0.37	-0.65
Thailand	64.23	2.14	1.42	1.43	2.13	0.98	-1.15
Viet Nam	84.24	1.09	0.37	0.20	1.26	0.80	-0.46
Latin America and the Caribbean	**553.20**	**2.71**	**-**	**-**	**2.44**	**4.80**	**2.36**
Argentina	38.75	4.88	0.53	2.96	2.46	8.13	5.68
Bolivia	9.18	2.26	0.28	0.42	2.12	15.71	13.59
Brazil	186.41	3.32	0.30	1.26	2.36	7.26	4.91
Chile	16.30	4.16	1.30	2.46	3.00	4.14	1.14
Colombia	45.60	1.65	0.48	0.34	1.79	3.90	2.11
Costa Rica	4.33	1.72	1.61	1.06	2.27	1.84	-0.43
Cuba	11.27	1.22	0.75	0.20	1.76	1.05	-0.71
Dominican Rep.	8.90	1.23	0.30	0.04	1.49	0.80	-0.69
Ecuador*	13.23	2.17	0.68	0.65	2.20	2.14	-0.06
El Salvador	6.88	1.07	0.84	0.29	1.62	0.72	-0.90
Guatemala	12.60	1.28	0.73	0.51	1.51	1.29	-0.22
Haiti	8.53	0.42	0.11	0.00	0.53	0.26	-0.27
Honduras	7.21	1.48	0.59	0.30	1.77	1.87	0.09

Country/Region	Population [millions]	Ecological Footprint of Production [gha per person]	Ecological Footprint of Imports [gha per person]	Ecological Footprint of Exports [gha per person]	Ecological Footprint of Consumption [gha per person]	Biocapacity [gha per person]	Ecological Deficit (-) or Reserve [gha per person]
Jamaica	2.65	1.53	2.22	2.67	1.09	0.63	-0.45
Mexico	107.03	2.15	1.95	0.72	3.38	1.67	-1.71
Nicaragua	5.49	1.98	0.40	0.34	2.05	3.29	1.24
Panama	3.23	2.63	0.97	0.41	3.19	3.49	0.30
Paraguay	6.16	3.89	0.52	1.19	3.22	9.71	6.50
Peru	27.97	1.51	0.50	0.45	1.57	4.02	2.45
Trinidad and Tobago	1.31	5.47	3.59	6.92	2.13	2.05	-0.08
Uruguay	3.46	7.33	1.05	2.90	5.48	10.51	5.03
Venezuela	26.75	2.88	0.67	0.74	2.81	3.15	0.34
North America	**330.48**	**8.97**	**-**	**-**	**9.19**	**6.49**	**-2.71**
Canada	32.27	12.13	4.80	9.86	7.07	20.05	12.98
United States of America	298.21	8.63	2.57	1.77	9.42	5.02	-4.40
Europe (EU)	**487.33**	**4.28**	**-**	**-**	**4.69**	**2.32**	**-2.38**
Austria	8.19	5.15	7.76	7.93	4.98	2.86	-2.12
Belgium*	10.42	4.57	18.75	18.19	5.13	1.13	-4.00
Bulgaria	7.73	3.40	1.66	2.34	2.71	2.79	0.08
Czech Rep.	10.22	5.59	4.83	5.08	5.36	2.74	-2.61
Denmark	5.43	6.51	9.24	7.73	8.04	5.70	-2.34
Estonia	1.33	7.44	5.14	6.19	6.39	9.09	2.69
Finland*	5.25	9.87	7.62	12.24	5.25	11.73	6.48
France	60.50	4.53	3.99	3.59	4.93	3.05	-1.88
Germany*	82.69	4.60	4.73	5.11	4.23	1.94	-2.29
Greece	11.12	4.23	3.21	1.58	5.86	1.69	-4.17
Hungary	10.10	3.97	2.95	3.37	3.55	2.82	-0.73
Ireland**	4.15	5.90	5.46	5.10	6.26	4.25	-2.01
Italy	58.09	3.38	4.16	2.77	4.76	1.23	-3.53
Latvia	2.31	5.24	3.09	4.84	3.49	6.97	3.49
Lithuania	3.43	3.73	4.16	4.69	3.20	4.18	0.98
Netherlands	16.30	4.25	11.74	11.60	4.39	1.13	-3.26
Poland	38.53	4.00	2.08	2.12	3.96	2.10	-1.86
Portugal	10.50	3.29	3.80	2.65	4.44	1.23	-3.20
Romania	21.71	2.93	1.22	1.28	2.87	2.26	-0.61
Slovakia	5.40	4.19	4.08	4.98	3.29	2.82	-0.47
Slovenia	1.97	3.85	7.41	6.79	4.46	2.20	-2.27
Spain	43.06	4.09	4.21	2.56	5.74	1.34	-4.40
Sweden	9.04	8.98	6.58	10.46	5.10	9.97	4.87
United Kingdom	59.89	3.67	3.62	1.96	5.33	1.65	-3.68
Europe (Non-EU)	**239.64**	**4.28**	**-**	**-**	**3.52**	**5.81**	**2.29**
Albania	3.13	1.24	1.14	0.15	2.23	1.20	-1.03

Country/Region	Population [millions]	Ecological Footprint of Production [gha per person]	Ecological Footprint of Imports [gha per person]	Ecological Footprint of Exports [gha per person]	Ecological Footprint of Consumption [gha per person]	Biocapacity [gha per person]	Ecological Deficit (-) or Reserve [gha per person]
Belarus	9.76	3.80	1.70	1.65	3.85	3.43	-0.43
Bosnia Herzegovina	3.91	2.39	1.76	1.23	2.92	1.99	-0.93
Croatia	4.55	2.68	2.72	2.20	3.20	2.20	-1.01
Macedonia, FYR	2.03	2.27	3.32	0.98	4.61	1.45	-3.16
Moldova, Rep.	4.21	1.05	0.56	0.38	1.23	1.28	0.05
Norway	4.62	11.11	9.32	13.51	6.92	6.12	-0.80
Russian Federation	143.20	4.89	0.68	1.82	3.75	8.11	4.37
Serbia / Montenegro	10.50	2.56	0.18	0.13	2.61	1.64	-0.98
Switzerland**	7.25	2.77	5.67	3.44	5.00	1.27	-3.73
Ukraine	46.48	3.38	1.14	1.83	2.69	2.40	-0.29

Table 2: *Total Ecological Footprint of Production, Imports, Exports, and Consumption, 2005*

Country/Region	Population [millions]	Ecological Footprint of Production [million gha]	Ecological Footprint of Imports [million gha]	Ecological Footprint of Exports [million gha]	Ecological Footprint of Consumption [million gha]	Biocapacity [million gha]	Ecological Deficit (-) or Reserve [million gha]
World	**6475.63**	**17443.59**	**-**	**-**	**17443.59**	**13360.95**	**-4082.67**
High Income Countries	**971.82**	**5811.24**	**-**	**-**	**6196.04**	**3561.53**	**-2634.51**
Middle Income Countries	**3097.93**	**7037.06**	**-**	**-**	**6787.01**	**6684.83**	**-102.19**
Low Income Countries	**2370.63**	**2257.67**	**-**	**-**	**2377.20**	**2089.69**	**-287.51**
Africa	**901.97**	**1189.63**	**-**	**-**	**1237.53**	**1627.09**	**389.56**
Algeria	32.85	42.44	27.00	14.76	54.68	30.64	-24.04
Angola	15.94	12.51	1.99	0.02	14.48	51.67	37.19
Benin	8.44	7.72	1.76	0.97	8.51	12.41	3.90
Botswana	1.77	5.03	1.98	0.65	6.36	14.92	8.55
Burkina Faso	13.23	26.07	1.37	0.92	26.52	21.16	-5.36
Burundi	7.55	5.83	0.60	0.12	6.31	5.18	-1.13
Cameroon	16.32	20.62	3.48	3.40	20.70	50.05	29.35
Central African Rep.	4.04	6.47	0.16	0.24	6.40	37.85	31.45
Chad	9.75	16.55	0.16	0.12	16.59	29.03	12.44
Congo	4.00	2.25	0.46	0.54	2.17	55.53	53.36
Congo, Dem. Rep.	57.55	34.12	1.29	0.21	35.21	239.91	204.71
Côte d'Ivoire	18.15	22.40	2.07	8.26	16.21	39.52	23.31
Egypt	74.03	94.13	38.39	9.17	123.35	27.56	-95.79
Eritrea	4.40	4.09	2.49	1.53	5.05	9.07	4.02
Ethiopia	77.43	102.44	4.35	2.11	104.68	77.75	-26.92
Gabon	1.38	3.15	1.02	29.48	1.80	34.56	32.77
Gambia	1.52	1.45	0.44	0.06	1.83	1.85	0.02
Ghana	22.11	29.13	8.86	5.13	32.85	25.79	-7.06
Guinea	9.40	11.82	0.35	0.22	11.95	28.53	16.57
Guinea-Bissau	1.59	1.66	0.07	0.30	1.43	5.41	3.98
Kenya	34.26	34.88	4.36	2.70	36.55	40.98	4.43
Lesotho	1.80	1.63	0.40	0.09	1.93	1.90	-0.03
Liberia	3.28	3.02	0.28	0.46	2.84	8.20	5.36
Libya	5.85	16.34	8.75	0.03	25.06	5.88	-19.18
Madagascar	18.61	18.86	1.86	0.60	20.12	69.66	49.54
Malawi	12.88	5.22	1.53	0.68	6.07	6.03	-0.04
Mali	13.52	21.08	1.55	0.74	21.90	34.71	12.82
Mauritania	3.07	5.48	1.44	1.09	5.84	19.57	13.73
Mauritius	1.25	0.54	3.51	1.24	2.81	0.90	-1.91
Morocco	31.48	31.84	22.81	19.08	35.57	21.74	-13.84
Mozambique	19.79	14.54	4.99	1.08	18.45	67.80	49.35

Country/Region	Population [millions]	Ecological Footprint of Production [million gha]	Ecological Footprint of Imports [million gha]	Ecological Footprint of Exports [million gha]	Ecological Footprint of Consumption [million gha]	Biocapacity [million gha]	Ecological Deficit (-) or Reserve [million gha]
Namibia	2.03	7.80	2.16	2.43	7.53	18.24	10.71
Niger	13.96	22.07	0.83	0.08	22.83	25.66	2.83
Nigeria	131.53	171.19	7.23	1.95	176.47	126.21	-50.25
Rwanda	9.04	6.96	0.33	0.12	7.17	4.29	-2.88
Senegal	11.66	13.98	4.01	2.17	15.82	17.70	1.88
Sierra Leone	5.53	4.18	0.16	0.07	4.27	5.57	1.31
Somalia	8.23	11.23	0.34	0.05	11.52	11.67	0.15
South Africa, Rep.	47.43	145.11	30.47	76.85	98.73	104.75	6.02
Sudan	36.23	79.85	10.02	1.51	88.36	101.12	12.77
Swaziland	1.03	1.27	1.43	3.47	0.76	1.74	0.98
Tanzania, United Rep.	38.33	42.22	4.03	2.36	43.88	45.84	1.96
Togo	6.15	5.29	1.17	1.47	5.05	6.65	1.60
Tunisia	10.10	13.95	12.47	8.60	17.81	11.61	-6.20
Uganda	28.82	39.06	2.18	1.61	39.62	27.16	-12.46
Zambia	11.67	7.93	2.84	1.78	8.99	33.41	24.42
Zimbabwe	13.01	14.25	2.84	2.55	14.55	9.72	-4.82
Middle East and Central Asia	**365.65**	**793.06**	**-**	**-**	**846.77**	**466.92**	**-379.85**
Afghanistan	29.86	13.36	1.21	0.33	14.25	21.75	7.49
Armenia	3.02	2.98	1.82	0.46	4.34	2.46	-1.88
Azerbaijan	8.41	15.61	5.36	2.80	18.17	8.59	-9.58
Georgia	4.47	4.07	2.66	1.91	4.81	7.87	3.05
Iran	69.52	177.90	38.95	30.83	186.03	98.48	-87.55
Iraq	28.81	33.07	5.46	0.09	38.44	7.98	-30.46
Israel	6.73	20.23	22.27	9.91	32.59	2.71	-29.88
Jordan	5.70	7.22	10.20	7.69	9.73	1.55	-8.18
Kazakhstan	14.83	63.93	14.84	28.90	49.98	63.46	13.48
Kuwait	2.69	22.10	8.14	6.37	23.88	1.42	-22.46
Kyrgyzstan	5.26	4.99	1.86	1.08	5.77	8.73	2.96
Lebanon	3.58	6.17	7.50	2.63	11.03	1.53	-9.50
Oman	2.57	10.05	6.00	4.04	12.01	6.56	-5.46
Saudi Arabia	24.57	107.10	52.90	95.51	64.49	31.25	-33.24
Syria	19.04	30.11	16.46	6.99	39.57	16.07	-23.51
Tajikistan	6.51	4.72	0.19	0.33	4.58	3.61	-0.97
Turkey	73.19	152.98	98.21	52.64	198.55	120.88	-77.67
Turkmenistan	4.83	18.96	0.10	0.39	18.66	17.80	-0.86
United Arab Emirates*	4.50	33.83	51.01	42.31	42.53	4.83	-37.70
Uzbekistan	26.59	49.61	0.62	2.03	48.20	27.15	-21.05
Yemen	20.98	14.07	8.00	2.93	19.14	12.25	-6.89

	Population [millions]	Ecological Footprint of Production [million gha]	Ecological Footprint of Imports [million gha]	Ecological Footprint of Exports [million gha]	Ecological Footprint of Consumption [million gha]	Biocapacity [million gha]	Ecological Deficit (-) or Reserve [million gha]
Asia-Pacific	**3562.11**	**5545.42**	**-**	**-**	**5758.57**	**2923.30**	**-2835.27**
Australia	20.16	255.77	51.91	150.29	157.40	310.88	153.49
Bangladesh	141.82	67.16	17.69	3.35	81.50	35.61	-45.89
Bhutan	2.16	2.15	0.03	0.03	2.15	3.97	1.81
Cambodia	14.07	12.35	2.06	1.14	13.27	13.10	-0.17
China	1323.35	2621.33	540.70	375.22	2786.81	1132.68	-1654.13
India	1103.37	947.16	138.22	99.07	986.32	452.08	-534.24
Indonesia	222.78	321.35	60.55	170.61	211.29	310.13	98.84
Japan*	128.09	421.84	360.92	156.17	626.58	77.20	-549.39
Korea DPR	22.49	33.71	1.67	0.21	35.17	14.40	-20.77
Korea, Rep.	47.82	161.49	172.83	155.41	178.91	33.40	-145.51
Lao PDR	5.92	6.48	0.07	0.29	6.26	13.84	7.58
Malaysia	25.35	85.28	70.38	94.33	61.33	67.77	6.45
Mongolia	2.65	8.70	1.14	0.59	9.25	38.75	29.50
Myanmar	50.52	59.84	0.63	4.50	55.97	75.66	19.69
Nepal	27.13	20.12	0.75	0.18	20.69	10.03	-10.66
New Zealand	4.03	52.81	14.18	35.99	31.00	56.64	25.64
Pakistan	157.94	113.85	29.93	13.62	130.15	67.26	-62.89
Papua New Guinea	5.89	12.65	0.46	3.16	9.95	26.18	16.23
Philippines	83.05	84.67	32.54	44.98	72.23	45.23	-27.00
Singapore	4.33	12.71	53.89	48.58	18.01	0.15	-17.86
Sri Lanka	20.74	14.26	10.35	3.37	21.24	7.77	-13.47
Thailand	64.23	137.63	90.96	91.72	136.86	62.89	-73.97
Viet Nam	84.24	92.12	31.35	17.24	106.23	67.66	-38.57
Latin America and the Caribbean	**553.20**	**1500.59**	**-**	**-**	**1350.76**	**2655.69**	**1304.93**
Argentina	38.75	189.21	20.50	114.56	95.15	315.13	219.98
Bolivia	9.18	20.75	2.53	3.84	19.45	144.21	124.76
Brazil	186.41	619.47	55.42	235.68	439.21	1353.78	914.57
Chile	16.30	67.83	21.23	40.16	48.91	67.42	18.51
Colombia	45.60	75.34	21.87	15.58	81.63	177.95	96.32
Costa Rica	4.33	7.42	6.98	4.58	9.83	7.96	-1.86
Cuba	11.27	13.70	8.41	2.25	19.86	11.84	-8.02
Dominican Rep.	8.90	10.93	2.66	0.36	13.23	7.13	-6.11
Ecuador*	13.23	28.64	9.04	8.56	29.11	28.29	-0.83
El Salvador	6.88	7.39	5.76	2.00	11.14	4.95	-6.19
Guatemala	12.60	16.18	9.25	6.46	18.97	16.20	-2.77
Haiti	8.53	3.62	0.96	0.02	4.56	2.25	-2.31
Honduras	7.21	10.65	4.29	2.16	12.78	13.46	0.68
Jamaica	2.65	4.06	5.89	7.07	2.88	1.68	-1.20
Mexico	107.03	230.23	209.20	77.50	361.93	178.41	-183.52
Nicaragua	5.49	10.86	2.22	1.84	11.25	18.03	6.78

Country/Region	Population [millions]	Ecological Footprint of Production [million gha]	Ecological Footprint of Imports [million gha]	Ecological Footprint of Exports [million gha]	Ecological Footprint of Consumption [million gha]	Biocapacity [million gha]	Ecological Deficit (-) or Reserve [million gha]
Panama	3.23	8.51	3.12	1.32	10.32	11.27	0.95
Paraguay	6.16	23.94	3.22	7.34	19.82	59.82	40.00
Peru	27.97	42.24	14.12	12.54	43.83	112.45	68.62
Trinidad and Tobago	1.31	7.13	4.68	9.03	2.78	2.68	-0.10
Uruguay	3.46	25.38	3.64	10.05	18.97	36.39	17.43
Venezuela	26.75	77.10	17.92	19.83	75.19	84.39	9.20
North America	**330.48**	**2964.40**	**-**	**-**	**3037.82**	**2143.30**	**-894.52**
Canada	32.27	391.34	154.79	318.05	228.08	646.87	418.79
United States of America	298.21	2573.06	765.73	529.04	2809.75	1496.43	-1313.32
Europe (EU)	**487.33**	**2086.27**	**-**	**-**	**2291.82**	**1128.18**	**-1163.64**
Austria	8.19	42.17	63.53	64.92	40.77	23.38	-17.39
Belgium*	10.42	47.65	195.39	189.56	53.48	11.74	-41.64
Bulgaria	7.73	26.27	12.81	18.11	20.98	21.57	0.60
Czech Rep.	10.22	57.12	49.37	51.95	54.75	28.03	-26.72
Denmark	5.43	35.38	50.21	41.97	43.64	30.96	-12.68
Estonia	1.33	9.89	6.84	8.23	8.50	12.09	3.58
Finland*	5.25	51.82	39.97	64.25	27.54	61.58	34.04
France	60.50	273.82	241.18	216.93	298.07	184.42	-113.65
Germany*	82.69	380.76	390.95	422.25	349.47	160.47	-189.00
Greece	11.12	47.03	35.66	17.53	65.16	18.78	-46.38
Hungary	10.10	40.11	29.78	34.07	35.84	28.49	-7.35
Ireland**	4.15	24.48	22.64	21.15	25.97	17.64	-8.33
Italy	58.09	196.10	241.59	161.15	276.54	71.21	-205.33
Latvia	2.31	12.09	7.12	11.16	8.05	16.09	8.04
Lithuania	3.43	12.81	14.27	16.09	10.98	14.36	3.38
Netherlands	16.30	69.19	191.35	189.00	71.54	18.42	-53.12
Poland	38.53	154.14	80.18	81.74	152.58	81.03	-71.55
Portugal	10.50	34.51	39.86	27.82	46.55	12.93	-33.62
Romania	21.71	63.56	26.56	27.80	62.32	49.05	-13.27
Slovakia	5.40	22.63	22.03	26.90	17.76	15.21	-2.56
Slovenia	1.97	7.57	14.57	13.36	8.77	4.32	-4.46
Spain	43.06	176.08	181.29	110.17	247.21	57.60	-189.61
Sweden	9.04	81.21	59.46	94.56	46.11	90.18	44.07
United Kingdom	59.89	219.86	216.78	117.43	319.22	98.64	-220.58
Europe (Non-EU)	**239.64**	**1026.67**	**-**	**-**	**842.40**	**1391.56**	**549.15**
Albania	3.13	3.89	3.57	0.48	6.98	3.75	-3.24
Belarus	9.76	37.09	16.58	16.08	37.59	33.43	-4.16
Bosnia Herzegovina	3.91	9.33	6.89	4.80	11.42	7.79	-3.63
Croatia	4.55	12.21	12.39	10.01	14.59	9.99	-4.59
Macedonia, FYR	2.03	4.61	6.76	2.00	9.37	2.94	-6.43

Country/Region	Population [millions]	Ecological Footprint of Production [million gha]	Ecological Footprint of Imports [million gha]	Ecological Footprint of Exports [million gha]	Ecological Footprint of Consumption [million gha]	Biocapacity [million gha]	Ecological Deficit (-) or Reserve [million gha]
Moldova, Rep.	4.21	4.44	2.34	1.59	5.18	5.39	0.21
Norway	4.62	51.32	43.06	62.43	31.95	28.26	-3.68
Russian Federation	143.20	699.60	97.13	260.34	536.39	1161.85	625.46
Serbia / Montenegro	10.50	26.87	1.88	1.32	27.43	17.18	-10.25
Switzerland**	7.25	20.08	41.11	24.92	36.27	9.20	-27.06
Ukraine	46.48	157.23	53.00	85.13	125.23	111.76	-13.47

Table 3: *Per-Person Ecological Footprint of Consumption by Component*

Country/Region	Total Ecological Footprint [gha per person]	Cropland [gha per person]	Grazing Land [gha per person]	Forest Land [gha per person]	Fishing Grounds [gha per person]	Carbon Uptake Land [gha per person]	Built-up Land [gha per person]
World	**2.69**	**0.64**	**0.26**	**0.23**	**0.09**	**1.41**	**0.07**
High Income Countries	**6.38**	**1.15**	**0.28**	**0.61**	**0.17**	**4.04**	**0.13**
Middle Income Countries	**2.19**	**0.62**	**0.22**	**0.18**	**0.09**	**1.00**	**0.08**
Low Income Countries	**1.00**	**0.44**	**0.09**	**0.15**	**0.02**	**0.26**	**0.05**
Africa	**1.37**	**0.54**	**0.25**	**0.24**	**0.03**	**0.26**	**0.05**
Algeria	1.66	0.62	0.17	0.13	0.01	0.69	0.05
Angola	0.91	0.40	0.15	0.11	0.05	0.15	0.05
Benin	1.01	0.44	0.08	0.24	0.02	0.19	0.04
Botswana	3.60	0.09	1.81	0.16	0.00	1.48	0.05
Burkina Faso	2.00	0.99	0.52	0.33	0.00	0.07	0.10
Burundi	0.84	0.30	0.05	0.37	0.01	0.07	0.04
Cameroon	1.27	0.53	0.33	0.23	0.03	0.09	0.06
Central African Rep.	1.58	0.38	0.88	0.22	0.01	0.02	0.07
Chad	1.70	0.71	0.66	0.25	0.01	0.00	0.08
Congo	0.54	0.24	0.03	0.11	0.04	0.07	0.05
Congo, Dem. Rep.	0.61	0.18	0.00	0.41	0.01	0.01	0.00
Côte d'Ivoire	0.89	0.48	0.02	0.17	0.05	0.10	0.07
Egypt	1.67	0.72	0.02	0.11	0.01	0.71	0.10
Eritrea	1.15	0.24	0.53	0.17	0.01	0.16	0.04
Ethiopia	1.35	0.38	0.46	0.40	0.00	0.06	0.05
Gabon	1.30	0.43	0.04	0.60	0.15	0.01	0.06
Gambia	1.20	0.72	0.15	0.17	0.05	0.07	0.05
Ghana	1.49	0.59	0.00	0.33	0.21	0.30	0.06
Guinea	1.27	0.45	0.32	0.42	0.03	0.00	0.05
Guinea-Bissau	0.90	0.39	0.31	0.14	0.00	0.00	0.06
Kenya	1.07	0.25	0.41	0.22	0.02	0.12	0.04
Lesotho	1.08	0.09	0.47	0.35	0.00	0.15	0.02
Liberia	0.86	0.26	0.01	0.52	0.03	0.00	0.05
Libya	4.28	0.68	0.21	0.07	0.02	3.27	0.04
Madagascar	1.08	0.28	0.46	0.19	0.06	0.04	0.06
Malawi	0.47	0.21	0.00	0.15	0.00	0.07	0.03
Mali	1.62	0.67	0.64	0.13	0.01	0.08	0.08
Mauritania	1.90	0.35	1.23	0.17	0.10	0.00	0.06
Mauritius	2.26	0.51	0.03	0.16	1.02	0.53	0.00
Morocco	1.13	0.55	0.18	0.05	0.06	0.26	0.03
Mozambique	0.93	0.37	0.00	0.30	0.00	0.19	0.06
Namibia	3.71	0.38	1.75	0.00	0.89	0.64	0.05
Niger	1.64	1.19	0.15	0.21	0.01	0.04	0.04
Nigeria	1.34	0.95	0.00	0.19	0.02	0.12	0.06
Rwanda	0.79	0.44	0.09	0.20	0.00	0.03	0.03

Country/Region	Total Ecological Footprint [gha per person]	Cropland [gha per person]	Grazing Land [gha per person]	Forest Land [gha per person]	Fishing Grounds [gha per person]	Carbon Uptake Land [gha per person]	Built-up Land [gha per person]
Senegal	1.36	0.60	0.30	0.19	0.06	0.15	0.05
Sierra Leone	0.77	0.30	0.02	0.32	0.10	0.00	0.03
Somalia	1.40	0.16	0.77	0.41	0.01	0.00	0.06
South Africa, Rep.	2.08	0.44	0.23	0.27	0.04	1.03	0.07
Sudan	2.44	0.59	1.34	0.19	0.00	0.26	0.05
Swaziland	0.74	0.19	0.45	0.00	0.00	0.00	0.08
Tanzania, United Rep.	1.14	0.34	0.42	0.21	0.03	0.09	0.06
Togo	0.82	0.41	0.04	0.30	0.02	0.00	0.04
Tunisia	1.76	0.78	0.10	0.18	0.09	0.57	0.05
Uganda	1.37	0.62	0.15	0.46	0.06	0.03	0.06
Zambia	0.77	0.14	0.19	0.24	0.01	0.14	0.05
Zimbabwe	1.12	0.26	0.37	0.24	0.00	0.21	0.03
Middle East and Central Asia	**2.32**	**0.69**	**0.08**	**0.08**	**0.04**	**1.34**	**0.08**
Afghanistan	0.48	0.27	0.10	0.05	0.00	0.00	0.06
Armenia	1.44	0.53	0.21	0.03	0.00	0.60	0.07
Azerbaijan	2.16	0.58	0.26	0.04	0.00	1.20	0.07
Georgia	1.08	0.49	0.26	0.04	0.01	0.23	0.06
Iran	2.68	0.69	0.11	0.04	0.09	1.66	0.09
Iraq	1.33	0.42	0.03	0.01	0.00	0.84	0.03
Israel	4.85	0.97	0.06	0.30	0.03	3.40	0.08
Jordan	1.71	0.70	0.05	0.14	0.00	0.71	0.10
Kazakhstan	3.37	1.18	0.00	0.11	0.01	2.03	0.05
Kuwait	8.89	0.71	0.10	0.17	0.02	7.75	0.15
Kyrgyzstan	1.10	0.56	0.01	0.01	0.00	0.41	0.10
Lebanon	3.08	0.68	0.07	0.25	0.02	2.01	0.06
Oman	4.68	0.41	0.17	0.13	0.44	3.40	0.14
Saudi Arabia	2.62	0.82	0.11	0.12	0.03	1.33	0.22
Syria	2.08	0.78	0.12	0.07	0.00	1.05	0.06
Tajikistan	0.70	0.30	0.08	0.01	0.00	0.25	0.06
Turkey	2.71	1.00	0.04	0.17	0.05	1.37	0.08
Turkmenistan	3.86	1.08	0.17	0.00	0.01	2.46	0.14
United Arab Emirates*	9.46	1.03	0.03	0.37	0.21	7.82	0.00
Uzbekistan	1.81	0.50	0.04	0.01	0.00	1.19	0.08
Yemen	0.91	0.26	0.13	0.02	0.10	0.36	0.05
Asia-Pacific	**1.62**	**0.49**	**0.08**	**0.13**	**0.07**	**0.78**	**0.06**
Australia	7.81	1.93	2.82	0.94	0.08	1.98	0.06
Bangladesh	0.57	0.33	0.00	0.07	0.01	0.13	0.04
Bhutan	1.00	0.12	0.12	0.67	0.00	0.00	0.09
Cambodia	0.94	0.44	0.08	0.21	0.04	0.14	0.04
China	2.11	0.56	0.15	0.12	0.07	1.13	0.07
India	0.89	0.40	0.01	0.10	0.01	0.33	0.04
Indonesia	0.95	0.50	0.00	0.12	0.16	0.09	0.08

Country/Region	Total Ecological Footprint [gha per person]	Cropland [gha per person]	Grazing Land [gha per person]	Forest Land [gha per person]	Fishing Grounds [gha per person]	Carbon Uptake Land [gha per person]	Built-up Land [gha per person]
Japan*	4.89	0.58	0.04	0.24	0.28	3.68	0.08
Korea DPR	1.56	0.43	0.00	0.12	0.02	0.94	0.06
Korea, Rep.	3.74	0.66	0.04	0.19	0.31	2.47	0.06
Lao PDR	1.06	0.48	0.14	0.33	0.01	0.00	0.10
Malaysia	2.42	0.55	0.04	0.44	0.23	1.07	0.09
Mongolia	3.50	0.21	1.91	0.12	0.00	1.22	0.03
Myanmar	1.11	0.62	0.05	0.26	0.05	0.06	0.06
Nepal	0.76	0.40	0.12	0.17	0.00	0.03	0.04
New Zealand	7.70	0.73	1.90	0.99	1.70	2.22	0.17
Pakistan	0.82	0.39	0.01	0.07	0.02	0.30	0.05
Papua New Guinea	1.69	0.24	0.01	0.26	1.06	0.00	0.13
Philippines	0.87	0.42	0.01	0.08	0.25	0.07	0.04
Singapore	4.16	0.56	0.08	0.25	0.07	3.19	0.01
Sri Lanka	1.02	0.37	0.01	0.13	0.11	0.37	0.04
Thailand	2.13	0.64	0.01	0.16	0.37	0.89	0.06
Viet Nam	1.26	0.56	0.00	0.15	0.03	0.46	0.07
Latin America and the Caribbean	**2.44**	**0.57**	**0.72**	**0.32**	**0.10**	**0.65**	**0.08**
Argentina	2.46	0.53	0.81	0.18	0.20	0.63	0.11
Bolivia	2.12	0.44	1.09	0.13	0.00	0.38	0.08
Brazil	2.36	0.61	1.11	0.49	0.02	0.04	0.08
Chile	3.00	0.52	0.41	0.77	0.60	0.56	0.13
Colombia	1.79	0.41	0.71	0.09	0.03	0.46	0.09
Costa Rica	2.27	0.39	0.27	0.59	0.05	0.86	0.11
Cuba	1.76	0.67	0.10	0.11	0.02	0.82	0.05
Dominican Rep.	1.49	0.46	0.33	0.08	0.02	0.54	0.05
Ecuador*	2.20	0.44	0.43	0.21	0.44	0.62	0.06
El Salvador	1.62	0.41	0.19	0.30	0.07	0.61	0.04
Guatemala	1.51	0.36	0.18	0.46	0.01	0.43	0.06
Haiti	0.53	0.31	0.04	0.09	0.00	0.06	0.03
Honduras	1.77	0.36	0.28	0.49	0.04	0.53	0.08
Jamaica	1.09	0.51	0.10	0.18	0.03	0.22	0.05
Mexico	3.38	0.77	0.31	0.23	0.07	1.92	0.08
Nicaragua	2.05	0.40	0.71	0.35	0.10	0.41	0.07
Panama	3.19	0.36	0.63	0.17	1.00	0.97	0.06
Paraguay	3.22	0.78	1.41	0.69	0.01	0.25	0.08
Peru	1.57	0.51	0.31	0.14	0.29	0.22	0.10
Trinidad and Tobago	2.13	0.41	0.13	0.24	0.22	1.13	0.00
Uruguay	5.48	0.28	4.04	0.56	0.25	0.23	0.11
Venezuela	2.81	0.37	0.81	0.10	0.16	1.30	0.07

Country/Region	Total Ecological Footprint [gha per person]	Cropland [gha per person]	Grazing Land [gha per person]	Forest Land [gha per person]	Fishing Grounds [gha per person]	Carbon Uptake Land [gha per person]	Built-up Land [gha per person]
North America	**9.19**	**1.42**	**0.32**	**1.02**	**0.11**	**6.21**	**0.10**
Canada	7.07	1.83	0.50	1.00	0.21	3.44	0.09
United States of America	9.42	1.38	0.30	1.02	0.10	6.51	0.10
Europe (EU)	**4.69**	**1.17**	**0.19**	**0.48**	**0.10**	**2.58**	**0.17**
Austria	4.98	1.02	0.26	0.39	0.03	3.07	0.21
Belgium*	5.13	1.44	0.18	0.60	0.03	2.51	0.38
Bulgaria	2.71	0.83	0.14	0.25	0.01	1.30	0.18
Czech Rep.	5.36	1.12	0.00	0.69	0.01	3.33	0.20
Denmark	8.04	2.49	0.00	1.00	0.67	3.53	0.34
Estonia	6.39	0.84	0.14	2.37	0.08	2.79	0.18
Finland*	5.25	1.24	0.06	1.96	0.15	1.68	0.16
France	4.93	1.28	0.32	0.39	0.17	2.52	0.25
Germany*	4.23	1.21	0.09	0.36	0.04	2.31	0.21
Greece	5.86	1.48	0.33	0.27	0.06	3.63	0.09
Hungary	3.55	1.48	0.00	0.38	0.01	1.49	0.20
Ireland**	6.26	0.65	0.50	0.46	0.38	4.03	0.24
Italy	4.76	1.19	0.22	0.43	0.06	2.77	0.10
Latvia	3.49	0.84	0.11	1.77	0.16	0.51	0.10
Lithuania	3.20	1.00	0.13	0.81	0.14	0.95	0.17
Netherlands	4.39	1.31	0.09	0.36	0.15	2.29	0.18
Poland	3.96	1.10	0.16	0.52	0.04	2.06	0.08
Portugal	4.44	0.93	0.40	0.20	0.30	2.58	0.04
Romania	2.87	1.20	0.05	0.31	0.02	1.13	0.17
Slovakia	3.29	0.96	0.03	0.58	0.01	1.52	0.19
Slovenia	4.46	0.87	0.29	0.50	0.01	2.68	0.11
Spain	5.74	1.30	0.33	0.35	0.31	3.41	0.04
Sweden	5.10	0.95	0.31	2.59	0.10	0.95	0.20
United Kingdom	5.33	0.87	0.21	0.46	0.08	3.51	0.20
Europe (Non-EU)	**3.52**	**0.94**	**0.05**	**0.29**	**0.17**	**2.00**	**0.07**
Albania	2.23	0.74	0.21	0.06	0.01	1.11	0.10
Belarus	3.85	1.34	0.17	0.27	0.03	1.93	0.10
Bosnia Herzegovina	2.92	0.82	0.18	0.35	0.01	1.47	0.09
Croatia	3.20	0.92	0.02	0.45	0.03	1.67	0.12
Macedonia, FYR	4.61	0.82	0.24	0.22	0.01	3.21	0.10
Moldova, Rep.	1.23	0.79	0.04	0.04	0.01	0.29	0.06
Norway	6.92	0.78	0.44	0.63	3.35	1.55	0.17
Russian Federation	3.75	0.92	0.03	0.34	0.15	2.24	0.06
Serbia / Montenegro	2.61	0.98	0.00	0.23	0.01	1.37	0.03
Switzerland**	5.00	0.66	0.18	0.27	0.03	3.73	0.14
Ukraine	2.69	1.00	0.00	0.12	0.04	1.46	0.08

Table 4: *Total Ecological Footprint of Consumption by Component, 2005*

Country/Region	Total Ecological Footprint [million gha]	Cropland [million gha]	Grazing Land [million gha]	Forest Land [million gha]	Fishing Grounds [million gha]	Built-up Land [million gha]	Carbon Uptake Land [million gha]
World	**17443.63**	**4130.17**	**1687.06**	**1516.91**	**559.92**	**435.22**	**9114.34**
High Income Countries	**6169.04**	**1118.39**	**267.69**	**595.69**	**162.76**	**125.65**	**3925.86**
Middle Income Countries	**1299.43**	**348.41**	**100.86**	**83.01**	**43.18**	**677.67**	**46.30**
Low Income Countries	**498.02**	**226.37**	**6.99**	**58.30**	**6.87**	**177.47**	**22.02**
Africa	**1237.53**	**488.99**	**226.39**	**214.97**	**28.08**	**48.80**	**230.30**
Algeria	54.68	20.31	5.50	4.15	0.48	1.67	22.56
Angola	14.48	6.38	2.39	1.75	0.73	0.80	2.42
Benin	8.51	3.68	0.69	2.05	0.20	0.31	1.57
Botswana	6.36	0.16	3.20	0.29	0.00	0.10	2.61
Burkina Faso	26.52	13.04	6.87	4.35	0.04	1.32	0.89
Burundi	6.31	2.28	0.36	2.81	0.06	0.31	0.49
Cameroon	20.70	8.58	5.33	3.72	0.55	1.01	1.50
Central African Rep.	6.40	1.54	3.57	0.87	0.03	0.29	0.10
Chad	16.59	6.91	6.39	2.43	0.12	0.74	0.00
Congo	2.17	0.97	0.13	0.43	0.16	0.20	0.28
Congo, Dem. Rep.	35.21	10.17	0.06	23.77	0.49	0.07	0.65
Côte d'Ivoire	16.21	8.67	0.33	3.15	0.97	1.30	1.79
Egypt	123.35	53.57	1.29	8.16	1.04	7.05	52.23
Eritrea	5.05	1.05	2.33	0.76	0.03	0.18	0.69
Ethiopia	104.68	29.76	35.77	30.72	0.03	3.95	4.46
Gabon	1.80	0.59	0.06	0.84	0.21	0.08	0.02
Gambia	1.83	1.08	0.22	0.26	0.07	0.08	0.10
Ghana	32.85	12.98	0.07	7.19	4.56	1.34	6.72
Guinea	11.95	4.25	2.97	3.95	0.30	0.50	0.00
Guinea-Bissau	1.43	0.61	0.50	0.22	0.01	0.09	0.00
Kenya	36.55	8.65	14.03	7.49	0.74	1.47	4.16
Lesotho	1.93	0.16	0.85	0.63	0.00	0.03	0.27
Liberia	2.84	0.87	0.04	1.70	0.09	0.15	0.00
Libya	25.06	3.97	1.20	0.41	0.11	0.26	19.12
Madagascar	20.12	5.20	8.55	3.49	1.03	1.11	0.73
Malawi	6.07	2.75	0.03	1.90	0.05	0.41	0.93
Mali	21.90	9.10	8.69	1.79	0.18	1.04	1.11
Mauritania	5.84	1.06	3.77	0.51	0.31	0.18	0.00
Mauritius	2.81	0.64	0.04	0.20	1.27	0.00	0.66
Morocco	35.57	17.36	5.69	1.72	1.81	0.90	8.10
Mozambique	18.45	7.41	0.02	5.87	0.07	1.23	3.85
Namibia	7.53	0.77	3.55	0.00	1.80	0.09	1.31

Country/Region	Total Ecological Footprint [million gha]	Cropland [million gha]	Grazing Land [million gha]	Forest Land [million gha]	Fishing Grounds [million gha]	Built-up Land [million gha]	Carbon Uptake Land [million gha]
Niger	22.83	16.58	2.14	2.97	0.08	0.57	0.49
Nigeria	176.47	125.05	0.19	24.77	3.18	7.55	15.72
Rwanda	7.17	3.99	0.82	1.82	0.01	0.30	0.23
Senegal	15.82	7.04	3.48	2.20	0.76	0.58	1.78
Sierra Leone	4.27	1.68	0.11	1.74	0.55	0.19	0.00
Somalia	11.52	1.30	6.31	3.38	0.04	0.49	0.00
South Africa, Rep.	98.73	20.95	10.82	12.97	1.95	3.14	48.91
Sudan	88.36	21.43	48.57	6.80	0.07	1.98	9.50
Swaziland	0.76	0.20	0.47	0.00	0.00	0.09	0.00
Tanzania, United Rep.	43.88	12.88	16.22	8.04	1.11	2.24	3.39
Togo	5.05	2.55	0.26	1.87	0.13	0.23	0.01
Tunisia	17.81	7.83	1.04	1.77	0.92	0.48	5.77
Uganda	39.62	17.87	4.46	13.21	1.59	1.61	0.87
Zambia	8.99	1.67	2.17	2.74	0.12	0.64	1.64
Zimbabwe	14.55	3.45	4.84	3.10	0.02	0.45	2.69
Middle East and Central Asia	**846.77**	**251.52**	**30.18**	**30.38**	**15.79**	**30.13**	**488.79**
Afghanistan	14.25	8.03	2.95	1.48	0.00	1.80	0.00
Armenia	4.34	1.60	0.63	0.08	0.01	0.21	1.80
Azerbaijan	18.17	4.86	2.22	0.33	0.04	0.62	10.11
Georgia	4.81	2.18	1.15	0.19	0.02	0.25	1.02
Iran	186.03	48.10	7.47	2.63	6.59	6.10	115.14
Iraq	38.44	12.19	0.93	0.19	0.03	0.85	24.25
Israel	32.59	6.55	0.39	2.00	0.21	0.56	22.88
Jordan	9.73	4.01	0.29	0.79	0.03	0.57	4.05
Kazakhstan	49.98	17.44	0.00	1.61	0.11	0.75	30.07
Kuwait	23.88	1.92	0.26	0.44	0.04	0.40	20.82
Kyrgyzstan	5.77	2.96	0.04	0.07	0.01	0.53	2.18
Lebanon	11.03	2.44	0.24	0.89	0.05	0.22	7.18
Oman	12.01	1.05	0.43	0.32	1.13	0.36	8.72
Saudi Arabia	64.49	20.12	2.64	2.87	0.83	5.40	32.63
Syria	39.57	14.77	2.24	1.35	0.06	1.16	20.00
Tajikistan	4.58	1.97	0.54	0.03	0.00	0.41	1.62
Turkey	198.55	72.90	3.24	12.54	3.64	6.18	100.06
Turkmenistan	18.66	5.23	0.82	0.02	0.05	0.66	11.89
United Arab Emirates*	42.53	4.65	0.12	1.68	0.93	0.00	35.16
Uzbekistan	48.20	13.19	0.94	0.38	0.01	2.14	31.55
Yemen	19.14	5.39	2.65	0.46	2.02	0.97	7.65
Asia-Pacific	**5758.58**	**1758.06**	**296.81**	**460.30**	**263.69**	**213.07**	**2766.65**
Australia	157.40	38.93	56.85	18.91	1.71	1.19	39.81
Bangladesh	81.50	46.32	0.70	9.40	1.70	5.21	18.17
Bhutan	2.15	0.26	0.25	1.45	0.00	0.18	0.00

Country/Region	Total Ecological Footprint [million gha]	Cropland [million gha]	Grazing Land [million gha]	Forest Land [million gha]	Fishing Grounds [million gha]	Built-up Land [million gha]	Carbon Uptake Land [million gha]
Cambodia	13.27	6.13	1.14	2.93	0.54	0.61	1.91
China	2786.81	736.98	198.99	164.55	87.38	99.05	1499.88
India	986.32	444.51	8.47	112.48	13.11	43.13	364.62
Indonesia	211.29	112.19	0.53	27.20	34.59	17.45	19.33
Japan*	626.58	73.67	4.50	30.35	36.35	10.86	470.85
Korea DPR	35.17	9.61	0.05	2.77	0.34	1.37	21.03
Korea, Rep.	178.91	31.75	2.04	9.25	14.65	3.02	118.20
Lao PDR	6.26	2.83	0.82	1.94	0.05	0.62	0.00
Malaysia	61.33	13.98	1.11	11.19	5.81	2.16	27.07
Mongolia	9.25	0.55	5.07	0.32	0.00	0.09	3.22
Myanmar	55.97	31.37	2.56	13.23	2.44	3.21	3.16
Nepal	20.69	10.87	3.14	4.63	0.03	1.15	0.87
New Zealand	31.00	2.92	7.64	3.97	6.85	0.69	8.93
Pakistan	130.15	61.00	1.04	10.73	2.73	8.05	46.60
Papua New Guinea	9.95	1.43	0.03	1.51	6.21	0.77	0.00
Philippines	72.23	34.89	0.56	6.93	20.70	3.59	5.56
Singapore	18.01	2.43	0.35	1.09	0.29	0.05	13.79
Sri Lanka	21.24	7.73	0.13	2.60	2.21	0.88	7.69
Thailand	136.86	40.84	0.58	10.20	23.67	4.13	57.44
Viet Nam	106.23	46.85	0.25	12.67	2.31	5.62	38.53
Latin America and the Caribbean	**1350.77**	**315.04**	**396.28**	**175.91**	**56.22**	**45.44**	**361.89**
Argentina	95.15	20.59	31.45	6.86	7.62	4.30	24.33
Bolivia	19.45	4.00	9.99	1.21	0.03	0.72	3.50
Brazil	439.21	113.69	206.83	90.61	4.63	15.55	7.90
Chile	48.91	8.51	6.76	12.47	9.80	2.17	9.19
Colombia	81.63	18.50	32.24	4.29	1.38	4.12	21.10
Costa Rica	9.83	1.69	1.16	2.54	0.24	0.49	3.71
Cuba	19.86	7.52	1.13	1.18	0.21	0.55	9.26
Dominican Rep.	13.23	4.05	2.97	0.72	0.20	0.46	4.83
Ecuador*	29.11	5.88	5.63	2.79	5.76	0.85	8.21
El Salvador	11.14	2.80	1.28	2.07	0.47	0.30	4.22
Guatemala	18.97	4.58	2.26	5.82	0.16	0.74	5.42
Haiti	4.56	2.66	0.37	0.78	0.03	0.23	0.48
Honduras	12.78	2.61	1.99	3.51	0.29	0.58	3.80
Jamaica	2.88	1.35	0.27	0.47	0.08	0.13	0.58
Mexico	361.93	82.81	32.81	25.10	7.86	8.05	205.30
Nicaragua	11.25	2.19	3.92	1.93	0.56	0.40	2.25
Panama	10.32	1.17	2.05	0.54	3.23	0.20	3.14
Paraguay	19.82	4.81	8.66	4.27	0.04	0.49	1.56
Peru	43.83	14.15	8.58	3.92	8.23	2.81	6.13
Trinidad and Tobago	2.78	0.53	0.17	0.31	0.29	0.00	1.48
Uruguay	18.97	0.96	14.00	1.93	0.87	0.40	0.80
Venezuela	75.19	9.99	21.75	2.59	4.23	1.92	34.71

Country/Region	Total Ecological Footprint [million gha]	Cropland [million gha]	Grazing Land [million gha]	Forest Land [million gha]	Fishing Grounds [million gha]	Built-up Land [million gha]	Carbon Uptake Land [million gha]
North America	**3037.83**	**470.66**	**106.01**	**337.10**	**37.96**	**34.12**	**2051.99**
Canada	228.08	59.11	16.27	32.26	6.69	2.87	110.88
United States of America	2809.75	411.55	89.73	304.84	31.27	31.25	1941.11
Europe (EU)	**2291.72**	**570.77**	**94.54**	**235.71**	**53.11**	**81.95**	**1255.88**
Austria	40.77	8.37	2.13	3.19	0.22	1.69	25.17
Belgium*	53.37	14.99	1.84	6.20	0.35	3.90	26.09
Bulgaria	20.98	6.38	1.11	1.93	0.08	1.43	10.05
Czech Rep.	54.75	11.46	0.00	7.09	0.15	2.05	34.00
Denmark	43.64	13.52	0.00	5.44	3.63	1.86	19.18
Estonia	8.50	1.11	0.19	3.15	0.11	0.24	3.71
Finland*	27.54	6.51	0.34	10.27	0.78	0.82	8.82
France	298.07	77.22	19.33	23.38	10.26	15.34	152.55
Germany*	349.47	99.72	7.66	29.76	3.49	17.43	191.42
Greece	65.16	16.48	3.66	2.98	0.71	1.00	40.32
Hungary	35.84	14.95	0.00	3.79	0.07	2.03	15.00
Ireland**	25.97	2.71	2.07	1.92	1.58	0.98	16.71
Italy	276.54	68.86	12.49	25.07	3.76	5.62	160.75
Latvia	8.05	1.93	0.26	4.09	0.36	0.23	1.17
Lithuania	10.98	3.44	0.43	2.79	0.48	0.58	3.24
Netherlands	71.54	21.28	1.50	5.84	2.83	2.97	37.37
Poland	152.58	42.55	6.12	19.84	1.43	3.24	79.40
Portugal	46.55	9.76	4.15	2.05	3.17	0.37	27.04
Romania	62.32	25.99	1.18	6.70	0.37	3.58	24.50
Slovakia	17.76	5.18	0.16	3.14	0.05	1.00	8.22
Slovenia	8.77	1.72	0.56	0.98	0.02	0.22	5.27
Spain	247.21	56.03	14.17	14.89	13.52	1.79	146.82
Sweden	46.11	8.55	2.82	23.44	0.90	1.84	8.57
United Kingdom	319.22	52.06	12.37	27.75	4.79	11.74	210.50
Europe (Non-EU)	**842.40**	**225.12**	**1078**	**68.88**	**40.16**	**17.46**	**480.00**
Albania	6.98	2.33	0.66	0.20	0.03	0.30	3.47
Belarus	37.59	13.09	1.68	2.68	0.32	0.97	18.86
Bosnia Herzegovina	11.42	3.22	0.71	1.36	0.02	0.35	5.75
Croatia	14.59	4.17	0.07	2.05	0.13	0.56	7.61
Macedonia, FYR	9.37	1.67	0.49	0.45	0.02	0.21	6.53
Moldova, Rep.	5.18	3.34	0.18	0.16	0.06	0.23	1.21
Norway	31.95	3.59	2.01	2.89	15.50	0.79	7.16
Russian Federation	536.39	132.27	3.65	49.02	22.10	9.17	320.17
Serbia / Montenegro	27.43	10.25	0.02	2.38	0.06	0.28	14.43
Switzerland**	36.27	4.75	1.30	1.96	0.19	0.98	27.07
Ukraine	125.23	46.43	0.00	5.72	1.74	3.61	67.74

Table 5: *Per-Person Biocapacity by Component, 2005*

Country/Region	Total Biocapacity [gha per person]	Cropland [gha per person]	Grazing Land [gha per person]	Forest Land [gha per person]	Fishing Ground [gha per person]	Built-up Land [gha per person]
World	**2.06**	**0.64**	**0.37**	**0.81**	**0.17**	**0.07**
High Income Countries	**3.67**	**1.42**	**0.33**	**1.20**	**0.58**	**0.13**
Middle Income Countries	**2.16**	**0.62**	**0.40**	**0.83**	**0.23**	**0.08**
Low Income Countries	**0.88**	**0.35**	**0.28**	**0.13**	**0.07**	**0.05**
Africa	**1.80**	**0.45**	**0.82**	**0.35**	**0.13**	**0.05**
Algeria	0.93	0.42	0.37	0.08	0.01	0.05
Angola	3.24	0.26	2.03	0.60	0.31	0.05
Benin	1.47	0.53	0.39	0.48	0.03	0.04
Botswana	8.45	0.21	7.31	0.55	0.34	0.05
Burkina Faso	1.60	0.89	0.52	0.09	0.00	0.10
Burundi	0.69	0.29	0.33	0.01	0.01	0.04
Cameroon	3.07	0.73	1.16	0.94	0.16	0.06
Central African Rep.	9.37	0.72	2.91	5.68	0.00	0.07
Chad	2.98	0.62	1.93	0.25	0.10	0.08
Congo	13.89	0.23	7.48	5.66	0.46	0.05
Congo, Dem. Rep.	4.17	0.17	2.16	1.78	0.06	0.00
Côte d'Ivoire	2.18	0.86	0.84	0.37	0.04	0.07
Egypt	0.37	0.25	0.00	0.00	0.02	0.10
Eritrea	2.06	0.14	0.58	0.07	1.22	0.04
Ethiopia	1.00	0.32	0.46	0.12	0.05	0.05
Gabon	24.97	0.55	4.65	15.86	3.86	0.06
Gambia	1.22	0.45	0.18	0.08	0.45	0.05
Ghana	1.17	0.58	0.32	0.14	0.06	0.06
Guinea	3.03	0.28	1.55	0.58	0.57	0.05
Guinea-Bissau	3.41	0.53	0.50	0.26	2.06	0.06
Kenya	1.20	0.26	0.86	0.01	0.02	0.04
Lesotho	1.06	0.10	0.94	0.00	0.00	0.02
Liberia	2.50	0.23	0.86	0.97	0.39	0.05
Libya	1.01	0.41	0.27	0.00	0.27	0.04
Madagascar	3.74	0.29	2.49	0.70	0.21	0.06
Malawi	0.47	0.24	0.10	0.02	0.08	0.03
Mali	2.57	0.62	1.25	0.56	0.06	0.08
Mauritania	6.38	0.20	4.26	0.01	1.85	0.06
Mauritius	0.72	0.25	0.01	0.05	0.42	0.00
Morocco	0.69	0.30	0.20	0.06	0.11	0.03
Mozambique	3.43	0.31	2.58	0.27	0.20	0.06
Namibia	8.98	0.38	2.39	0.43	5.74	0.05
Niger	1.84	1.11	0.67	0.01	0.00	0.04
Nigeria	0.96	0.61	0.24	0.02	0.03	0.06
Rwanda	0.47	0.33	0.09	0.02	0.01	0.03

Country/Region	Total Biocapacity [gha per person]	Cropland [gha per person]	Grazing Land [gha per person]	Forest Land [gha per person]	Fishing Ground [gha per person]	Built-up Land [gha per person]
Senegal	1.52	0.39	0.43	0.44	0.21	0.05
Sierra Leone	1.01	0.13	0.49	0.14	0.21	0.03
Somalia	1.42	0.14	0.77	0.06	0.39	0.06
South Africa, Rep.	2.21	0.77	0.87	0.25	0.25	0.07
Sudan	2.79	0.67	1.47	0.43	0.17	0.05
Swaziland	1.68	0.36	0.96	0.27	0.01	0.08
Tanzania, United Rep.	1.20	0.39	0.55	0.11	0.08	0.06
Togo	1.08	0.60	0.32	0.11	0.02	0.04
Tunisia	1.15	0.71	0.10	0.02	0.28	0.05
Uganda	0.94	0.57	0.24	0.02	0.06	0.06
Zambia	2.86	0.58	1.46	0.73	0.03	0.05
Zimbabwe	0.75	0.22	0.37	0.11	0.01	0.03
Middle East and Central Asia	**1.28**	**0.61**	**0.29**	**0.16**	**0.14**	**0.08**
Afghanistan	0.73	0.44	0.22	0.01	0.00	0.06
Armenia	0.82	0.44	0.21	0.07	0.02	0.07
Azerbaijan	1.02	0.59	0.25	0.09	0.02	0.07
Georgia	1.76	0.37	0.40	0.89	0.05	0.06
Iran	1.42	0.55	0.10	0.36	0.31	0.09
Iraq	0.28	0.21	0.03	0.00	0.01	0.03
Israel	0.40	0.26	0.01	0.03	0.02	0.08
Jordan	0.27	0.14	0.03	0.00	0.00	0.10
Kazakhstan	4.28	1.45	2.49	0.22	0.07	0.05
Kuwait	0.53	0.04	0.01	0.00	0.33	0.15
Kyrgyzstan	1.66	0.61	0.75	0.13	0.06	0.10
Lebanon	0.43	0.31	0.03	0.02	0.01	0.06
Oman	2.55	0.15	0.13	0.00	2.14	0.14
Saudi Arabia	1.27	0.63	0.18	0.00	0.24	0.22
Syria	0.84	0.64	0.13	0.01	0.00	0.06
Tajikistan	0.56	0.31	0.16	0.01	0.02	0.06
Turkey	1.65	0.98	0.23	0.31	0.05	0.08
Turkmenistan	3.68	1.18	2.22	0.00	0.15	0.14
United Arab Emirates*	1.08	0.13	0.00	0.00	0.94	0.00
Uzbekistan	1.02	0.63	0.25	0.03	0.03	0.08
Yemen	0.58	0.13	0.12	0.00	0.29	0.05
Asia-Pacific	**0.82**	**0.39**	**0.11**	**0.13**	**0.13**	**0.06**
Australia	15.42	5.47	3.41	2.22	4.26	0.06
Bangladesh	0.25	0.14	0.00	0.01	0.06	0.04
Bhutan	1.83	0.18	0.32	1.25	0.00	0.09
Cambodia	0.93	0.46	0.14	0.15	0.14	0.04
China	0.86	0.39	0.15	0.16	0.08	0.07
India	0.41	0.31	0.01	0.02	0.04	0.04
Indonesia	1.39	0.56	0.07	0.22	0.46	0.08
Japan*	0.60	0.16	0.00	0.27	0.08	0.08

Country/Region	Total Biocapacity [gha per person]	Cropland [gha per person]	Grazing Land [gha per person]	Forest Land [gha per person]	Fishing Ground [gha per person]	Built-up Land [gha per person]
Korea DPR	0.64	0.31	0.00	0.19	0.08	0.06
Korea, Rep.	0.70	0.16	0.00	0.07	0.40	0.06
Lao PDR	2.34	0.39	1.25	0.55	0.04	0.10
Malaysia	2.67	1.00	0.02	0.56	1.00	0.09
Mongolia	14.65	0.25	11.12	3.25	0.00	0.03
Myanmar	1.50	0.48	0.20	0.44	0.32	0.06
Nepal	0.37	0.17	0.11	0.04	0.01	0.04
New Zealand	14.06	4.40	5.06	2.08	2.35	0.17
Pakistan	0.43	0.32	0.01	0.01	0.04	0.05
Papua New Guinea	4.45	0.37	1.22	2.02	0.71	0.13
Philippines	0.54	0.28	0.07	0.07	0.08	0.04
Singapore	0.03	0.00	0.00	0.00	0.02	0.01
Sri Lanka	0.37	0.19	0.02	0.07	0.05	0.04
Thailand	0.98	0.65	0.01	0.09	0.16	0.06
Viet Nam	0.80	0.33	0.05	0.12	0.24	0.07
Latin America and the Caribbean	**4.80**	**0.79**	**1.15**	**2.46**	**0.32**	**0.08**
Argentina	8.13	2.49	3.08	0.58	1.87	0.11
Bolivia	15.71	0.65	3.05	11.86	0.06	0.08
Brazil	7.26	0.90	1.15	4.96	0.18	0.08
Chile	4.14	0.63	0.97	1.60	0.80	0.13
Colombia	3.90	0.26	1.89	1.61	0.04	0.09
Costa Rica	1.84	0.50	0.67	0.45	0.11	0.11
Cuba	1.05	0.63	0.09	0.15	0.14	0.05
Dominican Rep.	0.80	0.31	0.33	0.09	0.02	0.05
Ecuador*	2.14	0.39	0.50	0.99	0.19	0.06
El Salvador	0.72	0.31	0.17	0.09	0.11	0.04
Guatemala	1.29	0.37	0.49	0.32	0.05	0.06
Haiti	0.26	0.16	0.04	0.01	0.02	0.03
Honduras	1.87	0.49	0.40	0.65	0.25	0.08
Jamaica	0.63	0.23	0.08	0.27	0.00	0.05
Mexico	1.67	0.70	0.37	0.36	0.16	0.08
Nicaragua	3.29	0.82	0.89	0.95	0.55	0.07
Panama	3.49	0.38	1.02	1.34	0.69	0.06
Paraguay	9.71	1.55	3.18	4.84	0.06	0.08
Peru	4.02	0.42	1.26	1.98	0.26	0.10
Trinidad and Tobago	2.05	0.13	0.08	0.35	1.49	0.00
Uruguay	10.51	1.13	5.63	1.29	2.34	0.11
Venezuela	3.15	0.32	0.99	1.44	0.34	0.07
North America	**6.49**	**2.55**	**0.43**	**2.51**	**0.88**	**0.10**
Canada	20.05	4.89	1.80	9.30	3.96	0.09
United States of America	5.02	2.30	0.29	1.78	0.55	0.10

Country/Region	Total Biocapacity [gha per person]	Cropland [gha per person]	Grazing Land [gha per person]	Forest Land [gha per person]	Fishing Ground [gha per person]	Built-up Land [gha per person]
Europe (EU)	**2.32**	**1.00**	**0.21**	**0.64**	**0.29**	**0.17**
Austria	2.86	0.67	0.27	1.70	0.00	0.21
Belgium*	1.13	0.40	0.12	0.23	0.00	0.38
Bulgaria	2.79	1.44	0.31	0.76	0.10	0.18
Czech Rep.	2.74	1.38	0.16	1.00	0.00	0.20
Denmark	5.70	3.03	0.05	0.25	2.02	0.34
Estonia	9.09	1.33	0.41	2.69	4.48	0.18
Finland*	11.73	1.53	0.10	7.22	2.73	0.16
France	3.05	1.55	0.34	0.73	0.17	0.25
Germany*	1.94	1.01	0.11	0.53	0.08	0.21
Greece	1.69	0.93	0.32	0.11	0.24	0.09
Hungary	2.82	1.99	0.15	0.47	0.01	0.20
Ireland**	4.25	0.89	1.08	0.19	1.86	0.24
Italy	1.23	0.70	0.14	0.22	0.06	0.10
Latvia	6.97	1.11	0.85	2.92	2.00	0.10
Lithuania	4.18	1.81	0.57	1.35	0.28	0.17
Netherlands	1.13	0.31	0.08	0.08	0.48	0.18
Poland	2.10	1.14	0.17	0.59	0.11	0.08
Portugal	1.23	0.28	0.36	0.47	0.08	0.04
Romania	2.26	1.01	0.23	0.76	0.09	0.17
Slovakia	2.82	1.14	0.18	1.31	0.00	0.19
Slovenia	2.20	0.27	0.32	1.49	0.00	0.11
Spain	1.34	0.73	0.32	0.18	0.06	0.04
Sweden	9.97	1.42	0.34	5.39	2.63	0.20
United Kingdom	1.65	0.64	0.17	0.09	0.55	0.20
Europe (Non-EU)	**5.81**	**1.51**	**0.49**	**2.97**	**0.77**	**0.07**
Albania	1.20	0.65	0.20	0.16	0.09	0.10
Belarus	3.43	1.60	0.42	1.30	0.00	0.10
Bosnia Herzegovina	1.99	0.67	0.42	0.81	1.99	0.09
Croatia	2.20	0.31	0.61	0.81	0.33	0.12
Macedonia, FYR	1.45	0.80	0.28	0.25	0.01	0.10
Moldova, Rep.	1.28	1.01	0.07	0.13	0.01	0.06
Norway	6.12	0.78	0.43	2.78	1.96	0.17
Russian Federation	8.11	1.66	0.67	4.56	1.16	0.06
Serbia / Montenegro	1.64	1.07	0.12	0.41	1.64	0.03
Switzerland**	1.27	0.31	0.18	0.64	0.01	0.14
Ukraine	2.40	1.70	0.14	0.34	0.14	0.08

Table 6: *Total Biocapacity by Component, 2005*

Country/Region	Total Biocapacity [million gha]	Cropland [million gha]	Grazing Land [million gha]	Forest Land [million gha]	Fishing Grounds [million gha]	Built-up Land [million gha]
World	**13360.95**	**4129.15**	**2398.35**	**5265.11**	**1133.13**	**435.22**
High Income Countries	**540.65**	**241.32**	**33.77**	**187.62**	**62.76**	**15.18**
Middle Income Countries	**672.84**	**264.97**	**109.83**	**188.07**	**63.67**	**46.30**
Low Income Countries	**243.78**	**172.98**	**12.99**	**13.71**	**22.08**	**22.02**
Africa	**1627.09**	**410.23**	**736.84**	**317.06**	**114.16**	**48.80**
Algeria	30.64	13.79	12.11	2.73	0.35	1.67
Angola	51.67	4.08	32.32	9.53	4.93	0.80
Benin	12.41	4.47	3.32	4.07	0.24	0.31
Botswana	14.92	0.36	12.90	0.96	0.60	0.10
Burkina Faso	21.16	11.82	6.87	1.13	0.02	1.32
Burundi	5.18	2.22	2.53	0.05	0.09	0.31
Cameroon	50.05	11.99	19.01	15.42	2.62	1.01
Central African Rep.	37.85	2.89	11.73	22.94	0.00	0.29
Chad	29.03	6.04	18.86	2.40	0.98	0.74
Congo	55.53	0.93	29.91	22.65	1.84	0.20
Congo, Dem. Rep.	239.91	9.76	124.37	102.35	3.36	0.07
Côte d'Ivoire	39.52	15.65	15.18	6.71	0.68	1.30
Egypt	27.56	18.74	0.00	0.00	1.77	7.05
Eritrea	9.07	0.63	2.55	0.32	5.39	0.18
Ethiopia	77.75	24.42	35.77	9.47	4.14	3.95
Gabon	34.56	0.75	6.43	21.95	5.35	0.08
Gambia	1.85	0.68	0.28	0.13	0.68	0.08
Ghana	25.79	12.78	7.14	3.11	1.41	1.34
Guinea	28.53	2.61	14.61	5.42	5.38	0.50
Guinea-Bissau	5.41	0.84	0.79	0.42	3.27	0.09
Kenya	40.98	8.79	29.46	0.43	0.83	1.47
Lesotho	1.90	0.19	1.68	0.00	0.00	0.03
Liberia	8.20	0.77	2.81	3.18	1.29	0.15
Libya	5.88	2.39	1.60	0.02	1.61	0.26
Madagascar	69.66	5.36	46.29	12.94	3.95	1.11
Malawi	6.03	3.07	1.30	0.27	0.97	0.41
Mali	34.71	8.41	16.90	7.57	0.79	1.04
Mauritania	19.57	0.62	13.07	0.02	5.68	0.18
Mauritius	0.90	0.31	0.01	0.06	0.52	0.00
Morocco	21.74	9.58	6.19	1.76	3.32	0.90
Mozambique	67.80	6.15	51.01	5.44	3.97	1.23
Namibia	18.24	0.78	4.86	0.86	11.65	0.09
Niger	25.66	15.55	9.32	0.20	0.01	0.57

Country/Region	Total Biocapacity [million gha]	Cropland [million gha]	Grazing Land [million gha]	Forest Land [million gha]	Fishing Grounds [million gha]	Built-up Land [million gha]
Nigeria	126.21	80.50	32.16	2.68	3.31	7.55
Rwanda	4.29	2.95	0.82	0.15	0.07	0.30
Senegal	17.70	4.60	5.01	5.12	2.40	0.58
Sierra Leone	5.57	0.71	2.72	0.78	1.18	0.19
Somalia	11.67	1.17	6.32	0.50	3.19	0.49
South Africa, Rep.	104.75	36.48	41.45	11.90	11.78	3.14
Sudan	101.12	24.17	53.19	15.65	6.13	1.98
Swaziland	1.74	0.37	0.99	0.28	0.01	0.09
Tanzania, United Rep.	45.84	15.02	21.10	4.26	3.22	2.24
Togo	6.65	3.69	1.95	0.65	0.13	0.23
Tunisia	11.61	7.18	1.01	0.16	2.78	0.48
Uganda	27.16	16.31	7.06	0.44	1.75	1.61
Zambia	33.41	6.79	17.05	8.56	0.37	0.64
Zimbabwe	9.72	2.86	4.84	1.41	0.16	0.45
Middle East and Central Asia	**466.92**	**221.55**	**104.73**	**58.79**	**51.73**	**30.13**
Afghanistan	21.75	13.24	6.43	0.28	0.00	1.80
Armenia	2.46	1.33	0.64	0.21	0.06	0.21
Azerbaijan	8.59	4.95	2.14	0.73	0.16	0.62
Georgia	7.87	1.66	1.77	3.97	0.22	0.25
Iran	98.48	38.30	7.01	25.35	21.72	6.10
Iraq	7.98	5.96	0.84	0.12	0.22	0.85
Israel	2.71	1.75	0.08	0.21	0.11	0.56
Jordan	1.55	0.79	0.14	0.02	0.02	0.57
Kazakhstan	63.46	21.57	36.89	3.24	1.00	0.75
Kuwait	1.42	0.10	0.02	0.00	0.89	0.40
Kyrgyzstan	8.73	3.23	3.97	0.69	0.32	0.53
Lebanon	1.53	1.10	0.09	0.07	0.04	0.22
Oman	6.56	0.38	0.33	0.00	5.49	0.36
Saudi Arabia	31.25	15.53	4.45	0.00	5.88	5.40
Syria	16.07	12.22	2.40	0.21	0.08	1.16
Tajikistan	3.61	2.00	1.05	0.05	0.10	0.41
Turkey	120.88	71.58	16.65	22.89	3.58	6.18
Turkmenistan	17.80	5.69	10.71	0.01	0.72	0.66
United Arab Emirates*	4.83	0.58	0.01	0.00	4.24	0.00
Uzbekistan	27.15	16.84	6.59	0.71	0.87	2.14
Yemen	12.25	2.73	2.50	0.04	6.00	0.97
Asia-Pacific	**2923.30**	**1383.18**	**381.03**	**471.76**	**474.25**	**213.07**
Australia	310.88	110.23	68.80	44.81	85.85	1.19
Bangladesh	35.61	19.71	0.62	0.97	9.11	5.21
Bhutan	3.97	0.38	0.70	2.71	0.00	0.18
Cambodia	13.10	6.47	1.98	2.11	1.94	0.61

Country/Region	Total Biocapacity [million gha]	Cropland [million gha]	Grazing Land [million gha]	Forest Land [million gha]	Fishing Grounds [million gha]	Built-up Land [million gha]
China	1132.68	521.27	196.84	214.77	100.75	99.05
India	452.08	342.09	6.54	19.11	41.21	43.13
Indonesia	310.13	123.70	15.56	49.95	103.46	17.45
Japan*	77.20	20.53	0.46	35.19	10.16	10.86
Korea DPR	14.40	7.00	0.04	4.24	1.76	1.37
Korea, Rep.	33.40	7.70	0.05	3.28	19.36	3.02
Lao PDR	13.84	2.32	7.40	3.25	0.24	0.62
Malaysia	67.77	25.42	0.44	14.32	25.43	2.16
Mongolia	38.75	0.66	29.42	8.59	0.00	0.09
Myanmar	75.66	24.21	10.09	22.09	16.07	3.21
Nepal	10.03	4.64	2.90	1.17	0.17	1.15
New Zealand	56.64	17.72	20.38	8.38	9.47	0.69
Pakistan	67.26	50.24	0.97	1.46	6.55	8.05
Papua New Guinea	26.18	2.18	7.18	11.87	4.18	0.77
Philippines	45.23	23.16	5.48	6.06	6.93	3.59
Singapore	0.15	0.00	0.00	0.01	0.09	0.05
Sri Lanka	7.77	4.04	0.45	1.44	0.96	0.88
Thailand	62.89	41.54	0.78	6.09	10.35	4.13
Viet Nam	67.66	27.99	3.93	9.91	20.21	5.62
Latin America and the Caribbean	**2655.69**	**435.95**	**635.55**	**1360.17**	**178.59**	**45.44**
Argentina	315.13	96.50	119.16	22.63	72.54	4.30
Bolivia	144.21	5.94	28.05	108.94	0.56	0.72
Brazil	1353.78	166.95	213.64	924.48	33.16	15.55
Chile	67.42	10.30	15.88	26.00	13.06	2.17
Colombia	177.95	12.06	86.30	73.45	2.01	4.12
Costa Rica	7.96	2.15	2.92	1.93	0.49	0.49
Cuba	11.84	7.10	0.98	1.64	1.57	0.55
Dominican Rep.	7.13	2.78	2.90	0.83	0.16	0.46
Ecuador*	28.29	5.12	6.62	13.13	2.57	0.85
El Salvador	4.95	2.13	1.17	0.60	0.75	0.30
Guatemala	16.20	4.69	6.20	3.97	0.60	0.74
Haiti	2.25	1.40	0.36	0.11	0.16	0.23
Honduras	13.46	3.52	2.90	4.69	1.78	0.58
Jamaica	1.68	0.62	0.21	0.72	0.01	0.13
Mexico	178.41	75.16	39.26	38.85	17.09	8.05
Nicaragua	18.03	4.49	4.91	5.23	3.01	0.40
Panama	11.27	1.21	3.30	4.33	2.24	0.20
Paraguay	59.82	9.56	19.60	29.80	0.38	0.49
Peru	112.45	11.72	35.19	55.43	7.30	2.81
Trinidad and Tobago	2.68	0.17	0.11	0.45	1.94	0.00
Uruguay	36.39	3.90	19.49	4.48	8.12	0.40
Venezuela	84.39	8.48	26.40	38.47	9.11	1.92

Country/Region	Total Biocapacity [million gha]	Cropland [million gha]	Grazing Land [million gha]	Forest Land [million gha]	Fishing Grounds [million gha]	Built-up Land [million gha]
North America	**2143.30**	**843.61**	**143.63**	**831.02**	**290.92**	**34.12**
Canada	646.87	157.73	58.23	300.10	127.94	2.87
United States of America	1496.43	685.88	85.40	530.92	162.98	31.25
Europe (EU)	**1128.18**	**485.19**	**104.70**	**312.59**	**143.74**	**81.95**
Austria	23.38	5.52	2.24	13.91	0.03	1.69
Belgium*	11.74	4.16	1.26	2.41	0.01	3.90
Bulgaria	21.57	11.16	2.36	5.86	0.76	1.43
Czech Rep.	28.03	14.12	1.59	10.24	0.02	2.05
Denmark	30.96	16.48	0.27	1.35	11.00	1.86
Estonia	12.09	1.77	0.54	3.58	5.96	0.24
Finland*	61.58	8.02	0.53	37.89	14.32	0.82
France	184.42	94.03	20.28	44.26	10.51	15.34
Germany*	160.47	83.45	8.76	44.12	6.71	17.43
Greece	18.78	10.33	3.51	1.25	2.69	1.00
Hungary	28.49	20.06	1.55	4.78	0.07	2.03
Ireland**	17.64	3.69	4.48	0.78	7.70	0.98
Italy	71.21	40.50	8.35	12.97	3.77	5.62
Latvia	16.09	2.55	1.95	6.74	4.62	0.23
Lithuania	14.36	6.22	1.95	4.63	0.97	0.58
Netherlands	18.42	4.97	1.32	1.28	7.89	2.97
Poland	81.03	43.98	6.60	22.88	4.33	3.24
Portugal	12.93	2.91	3.82	4.98	0.85	0.37
Romania	49.05	21.90	4.94	16.60	2.03	3.58
Slovakia	15.21	6.17	0.97	7.06	0.01	1.00
Slovenia	4.32	0.54	0.62	2.93	0.00	0.22
Spain	57.60	31.30	13.83	7.94	2.75	1.79
Sweden	90.18	12.85	3.03	48.73	23.74	1.84
United Kingdom	98.64	38.53	9.94	5.42	33.00	11.74
Europe (Non-EU)	**1391.56**	**360.89**	**116.81**	**711.91**	**184.50**	**17.46**
Albania	3.75	2.03	0.62	0.51	0.29	0.30
Belarus	33.43	15.63	4.13	12.69	0.00	0.97
Bosnia Herzegovina	7.79	2.60	1.66	3.18	0.00	0.35
Croatia	9.99	1.43	2.79	3.71	1.51	0.56
Macedonia, FYR	2.94	1.64	0.57	0.51	0.01	0.21
Moldova, Rep.	5.39	4.25	0.31	0.56	0.04	0.23
Norway	28.26	3.59	1.97	12.83	9.08	0.79
Russian Federation	1161.85	237.13	95.89	652.97	166.70	9.17
Serbia / Montenegro	17.18	11.19	1.28	4.30	0.12	0.28
Switzerland**	9.20	2.26	1.27	4.64	0.05	0.98
Ukraine	111.76	79.14	6.31	16.00	6.70	3.61

Table 7: *Percent Change in Population, Ecological Footprint and Biocapacity, 1961 to 2005*

	Change in Population	Change in Per-Person Ecological Footprint of Consumption	Change in Total Ecological Footprint of Consumption	Change in Per-Person Biocapacity	Change in Total Biocapacity	HDI 1975	HDI 2005
World	**109%**	**19%**	**150%**	**-51%**	**3%**	**-**	**-**
High Income Countries	**44%**	**76%**	**153%**	**-31%**	**1%**	**-**	**-**
Middle Income Countries	**141%**	**21%**	**149%**	**-48%**	**7%**	**-**	**-**
Low Income Countries	**184%**	**22%**	**109%**	**-63%**	**-2%**	**-**	**-**
Africa							
Algeria	198%	85%	452%	-55%	34%	0.51	0.73
Angola	212%	-22%	144%	-69%	-2%	-	0.45
Benin	258%	-20%	185%	-77%	-19%	0.31	0.44
Botswana	201%	2%	207%	-66%	2%	0.51	0.65
Burkina Faso	192%	9%	218%	-35%	90%	0.26	0.37
Burundi	152%	-45%	38%	-57%	7%	0.29	0.41
Cameroon	202%	-23%	133%	-68%	-4%	0.42	0.53
Central African Rep.	159%	15%	198%	-63%	-3%	0.35	0.38
Chad	211%	-44%	74%	-66%	5%	0.30	0.39
Congo	289%	-42%	127%	-75%	-3%	0.48	0.55
Congo, Dem. Rep.	263%	-34%	140%	-76%	-14%	0.41	0.41
Côte d'Ivoire	392%	-41%	190%	-72%	39%	0.42	0.43
Egypt	159%	66%	331%	-33%	75%	0.43	0.71
Eritrea	-	-	-	-	-	-	0.48
Ethiopia	-	-	-	-	-	-	0.41
Gabon	184%	-4%	172%	-67%	-7%	-	0.68
Gambia	316%	-31%	188%	-70%	25%	0.29	0.50
Ghana	201%	32%	298%	-59%	23%	0.44	0.55
Guinea	184%	-41%	67%	-65%	1%	-	0.46
Guinea-Bissau	185%	-27%	108%	-63%	7%	0.27	0.37
Kenya	309%	-47%	119%	-74%	4%	0.47	0.52
Lesotho	107%	-46%	12%	-61%	-20%	0.50	0.55
Liberia	204%	-32%	108%	-71%	-12%	-	-
Libya	318%	288%	1524%	-62%	57%	-	0.82
Madagascar	238%	-53%	59%	-70%	2%	0.41	0.53
Malawi	257%	-61%	40%	-64%	30%	0.33	0.44
Mali	206%	-33%	106%	-60%	21%	0.25	0.38
Mauritania	200%	-49%	53%	-65%	6%	0.38	0.55
Mauritius	83%	237%	519%	-45%	0%	-	0.80

	Change in Population	Change in Per-Person Ecological Footprint of Consumption	Change in Total Ecological Footprint of Consumption	Change in Per-Person Biocapacity	Change in Total Biocapacity	HDI 1975	HDI 2005
Morocco	163%	-14%	127%	-50%	33%	0.44	0.65
Mozambique	155%	-9%	133%	-58%	6%	-	0.38
Namibia	231%	-21%	161%	-69%	1%	-	0.65
Niger	294%	-46%	115%	-77%	-8%	0.25	0.37
Nigeria	215%	-15%	168%	-64%	15%	0.32	0.47
Rwanda	206%	-36%	98%	-59%	27%	0.34	0.45
Senegal	224%	-30%	126%	-71%	-7%	0.34	0.50
Sierra Leone	141%	-35%	56%	-61%	-6%	-	0.34
Somalia	185%	-46%	55%	-63%	6%	-	-
South Africa, Rep.	166%	-19%	116%	-56%	16%	0.65	0.67
Sudan	207%	22%	276%	-69%	-4%	0.35	0.53
Swaziland	185%	-71%	-16%	-58%	18%	0.53	0.55
Tanzania, United Rep.	272%	-38%	130%	-75%	-7%	-	0.47
Togo	286%	-48%	99%	-75%	-2%	0.42	0.51
Tunisia	135%	42%	234%	-43%	35%	0.52	0.77
Uganda	322%	-47%	122%	-64%	52%	-	0.51
Zambia	261%	-45%	99%	-71%	4%	0.47	0.43
Zimbabwe	237%	-49%	72%	-75%	-16%	0.55	0.51
Middle East and Central Asia							
Afghanistan	193%	-69%	-10%	-70%	-11%	-	-
Armenia	-	-	-	-	-	-	0.78
Azerbaijan	-	-	-	-	-	-	0.75
Georgia	-	-	-	-	-	-	0.75
Iran	212%	68%	424%	-65%	10%	0.57	0.76
Iraq	281%	0%	282%	-80%	-24%	-	-
Israel	206%	132%	608%	-46%	65%	0.81	0.93
Jordan	512%	-25%	357%	-61%	140%	-	0.77
Kazakhstan	-	-	-	-	-	-	0.79
Kuwait	775%	130%	1909%	-83%	53%	0.77	0.89
Kyrgyzstan	-	-	-	-	-	-	0.70
Lebanon	84%	152%	363%	-11%	64%	-	0.77
Oman	343%	586%	2939%	-73%	21%	0.49	0.81
Saudi Arabia	485%	171%	1488%	-59%	138%	0.61	0.81
Syria	300%	45%	478%	-68%	26%	0.55	0.72
Tajikistan	-	-	-	-	-	-	0.67
Turkey	153%	8%	174%	-51%	23%	0.59	0.78
Turkmenistan	-	-	-	-	-	-	0.71
United Arab Emirates*	-	-	-	-	-	0.73	0.87

	Change in Population	Change in Per-Person Ecological Footprint of Consumption	Change in Total Ecological Footprint of Consumption	Change in Per-Person Biocapacity	Change in Total Biocapacity	HDI 1975	HDI 2005
Uzbekistan	-	-	-	-	-	-	0.70
Yemen	293% 0%	-22%	208%	-73%	5%	-	0.51
Asia-Pacific							
Australia	92%	-8%	76%	-40%	15%	0.85	0.96
Bangladesh	171%	-34%	80%	-60%	7%	0.35	0.55
Bhutan	146%	-36%	57%	-48%	28%	-	0.58
Cambodia	153%	-52%	21%	-53%	19%	-	0.60
China	97%	122%	336%	-22%	54%	0.53	0.78
India	144%	-14%	110%	-50%	22%	0.42	0.62
Indonesia	127%	-37%	44%	-48%	19%	0.47	0.73
Japan*	35%	137%	220%	-40%	-19%	0.86	0.95
Korea DPR	93%	17%	126%	-54%	-11%	-	-
Korea, Rep.	86%	289%	624%	-45%	2%	0.71	0.92
Lao PDR	166%	-37%	67%	-56%	18%	-	0.60
Malaysia	202%	29%	289%	-58%	28%	0.62	0.81
Mongolia	169%	-36%	73%	-67%	-11%	-	0.70
Myanmar	129%	22%	180%	-56%	1%	-	0.58
Nepal	165%	-39%	63%	-62%	1%	0.30	0.53
New Zealand	66%	-16%	40%	-41%	-1%	0.85	0.94
Pakistan	233%	-6%	214%	-50%	66%	0.37	0.55
Papua New Guinea	178%	26%	251%	-64%	1%	0.43	0.53
Philippines	198%	-23%	130%	-56%	30%	0.66	0.77
Singapore	156%	372%	1109%	-64%	-9%	0.73	0.92
Sri Lanka	101%	7%	116%	-46%	8%	0.62	0.74
Thailand	134%	84%	330%	-49%	19%	0.62	0.78
Viet Nam	144%	46%	257%	-44%	36%	-	0.73
Latin America and the Caribbean							
Argentina	85%	-62%	-30%	-39%	12%	0.79	0.87
Bolivia	168%	22%	227%	-66%	-10%	0.52	0.70
Brazil	149%	-5%	135%	-59%	1%	0.65	0.80
Chile	108%	30%	170%	-52%	0%	0.71	0.87
Colombia	162%	-12%	132%	-63%	-4%	0.66	0.79
Costa Rica	213%	-8%	188%	-67%	2%	0.75	0.85
Cuba	58%	55%	145%	2%	61%	-	0.84
Dominican Rep.	166%	33%	253%	-61%	4%	0.63	0.78
Ecuador*	190%	49%	333%	-71%	-17%	0.64	0.77
El Salvador	159%	12%	189%	-66%	-12%	0.60	0.74

	Change in Population	Change in Per-Person Ecological Footprint of Consumption	Change in Total Ecological Footprint of Consumption	Change in Per-Person Biocapacity	Change in Total Biocapacity	HDI 1975	HDI 2005
Guatemala	196%	12%	232%	-57%	26%	0.51	0.69
Haiti	120%	-47%	17%	-68%	-29%	-	0.53
Honduras	267%	-42%	112%	-76%	-12%	0.53	0.70
Jamaica	60%	25%	100%	-43%	-9%	0.69	0.74
Mexico	181%	79%	403%	-61%	9%	0.69	0.83
Nicaragua	229%	-26%	143%	-78%	-27%	0.58	0.71
Panama	179%	57%	338%	-69%	-13%	0.72	0.81
Paraguay	227%	-24%	149%	-76%	-20%	0.67	0.76
Peru	174%	-38%	71%	-62%	3%	0.65	0.77
Trinidad and Tobago	52%	56%	137%	-37%	-4%	0.76	0.81
Uruguay	35%	-19%	9%	-17%	12%	0.76	0.85
Venezuela	240%	13%	282%	-67%	11%	0.72	0.79
North America							
Canada	76%	34%	136%	-40%	5%	0.87	0.96
United States of America	58%	78%	181%	-42%	-8%	0.87	0.95
Europe (EU)							
Austria	16%	71%	97%	-18%	-6%	0.85	0.95
Belgium*	13%	67%	88%	-17%	-7%	0.85	0.95
Bulgaria	-3%	-11%	-13%	-5%	-7%	-	0.82
Czech Rep.	-	-	-	-	-	-	0.89
Denmark	18%	53%	80%	-19%	-4%	0.88	0.95
Estonia	-	-	-	-	-	-	0.86
Finland*	18%	6%	25%	-18%	-3%	0.85	0.95
France	31%	41%	85%	-11%	16%	0.86	0.95
Germany*	13%	47%	65%	2%	14%	-	0.94
Greece	33%	158%	242%	-12%	17%	0.84	0.93
Hungary	1%	16%	17%	21%	22%	0.79	0.87
Ireland**	46%	57%	130%	-27%	7%	0.82	0.96
Italy	15%	126%	160%	-9%	4%	0.85	0.94
Latvia	-	-	-	-	-	-	0.86
Lithuania	-	-	-	-	-	-	0.86
Netherlands	40%	67%	116%	-27%	2%	0.87	0.95
Poland	28%	12%	43%	-30%	-10%	-	0.87
Portugal	18%	68%	98%	-16%	-1%	0.79	0.90
Romania	17%	2%	19%	-10%	6%	-	0.81
Slovakia	-	-	-	-	-	-	0.86
Slovenia	-	-	-	-	-	-	0.92

	Change in Population	Change in Per-Person Ecological Footprint of Consumption	Change in Total Ecological Footprint of Consumption	Change in Per-Person Biocapacity	Change in Total Biocapacity	HDI 1975	HDI 2005
Spain	40%	120%	208%	-31%	-4%	0.85	0.95
Sweden	20%	5%	26%	-26%	-11%	0.87	0.96
United Kingdom	15%	55%	78%	-7%	6%	0.85	0.95
Europe (Non-EU)							
Albania	88%	7%	102%	-28%	36%	-	0.80
Belarus	-	-	-	-	-	-	0.80
Bosnia Herzegovina	-	-	-	-	-	-	0.80
Croatia	-	-	-	-	-	-	0.85
Macedonia, FYR	-	-	-	-	-	-	0.80
Moldova, Rep.	-	-	-	-	-	-	0.71
Norway	28%	-19%	4%	-17%	6%	0.87	0.97
Russian Federation	-	-	-	-	-	-	0.80
Serbia / Montenegro	-	-	-	-	-	-	-
Switzerland**	33%	87%	149%	-26%	-2%	0.88	0.96
Ukraine	-	-	-	-	-	-	0.79

Notes

World: Total population includes countries not listed in table.

High income countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, Korea, Rep., Kuwait, Netherlands, New Zealand, Norway, Portugal, Saudi Arabia, Singapore, Slovenia, Spain, Sweden, Switzerland, United Arab Emirates, United Kingdom, and United States of America.

Middle income countries: Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Belarus, Bolivia, Bosnia Herzegovina, Botswana, Brazil, Bulgaria, Cameroon, Chile, China, Colombia, Congo, Costa Rica, Croatia, Cuba, Czech Rep., Dominican Rep., Ecuador, Egypt, El Salvador, Estonia, Gabon, Georgia, Guatemala, Honduras, Hungary, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Latvia, Lebanon, Lesotho, Libya, Lithuania, Macedonia, FYR, Malaysia, Mauritius, Mexico, Moldova, Rep., Morocco, Namibia, Nicaragua, Panama, Paraguay, Peru, Philippines, Poland, Romania, Russian Federation, Serbia and Montenegro, Slovakia, South Africa, Rep., Sri Lanka, Swaziland, Syria, Thailand, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Ukraine, Uruguay, and Venezuela.

Low income countries: Afghanistan, Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Central African Rep., Chad, Congo, Dem. Rep., Côte d'Ivoire, Eritrea, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Haiti, India, Kenya, Korea DPR, Kyrgyzstan, Lao PDR, Liberia, Madagascar, Malawi, Mali, Mauritania, Mongolia, Mozambique, Myanmar, Nepal, Niger, Nigeria, Pakistan, Papua New Guinea, Rwanda, Senegal, Sierra Leone, Somalia, Sudan, Tajikistan, Tanzania, United Rep., Togo, Uganda, Uzbekistan, Vietnam, Yemen, Zambia, and Zimbabwe.

For the following countries, IPCC data supplemented FAO data for forest biocapacity calculation: Algeria, Bangladesh, Benin, Bosnia Herzegovina, Burundi, Chad, Egypt, El Salvador, Eritrea, Ethiopia, Gambia, Georgia, Haiti, Iran, Iraq, Jamaica, Jordan, Kuwait, Kyrgyzstan, Lebanon, Lesotho, Libya, Mali, Mauritania, Mauritius, Mongolia, Namibia, Oman, Rwanda, Senegal, Serbia and Montenegro, Singapore, Somalia, South Africa, Rep., Sri Lanka, Sudan, Swaziland, Syria, and Thailand.

1. Population data from the UN FAO.
2. Forest Footprint includes fuelwood.
3. Built-up land includes areas dammed for hydropower.
4. Carbon Footprint of a nations' consumption includes direct carbon dioxide emissions from fossil fuel combustion, as well as indirect emissions for products manufactured abroad. It also includes carbon dioxide emissions associated with extraction of these fossil fuels, such as flaring of gas. Other consumption-related carbon dioxide emissions included in the accounts are from cement production and tropical forest fires.

*Government review of National Footprint Accounts partial or in process.

**Government review of National Footprint Accounts completed.

The number of digits in these tables do not indicate precision and are for identification purposes only. Footprint and biocapacity results may be within an order of 10 percent margin in absolute terms, and possibly smaller in relative terms.

0.0 = less than 0.05
Totals may not add up due to rounding.

APPENDIX G: Frequently Asked Questions

How is the Ecological Footprint calculated?

The Ecological Footprint measures the amount of biologically productive land and water area required to produce the resources an individual, population or activity consumes and to absorb the waste they generate, given prevailing technology and resource management. This area is expressed in *global hectares,* hectares with world-average biological productivity. Footprint calculations use *yield factors* to take into account national differences in biological productivity (e.g., tonnes of wheat per UK hectare versus per Argentina hectare) and *equivalence factors* to take into account differences in world average productivity among land types (e.g., world average forest versus world average cropland).

Footprint and biocapacity results for nations are calculated annually by Global Footprint Network. The continuing methodological development of these National Footprint Accounts is overseen by a formal review committee (www.footprintstandards.org/committees). A detailed methods paper and copies of sample calculation sheets can be obtained at no charge; see www.footprintnetwork.org./atlas.

Why is the global total Ecological Footprint not equal to the sum of all national Footprints?

The Ecological Footprint of humanity as a whole is calculated by applying the standard Ecological Footprint methodology to global aggregate data. There are several sources of discrepancies between the calculated world Footprint and the sum of all the national Footprints. The main reasons for differences are listed here, in descending order of significance to the 2008 edition of the National Footprint Accounts:

- Carbon dioxide emissions from non-fossil-fuel sources. The carbon component of the Ecological Footprint includes a broad category of non-fossil-fuel carbon dioxide emissions. This group combines emissions from industrial processes, land-use change and flaring associated with oil and natural gas production. It also includes emissions from chemical reactions during cement production, and from the production of some biofuels. For lack of a suitable means of allocating these emissions to final consumption activities, the Footprint of emissions in this category is included only in the global total. This category accounts for 15% of the world's carbon emissions, or approximately 0.2 gha per person.
- The grazing Footprints of production of individual nations are capped at biocapacity. Since the annual productivity of grazing land accounts for nearly all available above-ground biomass, overshoot in this component is only physically possible for very short periods of time. For this reason, a nation's grazing gand Footprint of production is not allowed to exceed its calculated biocapacity. Sixty-seven nations are affected by this cap, though on the global scale the grazing land Footprint is less than the biocapacity. In total the national caps on grazing land Footprint remove a total of 324,000,000 gha, or 20% of the global grazing land Footprint. .
- The raw data contains discrepancies. Because much of the raw data used to calculate the National Footprint Accounts is based on self-reporting by individual countries, there are some discrepancies in reported values. This is particularly apparent in trade flows, where the sum of all countries' reported imports of a given commodity does not exactly equal the sum of their reported exports. More than 40% of the world's Ecological Footprint is reallocated through international trade. Discrepancies among countries' reported import and export quantities contribute to differences between the total global Footprint and the sum of the individual Footprints of all countries.
- Small countries not reported individually in the National Footprint Accounts are still included in global aggregate data. The National Footprint Accounts do not report results for countries with populations of less than 1 million, as data for these countries are generally less reliable. These countries are, however, included in the global aggregate data used to calculate the global Ecological Footprint.

What does a per person national Footprint actually mean?

A per person national Footprint measures the amount of bioproductive space under constant production required to support the average individual of that country. For example, a five-hectare per person Footprint means that an average individual in that country uses all of the services produced in a year by five hectares of world-average productive land. This land does not need to be within the borders of the individual's country as biocapacity is often embodied in goods imported from other countries to meet consumption demands.

What is included in the Ecological Footprint? What is excluded?

To avoid exaggerating human demand on nature, the Ecological Footprint includes only those aspects of resource consumption and waste production for which the Earth has regenerative capacity, and where data exist that allow this demand to be expressed in terms of productive area. For example, freshwater withdrawal is not included in the Footprint, although the energy used to pump or treat it is.

Ecological Footprint accounts provide snapshots of past resource demand and availability. They do not predict the future. Thus, while the Footprint does not estimate future losses caused by present degradation of ecosystems, if persistent this degradation will likely be reflected in future accounts as a loss of biocapacity.

Footprint accounts also do not indicate the intensity with which a biologically productive area is being used, nor do they pinpoint specific biodiversity pressures. Finally, the Ecological Footprint is a biophysical measure; it does not evaluate the essential social and economic dimensions of sustainability.

How do you measure biocapacity and how do you determine how much is available?

Biocapacity per person is calculated by taking the total amount of bioproductive land worldwide and dividing it by world population. It is a globally aggregated measure of the amount of land and sea area available per person to produce crops (cropland), livestock (grazing land), timber products (forest) and fish (fishing grounds), and to support infrastructure (built-up-land). A nation's biocapacity may include more global hectares than the nation has actual hectares if its land and sea area are highly productive. Biocapacity assessments reflect technological advancements that increase yields, as the conversion of hectares into global hectares takes into account productivity.

How does the Ecological Footprint account for the use of fossil fuels?

Fossil fuels such as coal, oil, and natural gas are extracted from the Earth's crust rather than produced by current ecosystems. When burning this fuel, carbon dioxide is produced. In order to avoid carbon dioxide accumulation in the atmosphere, in accordance with the goal of the UN Framework Convention on Climate Change, two options exist: a) human technological sequestration, such as deep well injection; or b) natural sequestration. Natural sequestration corresponds to the biocapacity required to absorb and store the CO_2 not sequestered by humans, less than the amount absorbed by the oceans. This is the Footprint for fossil fuels. Currently, negligible amounts of CO_2 are sequestered through human technological processes.

The sequestration rate used in Ecological Footprint calculations is based on an estimate of how much carbon the world's forests can remove from the atmosphere and retain. One 2005 global hectare can absorb the CO_2 released by burning approximately 1,525 litres of gasoline per year.

The fossil fuel Footprint does not suggest that carbon sequestration is the key to resolving global warming. Rather the opposite: It shows that the biosphere does not have sufficient capacity to cope with current levels of CO_2 emissions. As forests mature, their CO_2 sequestration rate approaches zero, and the Footprint per tonne of CO_2 sequestration increases. Eventually, forests may even become net emitters of carbon.

How is international trade taken into account?

The national Ecological Footprint accounts calculate each country's net consumption by adding its imports to its production and subtracting its exports. This means that the resources used for producing a car that is manufactured in Japan, but sold and used in India, will contribute to the Indian, not the Japanese consumption Footprint.

The resulting national consumption Footprints can be distorted, since the resources used and waste generated in making products for export are not fully documented. This can bias the Footprints of countries whose trade-flows are large relative to their overall economies. These misallocations, however, do not affect the total global Ecological Footprint.

Does the Ecological Footprint take into account other species?

The Ecological Footprint describes human demand on nature. Currently, there are 2.1 global hectares of biocapacity available per person on planet Earth, less if some of the biologically productive area is set aside for use by wild species. The value society places on biodiversity will determine how much biocapacity should be reserved for the use of non-domesticated species. Efforts to increase biocapacity, such as through monocropping and the application of pesticides, may at the same time increase pressure on biodiversity; this means a larger reserve may be required to achieve the same conservation results.

If the world has been in overshoot for the past 20 years, why haven't we already run out of resources?

Humanity's demand first began to overshoot global biocapacity in the 1980s. Every year since, the rate at which the planet can regenerate resources has not been sufficient to keep up with the rate at which humanity has been using these resources. In 2005, this overshoot, or excess demand, was 30 percent greater than the Earth's ability to meet this demand.

Regenerative capacity refers to the rate at which nature can take dispersed matter and turn it into resources, defined as concentrated and structured matter that humans find useful in one way or another. While the Earth is largely a closed system in terms of matter — there is little leaving the planet or arriving from space — it is an open system in terms of energy. This is fortunate, because without this input of energy, resources would be depleted, wastes would accumulate, and the planet would become an increasingly inhospitable place. Energy from the sun powers nature's regenerative processes, which act like a giant recycling machine, converting waste back into resources, and in doing so, maintaining the narrow range of conditions that have allowed humans to live and prosper on the planet.

Ecological Footprint methodology measures both the capacity of nature's recycling system — its biocapacity; and the demands humans are placing on it — their Footprint. There are two ways humanity's Footprint can overshoot the Earth's regenerative capacity: by using resources faster than the planet's living systems can regenerate them; or by degrading and dispersing matter — by creating waste — faster than nature can turn this waste into resources. This matter may be harvested from ecosystems, such forest or cropland, that exist on the surface of the planet; or it may be extracted from the Earth's crust in the form, for example, of fossil fuels. When regenerative capacity is exceeded by overharvesting, ecosystems become depleted, and if this depletion continues for too long, they collapse, sometimes with a permanent loss of productivity. When regenerative capacity is exceeded by extracting matter from the crust and dispersing it faster than it can be captured and concentrated by living systems, wastes begin to accumulate. The burning of fossil fuels, for example, is causing carbon dioxide to accumulate in the atmosphere and the oceans.

If overshoot was all due to overharvesting, standing stocks of renewable resources would be rapidly depleted. This is happening in fisheries, for example, where fish populations have dramatically collapsed, although data limitations make it difficult to show this in current Footprint accounts. However, to a considerably greater extent overshoot has resulted from bringing material up from the Earth's crust and dispersing it at a rate much faster than living systems can sequester it. As a result, we are depleting ecosystem stocks — trees, for example — at a slower rate than would be the case if all of overshoot was accounted for by overharvesting. This is why we have not yet run out of resources.

Does the Ecological Footprint say what is a "fair" or "equitable" use of resources?

The Footprint documents what happened in the past. It can quantitatively describe the ecological resources used by an individual or a population, but it does not prescribe what they should be using. Resource allocation is a policy issue, based on societal beliefs about what is or is not equitable. Thus, while Footprint accounting can determine the average biocapacity that is available per person, it does not stipulate how that biocapacity should be allocated among individuals or nations. However, it provides a context for such discussions.

Does the Ecological Footprint matter if the supply of renewable resources can be increased and advances in technology can slow the depletion of non-renewable resources?

The Ecological Footprint measures the current state of resource use and waste generation. It asks: In a given year, did human demand on ecosystems exceed the ability of ecosystems to meet this demand? Footprint analysis reflects both increases in the productivity of renewable resources (for example, if the productivity of cropland is increased, then the Footprint of 1 tonne of wheat will decrease) and technological innovation (for example, if the paper industry doubles the overall efficiency of paper production, the Footprint per tonne of paper will be cut by half). Ecological Footprint accounts capture these changes as they occur and can determine the extent to which these innovations have succeeded in bringing human demand within the capacity of the planet's ecosystems. If there is a sufficient increase in ecological supply and a reduction in human demand due to technological advances or other factors, Footprint accounts will show this as the elimination of global overshoot.

Does the Ecological Footprint ignore the role of population growth as a driver in humanity's increasing consumption?

The total Ecological Footprint of a nation or of humanity as a whole is a function of the number of people consuming, the quantity of goods and services an average person consumes, and the resource intensity of these goods and services. Since Footprint accounting is historical, it does not predict how any of these factors will change in the future. However, if population grows or declines (or any of the other factors change), this will be reflected in future Footprint accounts.

Footprint accounts also show how resource consumption is distributed among regions. For example, the total Footprint of the Asia-Pacific region, with its large population but low per person Footprint, can be directly compared to that of North America, with its much smaller population but much larger per person Footprint.

How do I calculate the Ecological Footprint of a city or region?

While the calculations for global and national Ecological Footprints have been standardized within the National Footprint Accounts, there are a variety of ways used to calculate the Footprint of a city or region. The family of "process-based" approaches use production recipes and supplementary statistics to allocate the national per person Footprint to consumption categories (e.g. food, shelter, mobility, goods and services). Regional or municipal average per person Footprints are calculated by scaling these national results up or down based on differences between national and local consumption patterns. The family of input-output approaches use monetary, physical or hybrid input-output tables for allocating overall demand to consumption categories.

There is growing recognition of the need to standardize sub-national Footprint application methods in order to increase their comparability across studies and over time. In response to this need, methods and approaches for calculating the Footprint of cities and regions are currently being aligned through the global Ecological Footprint Standards initiative. For more information on current Footprint standards and ongoing standardization debates, see www.footprintstandards.org.

For additional information about Footprint methodology, data sources, assumptions, and definitions please read the Guidebook to the National Footprint Accounts 2008 Edition and Calculation Methodology for the National Footprint Accounts, 2008 Edition.

http://www.footprintnetwork.org/atlas.

APPENDIX H: GLOSSARY

Acre: One U.S. acre is equal to 0.405 hectares. For U.S. audiences, Footprint results are often presented in global acres (ga), rather than global hectares (gha).

Biodiversity buffer: The amount of biocapacity set aside to maintain representative ecosystem types and viable populations of species. How much needs to be set aside depends on biodiversity management practices and the desired outcome.

Biological capacity, or biocapacity: The capacity of ecosystems to produce useful biological materials and to absorb waste materials generated by humans, using current management schemes and extraction technologies. "Useful biological materials" are defined as those used by the human economy. Hence what is considered "useful" can change from year to year (e.g. use of corn (maize) stover for cellulosic ethanol production would result in corn stover becoming a useful material, and thus increase the biocapacity of maize cropland). The biocapacity of an area is calculated by multiplying the actual physical area by the yield factor and the appropriate equivalence factor. Biocapacity is usually expressed in global hectares.

Biological capacity available per person (or per person): There were 13.3 billion hectares of biologically productive land and water on this planet in 2005. Dividing by the number of people alive in that year, 6.5 billion, gives 2.1 global hectares per person. This assumes that no land is set aside for other species that consume the same biological material as humans.

Biologically productive land and water: The land and water (both marine and inland waters) area that supports significant photosynthetic activity and the accumulation of biomass used by humans. Non-productive areas as well as marginal areas with patchy vegetation are not included. Biomass that is not of use to humans is also not included. The total biologically productive area on land and water in 2005 was approximately 13.3 billion hectares.

Carbon Footprint: When used in Ecological Footprint studies, this term is synonymous with demand on CO_2 area. The phrase "Carbon Footprint" has been picked up in the climate change debate. Several web-calculators use the phrase "Carbon Footprint". Many just calculate tonnes of carbon, or tonnes of carbon per Euro, rather than demand on bioproductive area. The Ecological Footprint encompasses the carbon Footprint, and captures the extent to which measures for reducing the carbon Footprint lead to increases in other Footprint components.

CO_2 area (also CO_2 land): The demand on biocapacity required to sequester (through photosynthesis) the carbon dioxide (CO_2) emissions from fossil fuel combustion. Although fossil fuels are extracted from the Earth's crust and are not regenerated in human time scales, their use demands ecological services if the resultant CO_2 is not to accumulate in the atmosphere. The Ecological Footprint, therefore, includes the biocapacity, typically that of unharvested forests, needed to absorb that fraction of fossil CO_2 that is not absorbed by the ocean.

Consumption: Use of goods or of services. The term "consumption" has two different meanings, depending on context. As commonly used in regard to the Footprint, it refers to the use of goods or services. A consumed good or service embodies all the resources, including energy, necessary to provide it to the consumer. In full life-cycle accounting, everything used along the production chain is taken into account, including any losses along the way. For example, consumed food includes not only the plant or animal matter people eat or waste in the household, but also that lost during processing or harvest, as well as all the energy used to grow, harvest, process and transport the food.

As used in Input-Output analysis, consumption has a strict technical meaning. Two types of consumption are distinguished: intermediate and final. According to the (economic) System of National Accounts terminology, intermediate consumption refers to the use of goods and services by a business in providing goods and services to other businesses. Final consumption refers to non-productive use of goods and services by households, the government, the capital sector, and foreign entities.

Consumption components (also consumption categories): Ecological Footprint analyses can allocate total Footprint among consumption components, typically food, shelter, mobility, goods, and services, often with further resolution into sub-components. Consistent categorization across studies allows for comparison of the Footprint of individual consumption components across regions, and the relative contribution of each category to the region's overall Footprint. To avoid double counting, it is important to make sure that consumables are allocated to only one component or sub-component. For example, a refrigerator might be included in the food, goods, or shelter component, but only in one.

Consumption Footprint: The most commonly reported type of Ecological Footprint. It is the area used to support a defined population's consumption. The consumption Footprint (in gha) includes the area needed to produce the materials consumed and the area needed to absorb the waste. The consumption Footprint of a nation is calculated in the National Footprint Accounts as a nation's primary production Footprint plus the Footprint of imports minus the Footprint of exports, and is thus, strictly speaking, a Footprint of apparent consumption. The national average or per person Consumption Footprint is equal to a country's Consumption Footprint divided by its population.

Consumption Land Use Matrix: Starting with data from the National Footprint Accounts, a Consumption Land Use Matrix allocates the six major Footprint land uses (shown in column headings, representing the five land types and CO_2 area) to the five Footprint consumption components (row headings). Each consumption component can be disaggregated further to display additional information. These matrices are often used as a tool to develop sub-national (e.g. state, county, city) Footprint assessments. In this case, national data for each cell is scaled up or down depending on the unique consumption patterns in the state, county or city.

	Built-up Land	Carbon Footprint	Cropland	Grazing Land	Forest Land	Fishing Ground	TOTAL
Food							
Shelter							
Mobility							
Goods							
Services							
TOTAL							

Conversion factor: A generic term for factors that are used to translate a material flow expressed within one measurement system into another one. For example, a combination of two conversion factors —"yield factors" and "equivalence factors"— translates hectares into global hectares. The extraction rate conversion factor translates a secondary product into primary product equivalents.

Conversion Factor Library: See Footprint Intensity Table.

Daughter product: The product resulting from the processing of a parent product. For example wood pulp, a secondary product, is a daughter product of roundwood. Similarly, paper is a daughter product of wood pulp.

Double counting: In order not to exaggerate human demand on nature, Footprint Accounting avoids double counting, or counting the same Footprint area more than once. Double counting errors may arise in several ways. For example, when adding the Ecological Footprints in a production chain (e.g., wheat farm, flour mill, and bakery), the study must count the cropland for growing wheat only once to avoid double counting. Similar, but smaller, errors can arise in analyzing a production chain when the end product is used to produce the raw materials used to make the end product (e.g. steel is used in trucks and earthmoving equipment used to mine the iron that is made into the steel). Finally, when land serves two purposes (e.g. a farmer harvests a crop of winter wheat and then plants corn to harvest in the fall), it is important not to count the land area twice. Instead, the yield factor is adjusted to reflect the higher bioproductivity of the double-cropped land.

Ecological debt: The sum of annual ecological deficits. Humanity's Footprint first exceeded global biocapacity in the mid-1980s, and has done so every year since. By 2005 this annual overshoot had accrued into an ecological debt that exceeded 2.5 years of the Earth's total productivity.

Ecological deficit/reserve: The difference between the biocapacity and Ecological Footprint of a region or country. An ecological deficit occurs when the Footprint of a population exceeds the biocapacity of the area available to that population. Conversely, an ecological reserve exists when the biocapacity of a region or country exceeds the Footprint of its population. If there is a regional or national ecological deficit, it means that the region or country is either importing biocapacity through trade, liquidating its own ecological assets, or emitting wastes into a global commons such as the atmosphere. In contrast, the global ecological deficit cannot be compensated through trade, and is equal to overshoot.

Ecological Footprint: A measure of how much biologically productive land and water an individual, population or activity requires to produce all the resources it consumes and to absorb the waste it generates, using prevailing technology and resource management practices. The Ecological Footprint is usually measured in global hectares. Because trade is global, an individual or country's Footprint includes land or sea from all over in the world. Ecological Footprint is often referred to in short form as Footprint. "Ecological Footprint" and "Footprint" are proper nouns and thus should always be capitalized.

Ecological Footprint Standards: Specified criteria governing methods, data sources and reporting to be used in Footprint studies. Standards are established by the Global Footprint Network Standards Committees, composed of scientists and Footprint practitioners from around the world. Standards serve to produce transparent, reliable and mutually comparable results in studies done throughout the Footprint Community. Where Standards are not appropriate, Footprint Guidelines should be consulted. For more information, consult www.footprintstandards.org.

Ecological reserve: See ecological deficit/reserve.

Embodied energy: Embodied energy is the energy used during a product's entire life cycle in order to manufacture, transport, use and dispose of the product. Footprint studies often use embodied energy when tracking the trade of goods.

Energy Footprint: The sum of all areas used to provide non-food and non-feed energy. It is the sum of CO_2 area, hydropower land, forest for fuelwood, and cropland for fuel crops.

Equivalence factor: A productivity-based scaling factor that converts a specific land type (such as cropland or forest) into a universal unit of biologically productive area, a global hectare. For land types (e.g. cropland) with productivity higher than the average productivity of all biologically productive land and water area on Earth, the equivalence factor is greater than one. Thus, to convert an average hectare of cropland to global hectares, it is multiplied by the cropland equivalence factor of 2.64. Pasture lands, which have lower productivity than cropland, have an equivalence factor of 0.50 (see also yield factor). In a given year, equivalence factors are the same for all countries.

Extraction rate: A processing factor comparing the quantity of a parent product to the quantity of the resulting daughter product. When a parent product is processed its mass changes. For example, when wheat is processed into white flour, the bran and germ are stripped, lessening its mass. Therefore, in order to calculate the number of hectares needed to produce a given mass of flour, an extraction rate is needed. This extraction rate in this example is the ratio of tonnes of flour divided by the tonnes of wheat processed to produce the flour.

Footprint intensity: The number of global hectares required to produce a given quantity of resource or absorb a given quantity of waste, usually expressed as global hectares per tonne. The National Footprint Accounts calculate a primary Footprint Intensity Table for each country, which includes the global hectares of primary land use type needed to produce or absorb a tonne of product (i.e., global hectares of cropland per tonne of wheat, global hectares of forest per tonne carbon dioxide)."

Footprint Intensity Table: A collection of the primary and secondary product Footprint intensities from the National Footprint Accounts. Footprint intensity is usually measured in gha per tonne of product or waste (CO_2). The Footprint Intensity Table is maintained by Global Footprint Network, supported by the Network's National Accounts Committee.

Footprint-neutral or negative: Human activities or services that result in no increase or a net reduction in humanity's Ecological Footprint. For example, the activity of insulating an existing house has a Footprint for production and installation of the insulation materials. This insulation in turn reduces the energy needed for cooling and heating this existing house. If the Footprint reduction from this energy cutback is equal to or greater than the original Footprint of insulating the house, the latter becomes a Footprint-neutral or negative activity. On the other hand, making a new house highly energy efficient does not by itself make the house Footprint-neutral, unless it at the same time causes a reduction in other existing Footprints. This Footprint reduction has to be larger than the Footprint of building and operating the new house.

Global hectare (gha): A productivity-weighted area used to report both the biocapacity of the Earth, and the demand on biocapacity (the Ecological Footprint). The global hectare is normalized to the area-weighted average productivity of biologically productive land and water in a given year. Because different land types have different productivity, a global hectare of, for example, cropland, would occupy a smaller physical area than the much less biologically productive pasture land, as more pasture would be needed to provide the same biocapacity as one hectare of cropland. Because world bioproductivity varies slightly from year to year, the value of a gha may change slightly from year to year.

Guidelines (for Footprint studies): Suggested criteria governing methods, data sources and reporting for use when Footprint Standards are not appropriate or not yet developed.

Hectare: 1/100th of a square kilometre, 10,000 square meters, or 2.471 acres. A hectare is approximately the size of a soccer field. See also global hectare and local hectare.

IO (Input-Output) analysis: Input-Output (IO, also I-O) analysis is a mathematical tool widely used in economics to analyze the flows of goods and services between sectors in an economy, using data from IO tables. IO analysis assumes that everything produced by one industry is consumed either by other industries or by final consumers, and that these consumption flows can be tracked. If the relevant data are available, IO analyses can be used to track both physical and financial flows. Combined economic-environment models use IO analysis to trace the direct and indirect environmental impacts of industrial activities along production chains, or to assign these impacts to final demand categories. In Footprint studies, IO analysis can be used to apportion Footprints among production activities, or among categories of final demand, as well as in developing Consumption Land Use Matrices.

IO (Input-Output) tables: IO tables contain the data that are used in IO analysis. They provide a comprehensive picture of the flows of goods and services in an economy for a given year. In its general form an economic IO table shows *uses* — the purchases made by each sector of the economy in order to produce their own output, including purchases of imported commodities; and *supplies* — goods and services produced for intermediate and final domestic consumption and exports. IO tables often serve as the basis for the economic National Accounts produced by national statistical offices. They are also used to generate annual accounts of the Gross Domestic Product (GDP).

Land type: The Earth's approximately 13.4 billion hectares of biologically productive land and water are categorized into five types of surface area: cropland, grazing land, forest, fishing ground, and built-up land. Also called "area type".

Life cycle analysis (LCA): A quantitative approach that assess a product's impact on the environment throughout its life. LCA attempts to quantify what comes in and what goes out of a product from "cradle to grave," including the energy and material associated with materials extraction, product manufacture and assembly, distribution, use and disposal, and the environmental emissions that result. LCA applications are governed by the ISO 14040 series of standards (http://www.iso.org).

Local hectare: A productivity-weighted area used to report both the biocapacity of a local region, and the demand on biocapacity (the Ecological Footprint). The local hectare is normalized to the area-weighted average productivity of the specified region's biologically productive land and water. Hence, similar to currency conversions, Ecological Footprint calculations expressed in global hectares can be converted into local hectares in any given year (e.g. Danish hectares, Indonesian hectares) and vice versa. The number of Danish hectares equals the number of bioproductive hectares in Denmark – each Danish hectare would represent an equal share of Denmark's total biocapacity.

National Footprint Accounts: The central data set that calculates the Footprints and biocapacities of the world and roughly 150 nations from 1961 to the present (generally with a three-year lag due to data availability). The ongoing development, maintenance and upgrades of the National Footprint Accounts are coordinated by Global Footprint Network and its 100-plus partners.

Natural capital: Natural capital can be defined as all of the raw materials and natural cycles on Earth. Footprint analysis considers one key component, *life-supporting* natural capital, or ecological capital for short. This capital is defined as the stock of living ecological assets that yield goods and services on a continuous basis. Main functions include resource production (such as fish, timber or cereals), waste assimilation (such as CO_2 absorption or sewage decomposition) and life-support services (such as UV protection, biodiversity, water cleansing or climate stability).

Overshoot: Global overshoot occurs when humanity's demand on nature exceeds the biosphere's supply, or regenerative capacity. Such overshoot leads to a depletion of Earth's life-supporting natural capital and a build-up of waste. At the global level, ecological deficit and overshoot are the same, since there is no net-import of resources to the planet. Local overshoot occurs when a local ecosystem is exploited more rapidly than it can renew itself.

Parent product: The product processed to create a daughter product. For example wheat, a primary product, is a parent product of flour, a secondary product. Flour, in turn, is a parent product of bread.

Planet equivalent(s): Every individual and country's Ecological Footprint has a corresponding Planet Equivalent, or the number of Earths it would take to support humanity's Footprint if everyone lived like that individual or average citizen of a given country. It is the ratio of an individual's (or country's per person) Footprint to the per person biological capacity available on Earth (2.1 gha in 2005). In 2005, the world average Ecological Footprint of 2.7 gha equals 1.31 Planet equivalents.

Primary product: In Footprint studies, a primary product is the least-processed form of a biological material that humans harvest for use. There is a difference between the raw product, which is all the biomass produced in a given area, and the primary product, which is the biological material humans will harvest and use. For example, a fallen tree is a raw product that, when stripped of its leaves and bark, results in the primary product of roundwood. Primary products are then processed to produce secondary products such as wood pulp and paper. Other examples of primary products are potatoes, cereals, cotton and forage. Examples of secondary products are kWh of electricity, bread, clothes, beef and appliances.

Primary production Footprint (also primary demand): In contrast to the consumption Footprint, a nation's primary production Footprint is the sum of the Footprints for all the resources harvested and all of the waste generated within the defined geographical region. This includes all the area within a country necessary for supporting the actual harvest of primary products (cropland, pasture land, forestland and fishing grounds), the country's built-up area (roads, factories, cities), and the area needed to absorb all fossil fuel carbon emissions generated within the country. In other words, the forest Footprint represents the area necessary to regenerate all the timber harvested (hence, depending on harvest rates, this area can be bigger or smaller than the forest area that exists within the country). Or, for example, if a country grows cotton for export, the ecological resources required are not included in that country's consumption Footprint; rather, they are included in the consumption Footprint of the country that imports the t-shirts. However, these ecological resources *are* included in the exporting country's primary production Footprint.

Productivity: The amount of biological material useful to humans that is generated in a given area. In agriculture, productivity is called yield.

Secondary product: All products derived from primary products or other secondary products through a processing sequence applied to a primary product.

Tonnes: All figures in the National Footprint Accounts are reported in metric tonnes. One metric tonne equals 1000 kg, or 2205 lbs.

Yield: The amount of primary product, usually reported in tonnes per year, that humans are able to extract per-area unit of biologically productive land or water.

Yield factor: A factor that accounts for differences between countries in productivity of a given land type. Each country and each year has yield factors for cropland, grazing land, forest, and fisheries. For example, in 2005, German cropland was 2.3 times more productive than world average cropland. The German cropland yield factor of 2.3, multiplied by the cropland equivalence factor of 2.6, converts German cropland hectares into global hectares: One hectare of cropland is equal to 6.0 gha.

Note that primary product and primary production Footprint are Footprint-specific terms. They are not related to, and should not be confused with, the ecological concepts of primary production, gross primary productivity (GPP) and net primary productivity (NPP).

www.footprintnetwork.org

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Global Footprint Network is committed to fostering a world in which all people have the opportunity to live satisfying lives within the means of one planet. Our mission is to advance the use of the Ecological Footprint, a science-based sustainability tool that measures how much of the Earth's resources we use, how much we have and who uses what. Our work seeks to make the planet's ecological limits a central consideration at all levels of policy and decision-making.

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