



# Reply to the first systematic response by the Global Footprint Network to criticism: A real debate finally?



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## ABSTRACT

We respond to a reaction of the Global Footprint Network/GFN on our 8-point criticism of the ecological footprint. We also refer to, and comment on, an associated debate in this journal between [Giampietro and Saltelli \(2014a, 2014b\)](#), on the one hand, and [Goldfinger et al. \(2014\)](#), on the other. We conclude that criticism on the footprint is accumulating and coherent across the various studies and disciplines and among the different authors. This was the first time that Wackernagel/GFN systematically responded to our criticisms. Hence, our response contains several original elements and the resulting exchange can be seen to add value to the existing literature. It ultimately allows readers to better make up their mind about the different viewpoints on the ecological footprint.

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## 1. Introduction

The ecological footprint is perhaps the best known and most used environmental indicator worldwide. A superficial observer might therefore interpret it as a reliable measure of environmental pressure or unsustainability. However, the criticism on it is gradually accumulating ([Gordon and Richardson, 1998](#); [van den Bergh and Verbruggen, 1999](#); [VROMraad, 1999](#); [Ayres, 2000](#); [Moffatt, 2000](#); [Opschoor, 2000](#); [van Kooten and Bulte, 2000](#); [EAI, 2002](#); [Grazi et al., 2007](#); [Lenzen et al., 2007](#); [Fiala, 2008](#); [van den Bergh and Grazi, 2010](#); [Blomqvist et al., 2013a, 2013b](#)).<sup>1</sup> These various studies seem to agree on the main shortcomings, summarized recently in [van den Bergh and Grazi \(2014a\)](#) in the form of 8 main points:

1. False concreteness
2. Global hectares: Adding to the hypothetical character of the ecological footprint
3. A case of “land value theory”: Land use as a proxy of environmental pressure
4. Incompleteness in terms of capturing relevant environmental pressures
5. Aggregation through unfounded, implicit weights
6. Carbon sink land resulting from an arbitrary “sustainable energy scenario”
7. Countries versus “bioregions”
8. Ecological deficit and antitrade sentiments

[Wackernagel \(2014\)](#) commented on [van den Bergh and Grazi's \(2014a\)](#) article, but avoided to systematically respond to these eight concerns and instead raised four different questions. In our counter-response ([van den Bergh and Grazi, 2014b](#)) we addressed his four questions, but concluded that Wackernagel finally did not respond to seven of the eight criticisms and did not seriously engage with our arguments in a separate section on the policy irrelevance of the footprint. To our surprise, immediately after the publication of the journal issue in which our article and his first response appeared, Wackernagel published a second – more systematic and more clarifying – response to our eight criticisms on the website of his Global Footprint Network (GFN) ([Wackernagel et al.,](#)

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<sup>1</sup> We could add here a large number of studies applying the ecological footprint that include (minor or major) changes in its methodological assumptions. In effect, such studies implicitly levy criticism on certain aspects of the footprint method. Major studies in this respect are mentioned in [van den Bergh and Grazi \(2014a\)](#). Note further that over time Wackernagel and his Global Footprint Network have frequently altered the assumptions of the method. All this means that much care is needed in comparing footprint estimates between studies or over time.

2014). We wrote a reaction to this and asked him to post it on this website too, but got a negative reaction. To contribute to better construction and use of environmental indicators, and learn from the mistakes of the footprint, we offer below this detailed reaction to GFN/Wackernagel. We further comment on related interactions on the ecological footprint in this journal between representatives of the GFN (Goldfinger et al., 2014) and Giampietro and Saltelli (2014a, 2014b). The latter authors present a very fundamental criticism of the footprint, adding several points to the above 8-point list. Below, text in Italics is the GFN's response to van den Bergh and Grazi (2014b), which was posted on its website (see Wackernagel et al., 2014), while our detailed reaction to their response is in normal letter type.

One might be inclined to think that this debate just involves a repetition of arguments. But in fact, as this was the first time that Wackernagel/GFN systematically responded to our criticisms, our response contains several original elements. The resulting exchange can therefore be seen to add value to the existing literature, and to allow readers to better make up their mind about the distinct viewpoints.

## 2. The Ecological Footprint method represents “false concreteness”

*GFN say: van den Bergh and Grazi claim that Footprint accounting compares “real” land area with “hypothetical” land area, and this represents a “false concreteness” of the method. The core of their claim is based on a common misconception about the Footprint methodology, in their words “that the [Ecological Footprint] method calculates the land area used by a human activity or economy as if they were sustainable, meaning that certain types of environmental, negative externality (e.g., pollution) have to be neutralized. This neutralization then translates into land area (used). Shifting from an unsustainable situation to a sustainable one requires a set of assumptions, which render the result, in terms of land use, hypothetical in nature.”*

*In fact, Footprint methodology makes no assumptions about the sustainability of human demands on a land area, nor does it “neutralize” negative externalities in the calculations. If it did, it would indeed be a hypothetical, predictive measure. Instead, it is simply descriptive, with both Footprint and biocapacity results based on actual measured values of current ecosystem productivity, including both resource production and carbon sequestration, without assessing whether other factors may make this level of productivity unsustainable in the future.*

*Our reply: The footprint approach makes many assumptions as we discuss in our original article (van den Bergh and Grazi, 2014a). To illustrate one that has an immense impact on the outcome: Carbon sequestration is assumed to occur only through forestation in the footprint calculations. But it can be realized in many ways, even without forests that use a lot of land. Carbon sequestration is not even needed if one reduces CO<sub>2</sub> emissions by replacing fossil fuels by renewable energy, which implies other values of land use per ton of CO<sub>2</sub> than the footprint assumptions. The result would be a different size footprint for many countries, notably as the carbon sequestration is responsible for about half of the footprint of many rich countries.*

*GFN say: In addition, they argue that because “Obviously, real land use could never exceed available land area,” the fact that the Footprint can overshoot biocapacity reveals the “unrealness” of this measurement. This is a perplexing comment. Ranchers, for example, who must ensure that there is sufficient feed for their herds, calculate the ability of available land to support cattle in “cow-calf acres” or “animal units,” taking into account both the number of hectares on their ranch and the average productivity per hectare. This rangeland management methodology parallels that of the Ecological Footprint,*

*with the latter taking into account human demand on cropland, forest and fishing grounds in addition to that on grazing land, and expressing this in a measure reflecting the average productivity per hectare of all these areas combined. Just as a ranch may not produce a sufficient flow of grass to keep up with the demands of a herd, so too a biologically productive area (a nation or the whole planet, for example), may not produce a sufficient flow of resources to keep up with human demand. This does not make overshoot hypothetical, however, it just means that demand will be met by dipping into prior years' accumulated flows (stocks of timber or fish, for example), or by allowing carbon emissions to go unsequestered and thus accumulate in the atmosphere.*

*Our reply: The problem here is that land use is confused with stocks. The confusion is introduced by the sentence “This does not make overshoot hypothetical, however, it just means that demand will be met by dipping into prior years' accumulated flows”. The second part of the sentence clarifies that overshoot is hypothetical, or is just an analogy for reducing stocks (accumulated flows). Note that in the rangeland example actual land use can never exceed actual land availability. So the analogy is not convincing. Note that Giampietro and Saltelli (2014a, p. 8) make various comments about the inconsistency of stocks and flows in the footprint approach.*

*GFN say: There is nothing hypothetical about these stocks or carbon accumulation, even if expressed in global hectares, a proxy representing the area of land required to produce these stocks or sequester the accumulated carbon. One would hardly make the argument that because distance is converted into abstract units called “meters” that this measurement is hypothetical rather than real. For any measurement, “the map is not the territory;” if van den Bergh and Grazi feel the Footprint accounting has an issue with false concreteness simply because it attributes a biocapacity value to surface areas, then they must have a gripe with any metric.*

*Our reply: A meter is always a meter, but a “global hectare” is not always a hectare. We criticize comparing hypothetical land use with hypothetical land availability. Overshooting of land use could not happen if real land use would be compared with real land supply. The first would always be limited by the latter. Laypersons like the footprint because it suggests something concrete, but it turns out to be misleading as it is all about virtual and hypothetical measures, both on the “demand and supply sides” of the footprint analysis. This is why we refer to “false concreteness”. Giampietro and Saltelli (2014a) affirm this problem, referring to “virtual hectares” of land. As a reviewer suggested, an additional complication arises from multi-functionality and multiple uses. These can mean that the footprint is further biased (for a discussion, see van den Bergh and Verbruggen, 1999, Section 3.2).*

## 3. The use of global hectares contributes to the hypothetical character of the Ecological Footprint

*GFN say: In addition to their qualms discussed above, van den Bergh and Grazi argue that the fact that a global hectare may represent a varying amount of productivity each year contributes to its hypothetical nature. This is a bit like saying that because a dollar may vary in purchasing power each year, it is a hypothetical rather than a real measure of financial wealth.*

*Our reply: Wackernagel/GFN proposes another incorrect analogy here. We are discussing land, which has a very clear interpretation: square meter, kilometer or hectare. It is not variable, unless land is taken by the water (flooded). Or a specific area of land can be turned into another use, so that the area for the first function is reduced in amount. But mixing productivity and*

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