

# Global Footprint Network response to the “Commission on the Measurement of Economic Performance and Social Progress” (or “Stiglitz Commission”) Report



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# **Global Footprint Network response to The “Commission on the Measurement of Economic Performance and Social Progress” (“Stiglitz Commission”) Report**

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## **Summary of Global Footprint Network’s comments**

Global Footprint Network welcomes the Commission’s report and appreciates the Commission’s tremendous work on synthesizing the complex field of measuring economic performance and social progress.

This report is a milestone in the history of public indicators and will become a significant platform for further debate.

The Commission report’s most significant contribution may be its emphasis on the need to track distinct policy goals separately: economic performance, quality of life, and environmental sustainability.

The Ecological Footprint has tremendous potential to support this agenda, for instance as a resource accounting tool and part of a micro-dashboard of economic performance and social progress indicators. The Ecological Footprint fully and wholly contains the carbon Footprint, and takes a comprehensive, more effective, approach by tracking other human demands on the biosphere’s regenerative capacity. But it needs to be complemented by socio-economic metrics.

The following includes our comments on some key findings of the Commission’s report. The five appendices of this response contain an explanation of the formal processes by which the Ecological Footprint methodology is currently developed and improved, and clarifies (in Appendix 1 and more specifically in Appendix 5) some misconceptions about the Footprint as presented in the Commission’s report.

# **Stiglitz Report: Great strides – but still some misconceptions**

## **Sarkozy opens a new era of indicator debate**

In his presentation of the Stiglitz Report at the Sorbonne University on September 14<sup>th</sup>, President Sarkozy demonstrated a profound commitment to reshaping public performance measures – because the way we measure success determines how we act. This was Sarkozy’s intention when gathering leading economists through the Stiglitz Commission to lay the land for a new debate. He rightly calls for leaving behind outdated and misleading statistical measures, and is committed to French leadership in bringing the insights and application of this debate into all international fora and institutions.

Sarkozy’s commitment highlights the significance of the Stiglitz Commission’s report and, indeed, it represents a major milestone in the literature on indicators of economic well-being and social progress. The report synthesizes the complex field of economic performance and social progress indicators and substantiates the voices of early pioneers like Hazel Henderson and Hermann Daly.

## **Are we moving fast enough, far enough?**

With this report, there is now wide agreement that humanity’s success in the 21<sup>st</sup> century depends largely on robust navigational tools. It thereby amplifies the EU’s “Beyond GDP” initiative and civil society proposals such as the “Forum pour d’Autres Indicateurs de Richesse” (FAIR), to develop better ways of measuring economic, social and environmental progress.

The Commission’s report points out that there is no consensus yet as to which indicators currently provide the greatest value, and how they should be applied in guiding public policy. As with any major call for change, the report itself contains tensions and contradictions, of which ongoing debate is necessary. Possibly the most significant issue is that the report underestimates the rapidity of change we are witnessing worldwide, which comes with both opportunities and new risks. The challenge is that this change is much faster than the pace at which government agencies, statistical offices, and even the public debate are able to move along. The rapid changes in resource consumption, growing poverty, financial stability are outrunning the institutions’ ability to learn and adapt to new measures relevant to the new challenges.

The possibility that the follow-up of the Commission’s report will be driven by large institutions, which are strong at maintaining status quo, and weak at

adapting to changing circumstances, may lead to even further delays in adapting more responsive and effective measures of well-being and sustainability.

Consider this: Since the release of the UN Brundtland Report in 1987, or about the same time we initiated Ecological Footprint research, humanity's demand on the biosphere has grown from using about the entire planet's biocapacity to the current situation of humanity using over one third more than what Earth can regenerate. Within this timeframe, at least a dozen countries have turned from Ecological Creditor countries (countries that use more resources than what is renewably available within their own borders) into Ecological Debtor countries (those whose residents use less biocapacity than their country has). At the same time, international efforts, such as the Millennium Development Goals, and certainly official statistics as presented through data portals of World Bank or OECD are oblivious to those trends.

## **Building on a great platform**

The Commission report's most significant contribution may be its emphasis on the need to track distinct policy goals separately: economic performance, quality of life, and environmental sustainability. Combining these various aspects of well-being into an arbitrary index would dilute clarity and provide numerical results with little practical utility.

Now that the 292-page report has built a productive platform for further discussions, the next step is to prioritize the most critical issues we need to address in order to secure human well-being – starting with ecological constraints.

## **What Footprint thinking offers to the Sarkozy agenda**

To successfully navigate the biosphere's constraints, we need to understand how much nature can provide compared to how much people demand from nature. Ecological services are at the root of every economic value chain, both on the supply side and in terms of the ability to assimilate waste. Simply put, if the demand for these services continues to exceed what ecosystems can provide, the health and future productivity of these ecosystems are at risk. Fishery collapses, deforestation, groundwater depletion and atmospheric CO<sub>2</sub> build-up leading to climate change are just some of the likely consequences.

We can manage these constraints, if we shift our thinking from the abstractions of GDP to the concreteness of a farmer. For instance, any resource manager would want to know both "how big the global farm is" and "how big of a farm is needed in order to provide the flow of resources we use and to absorb the

corresponding waste.” These two questions are at the core of what Ecological Footprint accounting provides.

The Commission’s report devotes a significant portion discussing the Ecological Footprint. Unfortunately, it also contains a number of important misconceptions that beg clarification. For instance, it states that the Footprint “gives no weight to possibilities offered by technical progress.” In reality, the opposite is true. As an accounting tool, the Footprint captures year-by-year changes in technological progress, as well as changes in consumption, population and biocapacity.

The Commission also mistakenly claims that the Footprint represents a “substantial anti-trade bias”. This is comparable to saying that a measurement tape is biased against large waists. The Footprint simply measures human demand on nature, and since we live in a global economy and are dependent on trade, the Footprint shows where countries are vulnerable. We live in an era where the limiting factor is no longer our factories’ capacity to produce, but the biosphere’s capacity to provide the ecological services we need.

## **Moving beyond carbon**

More troubling is the report’s conclusion that focusing on only one of the Ecological Footprint’s components, carbon, would be sufficient. While carbon emissions are an important aspect of society’s metabolism, it is only one of six interrelated demands on biocapacity measured by the Ecological Footprint. These include demand on fisheries, cropland, grazing land, forest land for wood and wood products, urban land, and forest for carbon sequestration.

In the European Union, the overall demand for ecological services, as measured by the Ecological Footprint, corresponds to two and a half times the biocapacity of the EU’s ecosystems. The accounting for other highly industrialized regions, like China and the United States, shows similar results. In a world of resource constraints, it will become increasingly difficult to secure the needed ecological services from elsewhere, even for highly industrialized regions. Carbon accounting by itself will not be able to monitor this challenge.

Focusing exclusively on carbon also does not help identify when policies aimed at identifying alternatives to fossil fuel lead to “burden shifting.” For instance, the recent demand for biofuels as a substitute for the use of fossil fuels represents a shift or even net increase of environmental pressure, not a reduction. Most of the new pressure is not carbon impact, but demand on forests or cropland, often with significant effects on biodiversity or food prices.

Carbon accounting in isolation would miss the fact that Ecuador is entering a resource crunch. Ecuador had about 5 times more per-capita biocapacity than Footprint in 1961, but is now using about the same amount as they have

available within their territory – and carbon is only a minor driver behind this trend. This rapid shrinkage of Ecuador's ecological remainder will have a significant impact on Ecuador's development potential, particularly in a resource-constrained world. None of the monetary measures, or carbon on its own, will be able to detect this important trend.

The same is true for low-income countries with a small per-capita biocapacity, and insufficient financial means to import resources. As their population grows, their limited biocapacity forces them into smaller and smaller per-capita Footprints. Uganda, Malawi, Zimbabwe and Burkina Faso, for example, are subject to these tragic trends. In these cases the carbon Footprint also plays an insignificant role.

The Ecological Footprint is only one of the indicators needed to succeed in the future, but it encompasses critical elements of a non-negotiable bottom-line condition for sustainability.

## **The way forward**

Sarkozys' vision and commitment has opened the debate about human well-being in the 21<sup>st</sup> century. But to succeed, we must make sure that the debate stays open, comprehensive, and relevant to the emerging trends. While large institutions play an important role, they need to be complemented by pioneer thinkers and independent organizations that have their ears closer to the ground, and have proven to be more innovative in framing the emerging challenges and opportunities for well-being and sustainability. We look forward to the ongoing debate that the Stiglitz Commission has catalyzed as humanity chooses the indicators needed to guide it to a positive future.

## Appendix 1: Further, more specific and technical reflections on the Commission's report

We share the Commission's view that "a unidimensional view of sustainability remains certainly out of reach" and that possibly the most productive approach is to use a "limited number of indicators – a 'micro' dashboard - and one that is specifically dedicated to the sustainability issue, based on a clear notion of what sustainability means." (paragraph 169)

***What sustainability means:*** The essence of sustainability is a commitment to human well-being – well-being that lasts (as discussed in paragraph 168). We believe that maintaining "sufficient amounts of all the assets that matter for well-being" in order to make well-being last necessitates the following: either a) using the key ingredient to every value chain – living natural capital<sup>1</sup> – no faster than it regenerates ("strong sustainability"), or b) if these assets are used faster, that these assets are not depleted faster than other human-made processes are able to compensate for the lost services from the living natural capital ("weak sustainability").

This means that whether one subscribes to strong or weak sustainability, we need to know "how much biocapacity is available, and how much is used by human activities." This is what the Ecological Footprint measures. There are presently no other accounting approaches available that are able to measure this question as comprehensively as the Ecological Footprint.<sup>2</sup>

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<sup>1</sup> ***Living and non-living natural capital, and why we consider living natural capital to be the limiting factor for sustainability.***

*Terms:* We distinguish between *living natural capital* (everything in the biosphere), and *non-living natural capital* (mostly underground assets such as fossil fuel or mineral reserves).

*Proposition:* We consider living natural capital to be the limiting factor for the human enterprise, since it also limits the use of non-living natural capital.

*Explanation:* Fossil fuel reserves or ores are not regenerative, but passive assets like gold bars, diamonds or cash. If a country has oil under its territory, it is similar to having financial assets in a fund, or gold in the safe of its national bank. These non-living natural capital stocks are assets that can be sold in exchange for other values, but they do not provide continuous physical services. However, using fossil fuel puts a demand on living natural capital, hence fossil fuel's use is limited by the regenerative capacity of living natural capital. The same is true for ores. Ores are not limited in themselves. But there is an energy cost to concentrating them to a useable level. This energy requirement represents again, a demand against living natural capital. Hence the use of non-living natural capital can ultimately be expressed as the corresponding demand on living natural capital.

*Note:* Giving primacy to living natural capital does not mean that non-living natural capital should not be tracked. Rather, we would argue that living natural capital needs primary attention in resource accounting.

<sup>2</sup> There are some measures that capture aspects of the Ecological Footprint, such as fish catch, forest exploitation, agricultural productivity, water availability, or carbon emissions; but there is no other measure available that combines these pressures into one overall result. Since humanity is facing a metabolism problem, where the overall demand is exceeding what nature as a whole can regenerate, there is a need for a combined measure. The only other broader measure of human

***The Footprint needs to be complemented by other measures:*** Of course, this crucial and basic information about the use and availability of biocapacity needs to be complemented by both environmental and socio-economic measures. The environmental side needs to be informed by key issues such as the presence or absence of toxic materials and pollutants that are threatening human health (an aspect that the Footprint does not cover at all). The socio-economic dimension needs to track outcome measures of human well-being (which the Footprint also does not cover) and economic production capacity (for which the Footprint only measures the input and availability of living natural capital). The Human Development Index is a popular example of a measure that captures human well-being in a systematic way.<sup>3</sup>

Therefore, we believe that the Ecological Footprint is an essential and natural candidate for the micro-indicator dashboard. As the Commission points out, it is best used, not as an independent or sole indicator, but in conjunction with other relevant indicators.

Choosing the core set of indicators depends on identifying the key questions that are most critical for succeeding with a human economy over the next decades (as mirrored in section 3.1 and paragraphs 168). We recommend that the Commission's report be more explicit about what these key questions are. More specifically, we recommend the question of "how much biocapacity can provide, and how much is used by human activities" be included in these discussions; and if it is not, one of the key questions would need to discuss why not (See Appendix 2).

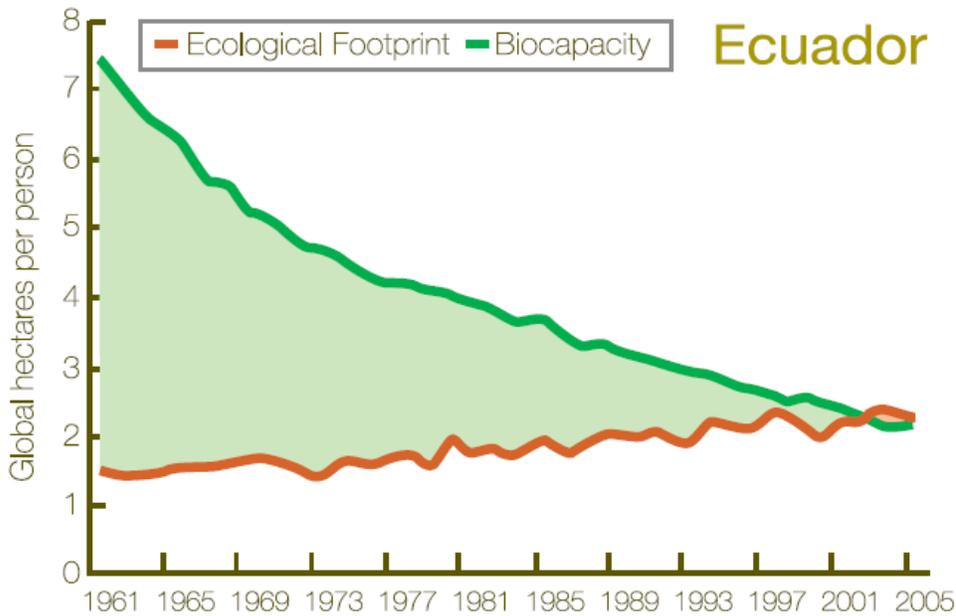
Consider, for example, the case of Ecuador (Figure 1). To achieve stability and human development, it is in the interest of the government of Ecuador to understand its Footprint and biocapacity trends over the last 50 years, and what these trends might imply for the next 50 years.

We share the Commission's opinion that some of these key indicators will be monetary, and some biophysical (Recommendation 4).

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appropriation of ecological services is based on Net Primary Production assessments. However, this measure does not link biological production with final demand, nor does it include waste flows such as carbon dioxide.

<sup>3</sup> Please note that the Ecological Footprint is an accounting approach (a scientific inquiry based on a specific research question) while indices like the Human Development Index are a somewhat arbitrary (or theory based) score card. There is policy value in score cards – for instance they can be used as "alarms" – but they are outside the realm of strict, testable science.



**Figure 2: Ecuador's per-person Footprint and biocapacity since 1961.**<sup>4</sup> Ecuador's Footprint represents the biocapacity needed, on average to provide for the average consumption of a Ecuadorian resident. The biocapacity is the productive area available within Ecuador. The green surface between the lines shows the shrinking ecological remainder of Ecuador. Once the lines cross, the remainder becomes a deficit. Ecological deficits can be compensated by overusing local biocapacity or by using biocapacity from abroad, for instance through import.

The report correctly states: “if we were able to derive this index from a physical-economic model predicting future interactions between the economy and the environment in a reliable way, then this index would send us correct forewarnings of non sustainability, through strong upward curbing of the relative “imputed” price of these critical natural assets.” (paragraph 177). The Ecological Footprint meets this criterion by indicating the unsustainable nature of the human enterprise through a widening gap between the Ecological Footprint and biocapacity. If this gap widens, we will have increasing difficulty in meeting economies’ ecological service needs.

**The need for effective communication:** The Commission rightly maintains that “In such cases, and a *fortiori* for items on which we do not have a single guesstimate of a monetary value, a separate physical accounting is unavoidable. The problem then is to present such an index in a compelling way. Monetary indices have the advantage of using units that speak to everyone..” (paragraph 182-183) The report states that the Ecological Footprint’s results expressed in terms of land area are effective at communicating. In addition, Ecological Footprint results can easily be translated into comparisons between available

<sup>4</sup> <http://www.footprintnetwork.org/en/index.php/GFN/page/trends/ecuador/>

biocapacity of a territory and demand of that territory, i.e. having one planet and using two, or having one Russia and using one half.

**Why carbon is not enough:** No doubt, carbon accounting is essential, but focusing solely on carbon is insufficient and potentially dangerous. The Ecological Footprint contains the carbon Footprint fully and wholly, and by also providing the broader view, it is better equipped for the 21<sup>st</sup> century. With the growing resource hunger of humanity, competition for ecological resources and services will become the defining force of the 21<sup>st</sup> century. The potential for peak energy and rapid climate change are compounded with food shortages, biodiversity loss, depleted fisheries, soil erosion, and freshwater stress. We are facing a global supply-demand crunch of natural capital. This goes beyond carbon emissions. Essentially, humanity is using more than Earth can renew. This “overshoot” will become particularly pressing for the world as a whole if the United States and Europe continue consuming at current rates and if the resource demands from countries like India and China continue to grow. By focusing only on carbon, we are likely to miss other core threats to the biosphere’s integrity and productivity. Also, by attacking all the threats collectively, by addressing humanity’s material metabolism as a whole, there is a far better chance of achieving sustainability.

**Inaccuracy in the representation of the Footprint:** Appendix 5 of this report to the Commission identifies some misconceptions in the way the Ecological Footprint is being presented in the Commission’s report.

**Additional information:** We also include here, for your consideration, Appendix 3 which addresses how the method should be scrutinized and Appendix 4 which outlines how the Footprint is being methodologically improved over time.

**Conclusion:** We would conclude that in an ecologically constrained world, it is in the direct self-interest of a nation to know how much biocapacity can provide within its borders and how much biocapacity it takes to support its residents (See Figure 1). It is also important to know for each country how much biocapacity can provide in the world. If a country (or city) is structurally locked into high levels of resource consumption, which is strongly dictated by its own infrastructure set-up, this entity might run significant economic and resource risks in a more resource-constrained world. In other words, Ecological Footprint accounting is crucial for managing sustainability and an economy’s longer term stability. At the same time, it is not sufficient for all aspects of sustainability.

Again, we thank the Commission for this valuable contribution and remain open to contributing to its discussions. We also welcome feedback on how Ecological Footprint accounting can be made more accurate and useful, particularly at the national level, and what is needed to make it a part of any serious collection of national performance indicators of the 21<sup>st</sup> century.



## **Appendix 2: Research question of the Ecological Footprint method**

No one should be asked to “believe in the Ecological Footprint” as an article of faith. Rather, as a scientific tool, Ecological Footprint accounts address, through empirical analysis and with ever increasing accuracy, ***one particular research question***: *How much of the planet’s productive capacity is demanded to support human activities?*

In a time of increasing ecological constraints, this is perhaps the single most important research question for the 21<sup>st</sup> century, one that humanity cannot afford to ignore. Failing to live within the budget that nature provides will eventually lead to ecological bankruptcy and collapse. There may thus be no single research endeavor more important than building an accurate understanding of humanity’s demand on the biosphere. All it takes is an open, transparent, scientific process. [This mirrors the Commission’s section 3.1 “What do we want to measure?”]

## Appendix 3: Scrutinizing the Ecological Footprint method

As stewards of the most widely used Ecological Footprint accounts and methodology in use today, [Global Footprint Network](http://www.footprintnetwork.org) ([www.footprintnetwork.org](http://www.footprintnetwork.org)) is the first to acknowledge that Footprint accounts can and must be improved. This is not unique to the Ecological Footprint, but a fundamental characteristic of all true scientific endeavors. As a scientific organization, Global Footprint Network depends on input from others on how the accounting methods can improve. Global Footprint Network positions itself as an “IPCC for biocapacity” – it is a forum for forging agreement on how to capture human demand on biocapacity, not a representative of a particular method.

Many criticisms are valid, and have been taken up on the research agenda (Kitzes et al, [2007](#) – [2009](#)).<sup>5</sup> Some criticisms raised in the literature are based on misconceptions. Answers to many of those can be found on the Global Footprint Network [website](#) ([www.footprintnetwork.org/faq](http://www.footprintnetwork.org/faq)).

The Footprint can be refuted through two questions:

- 1) *“Isn’t the Footprint’s research question irrelevant to sustainability?”* We believe the Footprint’s research question is central to sustainability. Otherwise, why does a farmer need to know whether her farmland extends over 5, 50 or 500 hectares? Clearly, a larger farm will make it easier for the farmer to provide for her cattle. Why should that same logic be irrelevant for a region? How can sustainability be meaningful without understanding what ecological assets are available, and what ecological constraints are affecting a particular region?
- 2) *“Isn’t the Footprint’s research question answered too poorly to be useful?”* Certainly, the accuracy and detail of the results can still be enhanced. Therefore, Global Footprint Network, together with 100 partner organizations from across the world, builds on 15 years of methodological development and continues to refine the tool. We constructed our method to be conservative. In other words, our results are most likely an underestimate of global overshoot. This provides a consistent argument for a significant reduction of resource throughput through the human economy, far distant from what most policies implemented today are aiming to achieve. We would certainly not be better off with no Footprint results, in spite of all their limitations.

A third question could then be: *How can the method be improved?* But this third question should not be confused with the question “Should the Footprint be used or not?” Only questions 1) and 2) are relevant for this latter question about whether the Footprint should be used or not.

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<sup>5</sup> [http://www.brass.cf.ac.uk/uploads/fullpapers/Kitzes\\_et\\_al\\_M65.pdf](http://www.brass.cf.ac.uk/uploads/fullpapers/Kitzes_et_al_M65.pdf) (for 2007), <http://dx.doi.org/10.1016/j.ecolecon.2008.06.022> (for 2009)

## Appendix 4: The scientific improvement process behind the Ecological Footprint method

The most current description of the national calculation [methodology](#) is documented in three reports issued in 2008: an [Atlas](#) on the results, [a method paper](#), and a [guidebook](#) on the National Footprint Accounts (all available via [www.footprintnetwork.org/atlas](http://www.footprintnetwork.org/atlas)). In addition to several scientific publications, a popular introduction is available in the WWF/Global Footprint Network/ ZSL's [Living Planet Report 2008](#).

As with all rigorous scientific processes, our process of calculating Ecological Footprint accounts does not apply a single, fixed methodology, but rather continuously sharpens and evolves in response to new scientific information.

We have several processes underway at Global Footprint Network to ensure that our calculations remain up-to-date and transparent for users.

First, we engage in ongoing internal and community reviews of our methodology through the activities of our [National Accounts Committee](#). This committee, composed of representatives from Global Footprint Network partner organizations, is responsible for suggesting methodological changes to our core National Footprint Accounts and considering any changes suggested from external academics and reviewers. All changes to our calculation methodology are open for public comment before implementation, in accordance with the Committee's charter, and external parties are encouraged to submit recommended changes to the accounts directly to Global Footprint Network for consideration by the Committee.

There is also a complementary committee on standards which oversees standards development for Footprint accounting at the subnational level (regions, products and organizations). More on this is available at [www.footprintstandards.org](http://www.footprintstandards.org).

Second, we engage in collaborative research projects with national governments and external consultancies to review our accounting methodology for specific nations.

The government of Switzerland was the first in 2006. Four Swiss government agencies led the effort and the Swiss Statistical Offices published the review in 2006. [The report](#) exists in English, French, German and Italian, plus a more [technical background](#) report only in English). Now, Switzerland [features the Ecological Footprint](#) among its sustainability indicators (MONET).

Another example is the European Commission's DG Environment review. It concluded with its recent 350-page report on the Ecological Footprint, which is highly supportive of the Ecological Footprint and confirms Global Footprint

Network's research agenda. The report can be downloaded at: "[Potential of the Ecological Footprint for monitoring environmental impact from natural resource use](#)".

Recently, SOeS of the French Ministry of Sustainable Development produced the study "Une expertise de l'empreinte écologique (May 2009, No 4)", which examined the transparency and reproducibility of the National Footprint Accounts. The report documents that their research team was able to reproduce Global Footprint Network time trends within 1-3 percent. SOeS' initial report is available at [http://www.ifen.fr/uploads/media/etudes\\_documentsN4.pdf](http://www.ifen.fr/uploads/media/etudes_documentsN4.pdf) or see <http://www.ifen.fr/publications/nos-publications/etudes-documents/2009/une-expertise-de-l-empreinte-ecologique-version-provisoire.html>

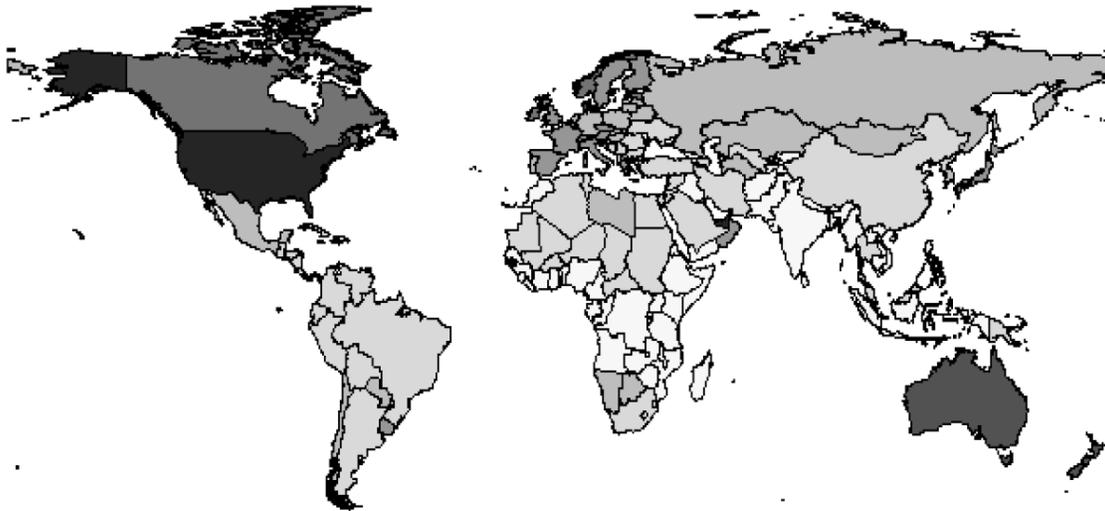
## Appendix 5: Ecological Footprint Accounting: comments relevant to specific sections in the Commission's report

**This section addresses some potential misconceptions as presented in paragraphs 160 to 166, and in the technical report section 2.5.** In order to clarify specific claims made by the Commission's report, we show the original report text in black, followed by our comments in red and suggested replacement language in blue.

### 2.4.2. Footprints [COMMENTS are added in red, SUGGESTED new language in blue]

160. Although apparently quite different from “extended wealth” notions, various attempts at measuring sustainability through the use of “footprints” are also inspired by the general approach of comparing current flows of consumption and their effects on certain dimensions of the environment with an existing stock. In this sense, they may also be regarded as “wealth” measures. However the focus is exclusively on natural capital, and the valuation convention differs from the ANS one in that no market prices are explicitly used.
161. The Ecological Footprint (hereafter EF) measures how much of the regenerative capacity of the biosphere is used up by human activities (consumption). It does so by calculating the amount of biologically productive land and water area required to support a given population at its current level of consumption. A country's Footprint (demand side) is the total area required to produce the food, fiber and timber that it consumes, absorb the waste that it generates, and provide space for its infrastructure (built-up areas). On the supply side, biocapacity is the productive capacity of the biosphere and its ability to provide a flux of biological resources and services useful to humankind.
162. The results are well-known and rather striking: since the mid-1980s, humanity's footprint has been larger than the planet's carrying capacity, and in 2003 humanity's total Footprint exceeded the Earth's biocapacity by approximately 25 per cent. While 1.8 global hectares per person are available world-wide, Europeans use 4.9 global hectares per person and North Americans use twice that amount, that is, much more than the actual bio-capacity of those two geographical zones (Figure 3.2). [COMMENT: These are not the latest numbers. Global Footprint Network has produced a 2008 edition (launched in October 2008) which produces results up to 2005. The results are available at [www.footprintnetwork.org](http://www.footprintnetwork.org) SUGGESTION: update numbers]

**Figure 3.2 : Ecological footprint by country**



Source : Global Footprint Network, data for year 2005

Reading : Dark areas correspond to countries with the highest values for the ecological footprint, i.e. with the highest contributions to worldwide unsustainability. Countries with missing values are not represented

163. This indicator shares with accounting approaches the idea of reducing heterogeneous elements to one common measurement unit (the global hectare, e.g one hectare with productivity equal to the average productivity of the 11.2 billion bioproductive hectares on Earth). It assumes that different forms of natural capital are substitutable and that different natural capital goods are additive in terms of land area, [COMMENT: Since areas are mutually exclusive, they can be added up. However, full substitutability should not be assumed. For example, reducing forest use does not reduce pressure on fisheries. Therefore, this is an additional distortion of the current Footprint method which leads to an overall underestimate of humanity's overall demand. Also note that Footprint accounting is constructed so that, if anything, it is biased towards underestimating human demand on nature. In other words, Global Footprint Network's estimates most likely understate the reality of global overshoot], but strongly stands against weak sustainability assumptions [COMMENT: The Footprint is a descriptive, not a normative tool. It is designed to describe human use of ecological services. Further, it is not proposed as the single indicator for sustainability, merely as one significant one that compares human demand against what nature can regenerate – even if we take a weak sustainability assumption, one would still need to know to what extent natural capital is overused. Otherwise, one cannot judge whether this overuse is compensated by other human-made capital. SUGGESTION: Replace sentence “but strongly stands against weak sustainability assumptions” with: “by definition, it only measures living natural capital, which is relevant information for both weak and

strong sustainability approaches”]. In fact, this indicator gives no role to savings and capital accumulation: any positive ecological surplus (biocapacity that exceeds the ecological footprint) does not entail an increase in some natural capital stock, and hence an improvement in future productive capacity. [COMMENT: The Footprint simply compares human demand against nature’s regeneration rate for a given time period (typically a year). An additional, relevant question is indeed to analyze how underuse and overuse affects future bioproductivity. But this is a separate assessment. Natural capital is not as linear as financial capital under a fixed interest rate scheme. SUGGESTION: Since the Footprint only compares demand against regeneration, it would need to be complemented by other assessments estimating how overshoot (and ecological remainders) affect future biocapacity]. A fortiori, saving and accumulating manufactured or human capital does not help sustainability. [COMMENT: This is an incorrect conclusion. The Footprint is not intended to “prove” or “disprove” sustainability. This is also clearly stated in the Footprint standards [www.footprintstandards.org](http://www.footprintstandards.org). Footprint assessments just answer one particular research question. But yes, society needs to consider to what extent human-made capital is able to compensate for lost natural capital. In some instances it does not – e.g., more fishing fleets do not compensate for depleted fishstocks. In some instances it does, better insulated housing stocks compensate for less energy availability. SUGGESTION: delete this sentence]. On the other hand, one must observe that the indicator ignores the threat to sustainability resulting from the depletion of non-renewable resources (e.g. oil): the consequences for sustainability are treated only from the waste assimilation (implied CO2 emissions) point of view rather than from an analysis based on depletion dynamics. [COMMENT: This is consistent with the Footprint’s research question: How much biocapacity is occupied by human activities? Subterranean depletion of mineral stocks needs to be monitored separately. SUGGESTION: You may want to write “this needs to be tracked separately since it is outside of the scope of the Footprint’s research question”].

164. The results are also problematic for measuring a country’s own sustainability, because of the substantial anti-trade bias inherent in the Ecological Footprint methodology. [COMMENT: This is a misconception. Footprint accounting is a description of available biocapacity on the one hand, and demand on ecological services on the other. The Ecological Footprint is science-based and does not in itself advocate a position. For instance, it describes trade flows, but does not take a position on trade per se. Ecological Footprint assessments do not advance a particular normative perspective about whether countries need or do not need to live within their own biocapacity. But there is a mathematical fact that not all countries can be net importers of ecological services. SUGGESTION: delete this paragraph, or replace it by stating that “the Footprint describes trade-flows in biophysical terms. The Footprint makes it apparent that not all countries can be net-importers – in fact, all the imports and exports will balance out due to the thermodynamic law of mass conservation. If all countries bank on becoming net importers, they will run into physical impossibilities”]. The fact that densely populated (low biocapacity) countries like the Netherlands have ecological deficits, whilst sparsely populated (high biocapacity) countries like Finland enjoy surpluses can be seen as part of a normal situation where trade is mutually beneficial, rather than an indicator of non-sustainability. [COMMENT: Global Footprint Network does not claim that Finland is sustainable. Footprint standards explicitly prohibit the making of these sorts of claims

([www.footprintstandards.org](http://www.footprintstandards.org)). Again it is merely a question of describing resource flows in the context of local or global biocapacity. The fact is that if a country does use more biocapacity in net-terms than it has available within its territory, it has to get the difference from somewhere. Currently, for some of these ecological services, countries do not pay (e.g., CO<sub>2</sub> emissions). Also consider this: The Netherlands' biocapacity is determined by what they have within their boundaries. If they want to use more (in net terms) they need to get it from somewhere else. And, it is unlikely that Finland will abdicate some of its biocapacity to the Netherlands for free. Nations fiercely defend their territorial sovereignty. This does not mean Footprint accounting is for or against trade. Measuring a country's biocapacity just treats it as a national asset, which it is. It is a current political reality. It is similar to counting a country's population, or a country's economic debt. Also consider this: Currently, according to international law, biocapacity is not shared equally among the people of the planet. Further, the Footprint method does not advocate any particular distribution rights or schemes, it just describes who uses what, and how much capacity is available where. Since nations still consider their territory to be under their control, it is useful to know how much biocapacity these territories represent. Again, this is not an ideological bias, just a description. **SUGGESTION: delete this paragraph**]. Indeed, recent research has tended to move away from comparing a country's EF with its *own* biocapacity, and to propose instead to divide all countries' EFs by *global* biocapacity. **[COMMENT: both comparisons are useful, they give answers to different questions, and both are descriptive. Having this information helps countries to set more informed goals. SUGGESTION: explain what kind of insights both comparisons offer]**. By doing this, one is acknowledging that EFs are not measures of a country's own sustainability but of its contribution to global non-sustainability. **[COMMENT: Countries use Ecological Footprints to answer all kinds of questions related to policy and future risks. A variety of comparisons can be used to answer different questions. Global Footprint Network doesn't claim that the Footprint is a measure of whether a country is 'sustainable' or not – rather Ecological Footprint and biocapacity information is key to understanding the sustainability situation of a country. For instance, India has a per capita Footprint that if replicated worldwide would result in humanity being within the capacity of one planet. However, this does not mean that India 'sustainable.' It is indeed a problem for India that its current demand on nature exceeds about two fold what India's ecosystems can provide and that a large percentage of its population have Footprints so low that their basic human are not met. SUGGESTION: You may want to write: "The Ecological Footprint can be compared against global or local biocapacity. Neither comparisons prove sustainability, but if the per capita Footprint exceeds global average biocapacity, this means that this level or resource consumption is not globally replicable. If the Footprint exceeds local biocapacity, this means that in order to support the population's consumption, the country needs to access, in net-terms, biocapacity from abroad or deplete its own stocks"]**.

165. Overall, this means that the Ecological Footprint could at best be an indicator of instantaneous non-sustainability at the worldwide level. EFs for countries should be used as indicators of inequality in the exploitation of natural resources and interdependencies between geographical areas. Moreover, even the worldwide

ecological deficit emphasized by the Ecological Footprint may not convey the message it is said to. Indeed, one can show that the worldwide imbalance is mostly driven by CO<sub>2</sub> emissions, expressed in hectares of forest needed for storage. By definition, the worldwide demand placed on cropland, built-up land and pasture cannot exceed world biocapacity. [COMMENT: The story is a bit more complex. By definition, the amount of cropland we have is the amount we use as is the case with built-up land. But the benefit of land use accounting is that we can track spillover effects, which are increasingly relevant as resource throughput increases. For example, in an effort to address climate change, the increased demand for biofuels has increased pressure on cropland and forests. Also, forest areas that are used for timber are not available for carbon sequestration, etc. In essence, the overall National Footprint Account for a nation shows how all demands compound and compete for biocapacity. No other indicator is able to map these competing demands. Current Footprint accounts could still be improved to show more accurately the impact of overfishing, groundwater depletion and other phenomena of overshoot, which is part of our ongoing research agenda. SUGGESTION: “CO<sub>2</sub> is currently the most significant driver of global overshoot”].

166. As a result, less-encompassing but more-rigorously-defined footprints, such as the “Carbon Footprint” (CF), would seem better-suited, insofar as they are more clearly physical measures of stocks that do not rely on specific assumptions about productivity or an equivalence factor. [COMMENT: The carbon Footprint, which was derived from the Ecological Footprint and popularized originally through a large advertisement campaign by BP, represents a big piece of the global Footprint, and of the Footprint of industrialized countries. But lower income countries in Africa for instance have a minimal carbon Footprint. If the entire attention is put onto the carbon Footprint, one may lose sight of other demand on nature. It may even lead to spill-over effects: carbon reduction, as for instance with biofuels, can lead to a shifting of the pressure on other biomes. Therefore, biofuels need to be assessed from an overall demand on nature perspective, not just carbon. The same is true for fuel wood or water power, or agriculture. SUGGESTION: Add: “but by focusing on the carbon Footprint only, other environmental pressures might get ignored.”] As far as communications is concerned, such an indicator is just as capable of sending strong messages in terms of the over-utilization of the planet’s capacity for absorption. [COMMENT: The power of the Ecological Footprint is that it allows analysts to compare human demand against biocapacity (global or local, at all scales). Also, it communicates easily. It can easily be understood how many planets we have and how many we use. Carbon numbers are more abstract, and emission limits are not as simply communicated. Also, most indicators, including carbon accounting, look only at one side (for example emissions) not absorptive limits. This would be like financial accounting that only focuses on expenditure without understanding income. SUGGESTION: delete the sentence]. The CF also has the interesting feature of being computable at any level of disaggregation. This makes it a powerful instrument for monitoring the behavior of individual actors. As far as communication is concerned, such an indicator has exactly the same capacity to send strong messages in terms of over-utilization of the absorbing capacity of our planet. [COMMENT: The Ecological Footprint shares the ability to disaggregate – in addition, it captures problems from burden-shifting.]

## Technical report

### 2.5. Footprints

The *Ecological Footprint* was initially proposed by Wackernagel and Rees (1995). Since then, it has been sponsored by Redefining Progress and the WWF, which provides regularly updates of the index in its annual *Living Planet Report*, and has gained increasing popularity among green NGOs and public opinion. Methodology and updates are currently maintained by the Global Footprint Network.

The Ecological Footprint (EF hereafter) measures “how much of the regenerative capacity of the biosphere is used by human activities (consumption). It does so by calculating the amount of biologically productive land and water area required to support a given population at its current level of consumption and resource. A country’s Footprint (demand side) is the total area required to produce the food, fiber and timber that it consumes, absorb the waste it generates, and provide areas for its infrastructures (built-up areas). On the supply side, biocapacity is the productive capacity of the biosphere and its ability to provide a flux of biological resources and services useful to humanity”, as Moran, Wackernagel and co-authors (2008) phrased it.

Results are well-known and rather striking (figure 2.4): since the mid-1980s humanity’s footprint is larger than the planet’s carrying capacity and in 2003 humanity’s total Footprint exceeded the Earth’s biocapacity by approximately 25 per cent (we would have needed an extra 25% Planet to meet our needs, to say it informally). While 1.8 global hectares per person are available worldwide, Europeans use 4.9 global hectares per person and North Americans use twice that amount, that is much more than the actual bio-capacities of the two geographical zones.

Undoubtedly, the phrasing, the concepts and the results are very appealing and seem very easy to understand. Those reasons explain the success of this indicator, among citizens and international influential bodies. But these pedagogical qualities do not mean that the indicator is without weaknesses, and, just as the ANS, but for very different reasons, it has been criticized on many of its aspects.<sup>6</sup>

Some very general criticisms are the fact that the index gives no weight to possibilities offered by technical progress [COMMENT: incorrect, see above], or the fact that it is mute on unsustainability problems that result from the extraction of fossil resources, or on items such as biodiversity or water quality [COMMENT: The Ecological Footprint is sensitive to this to the extent these pressures affect biocapacity]. Even on what it is supposed to do well, the indicator raises some problems. To look at them a bit more closely, let’s consider the 6 different types of land use separately. For cropland, the Ecological Footprint accounts do not rely on the definition of a “sustainable” agricultural yield, a yield leaving soils with sufficient quality to offer the same yield next year for instance. On the contrary, the biocapacity is indeed the observed capacity obtained from real yield. As a consequence, at the country level, the footprint of production will always equal the biocapacity of the country for cropland [COMMENT: as more crop area is used, less forests or grazing land is available, hence increasing the pressure on those unless pressure on those is reduced. Even if there is as much crop land used as is available, this is one component that makes up the overall demand of humanity.]. This has two consequences. First, at the country level, ecological deficit for cropland will only mirror trade deficit. Second, at

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<sup>6</sup> A recent and more extensive review of the index has been provided by the French CESE (Le Clezio, 2009) and by the French Ministry of Ecology (CGDD, 2009)

the worldwide level, exports and imports clear up and thus Ecological Footprint and Biocapacity for cropland will always be equal [COMMENT: But cropland competes for biocapacity that could be forests or grazing land or built up land otherwise].

Those points are not concealed by the authors<sup>7</sup> but are not really put forward when interpreting and analysing the results. Van den Bergh and Verbruggen (1999) had already pointed out what they call the substantial anti-trade bias inherent of the Ecological Footprint methodology [[COMMENT: The Ecological Footprint is a measurement, not an ideology. There is no pro or anti trade bias].<sup>8</sup> The fact that densely populated regions, hence low biocapacity countries like the Netherlands, have ecological deficits whilst sparsely populated regions, hence high biocapacity countries such as Finland, enjoy surplus can be seen as part of the normal trade of goods to the mutual benefits of both, and is by no means an indicator of unsustainability [COMMENT: not all countries can be net importers of biocapacity].

Indeed, the most recent update of the methodology (*Calculation methodology v1.0*, 2008) acknowledged that a country's ecological credit is not in itself a sufficient criterion for sustainability. Moran, Wackernagel et al. (2008) moved away from comparing a country's EF with its *own* biocapacity, and proposed rather to divide all countries' EFs by *global* biocapacity. By doing so, they acknowledge that EFs are not intended as measures of a country's own sustainability, but more of its contribution to global unsustainability [COMMENT: comparison to global or local biocapacity is useful, but answers different questions.] Yet the fact that no ecological deficit can exist for cropland at the worldwide level remains. At this worldwide level, this indicator is not informative at all on the excess pressure that men, on the average, exert on the regenerative capacity of this cropland. The same reasoning applies to grazing land. Once again, at the country level, ecological deficit will only mirror the trade deficit on livestock products and ecological deficit at the worldwide level is impossible. Regarding built-up lands, demands placed on this land use type always equal the biocapacity, as they both represent the cropland area lost for providing those services. Hence, the contribution of that type of land to the overall ecological deficit is null.

Concerning demands placed on fishing grounds and forest lands, the EF provides a treatment that seems more completely in line with a full sustainability perspective, that is the flow of consumption available leaving the stock unchanged for next year. Nevertheless, at the worldwide level, one observes that biocapacity exceeds footprint, suggesting that there is no sustainability problems regarding the use of those resources. Moreover, shall they turn into a deficit, one must keep in mind that they represent quite a small part of the overall EF (respectively 9% and 3% for forest land and fishing grounds).

Last, but not least, carbon uptake land is the amount of forest land required to uptake carbon dioxide anthropogenic emissions. In 2005, it is the largest contributor (more than 50 %) to humanity's current total Ecological Footprint and increased more than tenfold from 1961 to 2005. In the standard presentation of the Footprint, there is no formal biocapacity in front of the demand for waste (CO<sub>2</sub>) assimilation [COMMENT: forest biocapacity faces two competing demands: carbon sequestration and forest products such as timber and firewood]. Note that an alternative view could be to aggregate the footprint (area of forest) needed to supply wood for construction,

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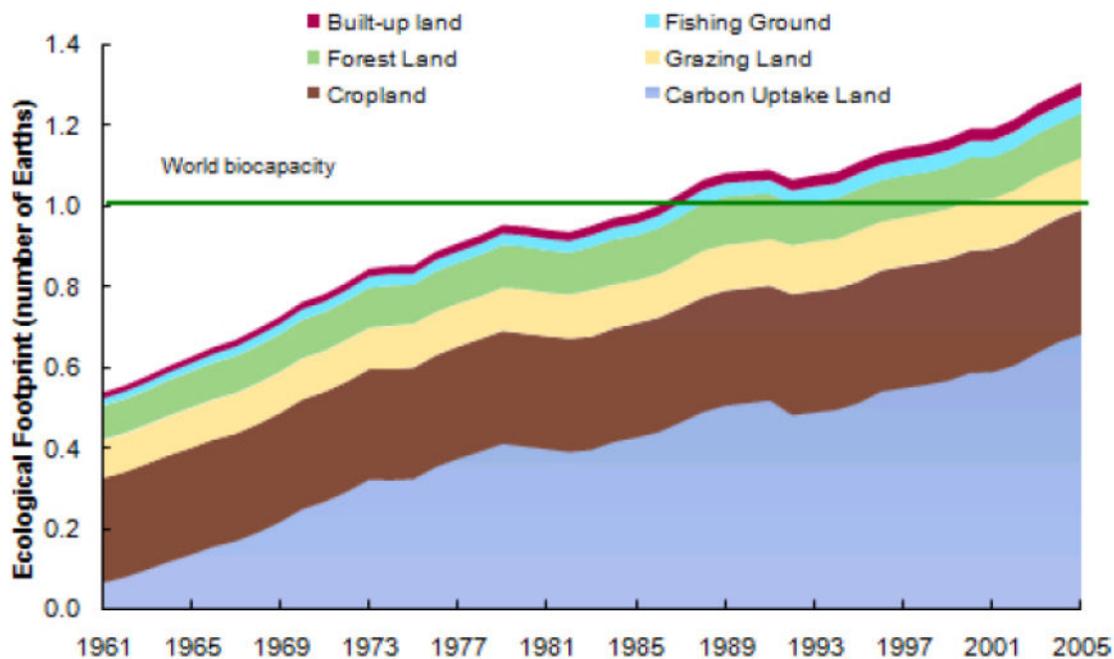
<sup>7</sup> See *Calculation Methodology for the National Footprint Accounts, 2008 Edition, version 1.0*.

<sup>8</sup> One should notice that, unlike adjusted net savings, EF is based on final consumption (or final demand), that is production + imports - exports. To put it differently, the required equivalent land area for a given consumption is attributed to the resource *consumer* rather than the *producer*. For instance, non-renewables extracted in a developing country and exported to a developed country (e.g oil) count towards the developed country's Ecological Footprint.

fuel and paper and the footprint needed to absorb CO<sub>2</sub> emissions, and to compare this aggregate with the biocapacity of forest, as forest is indeed the counterpart used to monitor carbon dioxide absorption and each use (wood products and CO<sub>2</sub> absorption) puts a competitive demand on the same unit of forest. In doing so, we would be able to display a huge global deficit in forest land, mirroring the overaccumulation of CO<sub>2</sub> emissions in the atmosphere.

Till now, we have reviewed potential unbalances for each kind of land separately. To aggregate those different areas and come up with one single figure, both biocapacity and footprints originally measured in hectares are expressed in terms of a standardized land area unit, termed global hectare. It is a way to re-weight land areas according to their relative potential *agricultural* productivity. This potential is assessed through the spatial GAEZ model of potential agricultural yields framed by IIASA and FAO. As an example, consider one hectare of cropland and one hectare of forest. The GAEZ model would tell you that the potential yield of the cropland area is twice the potential yield for forest land. Then, while aggregating cropland and forest land to compute overall footprint, cropland areas will be weighted twice forest areas. This is not neutral for policy recommendations as forest will generally have lower equivalence factor (weights), and as such, a heavy substitution from forest to cultured lands will directly increase the overall biocapacity available and will alleviate consequently the ecological deficit. [COMMENT: not really. The intent of the accounts is that landuse change does not affect biocapacity.]

Figure 2.4: Humanity’s ecological footprint by component 1961-2005



Source: Ewing et al. (2008)

In short, the apparent simplicity of the EF hides several difficulties and this often argues in favour of better focusing its real contribution and of maybe less extensive but more transparent approaches. Comparisons of EFs between countries should be used, shall it be used, as an indicator of inequality of consumption and interdependencies between geographical areas (e.g.

Mac Donald and Patterson, 2004). But the main message conveyed by the Ecological Footprint, and it is indeed a message, is that humanity, and notably western developed countries, has increased dramatically the level of CO<sub>2</sub> emissions in the atmosphere during the last 40 years (figure 2.4). Those annual emissions are far above the level that could be assimilated by nature, with the well-known consequences on temperature and climate. The methodological approach in the Footprint calculations consist in expressing those emissions in terms of the required equivalent surface (forest) to absorb them. It gives the flavour and the sense of this tremendous problem to the man on the street, and it is its most valuable virtue. But its value-added compared to true carbon accounts is not striking otherwise. [COMMENT: The Ecological Footprint shows tradeoffs between carbon and other pressures, also shows to what extent the entire human metabolism can be accommodated by the biosphere].

Indeed, the Ecological Footprint methodology provides interesting elements for a full carbon account of consumption, as the carbon footprint at the country level takes into account not only direct CO<sub>2</sub> emissions, but also indirect emissions embodied in imported goods. More generally, carbon accountancy (see the “*Bilan Carbone*” methodology in France for instance) is probably a more promising attempt to monitor the demand we (a country, a local community, a citizen...) place on available waste absorptive capacity of our ecosystem. [COMMENT: carbon only is blind to many sustainability relevant questions. Also, it may lead to underestimating the self-interest of countries and cities to take action to prepare themselves for a resource constrained future.]

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