

The political economy of fifty years of the Tinbergen & Hueting approach (1969-2019)

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October 31 2019

Prepublication of parts of THAENAES^{1 2}

Keywords: sustainable, economic, growth

Abstract: The paper by Jan Tinbergen & Roefie Hueting (1991) for the Earth Summit in Rio 1992 provides an approach to the economics and national accounts of ecological survival that still is unsurpassed. The approach is rooted in the economic subject matter of scarcity and in fundamentals of ecology (notably that one can observe collapse only when it is too late), and the approach is applicable within the statistical framework of national accounting and thus fully practical. The approach however is much misunderstood in the world of national accounts and their history, and also in mainstream economics and the opposing ecologists and ecological economists. Political economy allows us to deconstruct the various points of view. The conclusion is that the various disciplines require more discipline. The story of population and production growth and environmental degradation over the last 50 years is not only a story about conflicting political goals but also a story about grand failure at the academia and national institutes of research and advice. The paper is a prepublication of parts of a draft book that should be published in open access in 2020.

¹ Colignatus (2019d) is a draft book, with a title abbreviated as THAENAES, that should be published in 2020 in open access. Parts of this draft book have been used to compose this article. The copyright remains with the book and this article must be seen as a collection of quotes with some edits to link them.

² A presentation was at the Dutch-Flemish Political Science Day, Antwerpen, June 14 2019, <http://thomascool.eu/Papers/Environment/2019-06-12-Sheets-50-years-Tinbergen-Hueting.pdf>

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1. Introduction

Ragnar Frisch (1895-1973) and Jan Tinbergen (1903-1994) received the Nobel Prize in economics in 1969. Roefie Hueting (born 1929) is a recipient of the UNEP Global 500 Award in 1994.³ Tinbergen was the organiser behind the latter award, see his collection of recommendations by Robert Goodland (1939-2013) and others (originally for the Sasakawa prize).⁴ Apart from organising the UNEP award amongst environmentalists, Tinbergen also expressed his own support on content concerning economics and the national accounts.

Tinbergen & Hueting (1991)⁵ provide an approach to the economics and national accounts of ecological survival that still is unsurpassed. The approach is:

- (1) rooted in the economic subject matter (scarcity)
- (2) rooted in fundamentals of ecology (collapse is observed when it is too late)
- (3) applicable within the statistical framework of national accounting and thus fully practical
- (4) demanding in economic and environmental expertise but concerning its result easy to understand by policy makers and the general public, for, with *standard national income* (NI) and *environmentally Sustainable National Income* (eSNI), then $e\Delta = NI - eSNI$ namely gives the distance to environmental sustainability.

Boumans (1992) shows that young Tinbergen in his thesis Tinbergen (1929) moved from physics to economics in a “limited transfer”, namely that Tinbergen adopted the methods and not the analogies of physics. The use of those analogies is what Mirowski (1989) evaluated as “more heat than light”. Buitenhuis (2016) in a master’s thesis supervised by Boumans clarifies that young Tinbergen was familiar with the methods of thermodynamics, but there are indications that he had his hesitations about their fruitfulness for economics.⁶ Tinbergen in 1926 moved onwards to business cycle analysis at CBS Statistics Netherlands. Tinbergen in

³ <http://www.global500.org/index.php/thelaureates/online-directory/item/208-roelof-hueting>

⁴ <http://www.sni-hueting.info/EN/Others/2019-05-02-Tinbergen-1990-UNEP-Sasakawa-Hueting.pdf>

⁵ <http://www.sni-hueting.info/EN/Publications/1991-Tinbergen-Hueting-GNP-and-market-prices.pdf>

⁶ <https://tinbergenletters.eur.nl/Letters/letter-to-pikler/>

official position there in 1929-1945 and also at the *League of Nations* became one of the founding fathers of national accounting alongside Keynes, Hicks, Kuznets, Meade, Stone and others, as is generally recognised see Kenessey (ed) (1994), Den Bakker (1994) in the latter volume, Bos (1992)-(2013) and Vanoli (2005). The Tinbergen & Hueting approach belongs to this method of national accounting.

Hueting & De Boer (2019b) review the results over 1969-2019. CBS invited these authors for a presentation of their book and a lecture on July 11 2019 that was attended by some sixty statisticians. CBS also made a video available (in Dutch), while sheets are also available in English.⁷

This article will review:

- (1) The Tinbergen & Hueting approach appears to be misunderstood or neglected by “ecological economists” who are no proper economists and who follow thermodynamics and entropy without much success in convincing the world, and with instead confusion for economic advisers and policy makers. The same holds mutatis mutandis for ecologists and biologists who keep a distance from economics and who developed their own terminology, see Colignatus (2019b).
- (2) Mainstream environmental economists like David Pearce (1941-2005) and Nordhaus (Nobel Prize in economics 2018) use the methods of the calculus of variations, which Tinbergen used in his thesis and still in Tinbergen (1956), but the Tinbergen & Hueting approach is based upon the IUCN, UNEP and WWF (1980) “*World Conservation Strategy: living resource conservation for sustainable development*”, that uses the precautionary principle, and that allows the simpler condition that the vital environmental functions for the year of statistical observation must not be less at the end than at the beginning of the year. For statistics the use of the current state of technology and a zero rate of discount are obvious assumptions.
- (3) History writing about these developments is currently stuck in the approach propagated notably by Bos op.cit. that only looks at *conventional* national accounting, which apparently assumes that Tinbergen after 1950 did no longer think about national accounting, which thus neglects the Tinbergen & Hueting approach. Instead, *traditional* history writing would have an open mind and would also write about the Tinbergen & Hueting approach on economics and the national accounts including the environment.

The above is only a selection of issues discussed by Colignatus (2019d). This article belongs to political economy, as defined by Colignatus (2000a, 2005, 2011). Works by others will be deconstructed, which means that they are not only analysed on content but also on backgrounds of authors and potential purposes and (intended) effects. In case of tough criticism, authors have been informed and given the opportunity for comment or correction.

2. The academic lure of the calculus of variations

The “Report of the United Nations Conference on the Human Environment, Stockholm 5-16 June 1972” causes embarrassment: so much was known already

⁷ <http://www.sni-hueting.info/EN/NA-eSNI/index.html>

so early, and actually so little has been achieved (United Nations 1973). The IUCN, UNEP and WWF (1980) "*World Conservation Strategy: living resource conservation for sustainable development*" argues "that for development to be sustainable, it should support conservation rather than hinder it". The Tinbergen & Hueting approach adopts this principle of conservation.

The approach is to make the measurement of national income conditional upon assumptions about preferences for environmental sustainability. The statistical measurement of environmentally sustainable national income (eSNI) requires that the vital environmental functions remain available for future generations. This approach puts physical boundaries upon economic welfare optimisation. For statistics it suffices to look at only one year, and not all future generations. The vital environmental functions are conserved, i.e. they should not be less at the end than at the beginning of the year of observation. While the prime result is the distance to environmental sustainability $e\Delta = NI - eSNI$, the method also provides for a rich biotope of indicators at the individual level of resource use.

Remarkably, academic economists inverted the conservation strategy. They interpreted the issue in terms of economic theory as a problem of optimising welfare over an infinite horizon of generations, while neglecting the boundary condition, regarding the boundary as not very relevant if their models gave solutions anyway. They started discussing whether "sustainability" meant equal consumption over the generations, or equal welfare, or discounted forms, or integral value vs per capita, and so on. All this distracts from ecological survival.

In practical calculation, various "green GDPs / indicators" have been proposed such as ISEW, Ecological Footprint, Adjusted Net Savings / Genuine Savings and Genuine Progress Indicator, and lately there is an increased interest in happiness as a re-interpretation of economic utility and social welfare. With respect to both ecological survival and requirements of economic theory these alternatives however fail.

David Pearce (1941-2005) apparently dominated the discussion and managed to get his view adopted by UNEP / Worldbank in the "Genuine Savings" indicator, nowadays "Adjusted Net Savings". Pearce had a background in Cost-Benefit Analysis (CBA) that has a tradition of looking at substitutions and trade-offs. Pearce suggested that there would be trade-offs in the environmental issue and between the generations, and he regarded sustainability as relying upon such trade-offs. If a current generation destroyed resources then a next generation might be "compensated" by e.g. more man-made capital like human capital. In this manner he created a discussion about the distinction between "weak" (trade-offs) and "strong" (conservation) sustainability. He portrayed the issue as if the proper notion of sustainability within economics would be the "weak" one, while the original proposal of conservation was marginalised and no longer called "conservation" but "strong sustainability". He stated that the Tinbergen and Hueting approach provided an "inverted" solution, while it was actually he himself who had inverted the IUCN, UNEP and WWF (1980) *World conservation strategy*. Potentially his wish to join in the abstraction of mathematical economics and the calculus of variations (by younger co-workers) suggested to him that such boundary issues could also be neglected. His inversion was actually a category

mistake, since boundary conditions for an optimisation problem would have no trade-offs for themselves.

Currently, statistical offices and economic advisory and planning agencies over the world are implementing UN SEEA systems for national accounting and derived indicators both for statistical observation and projections for the future. These satellite accounts put the environment outside of the realm of economics, and do not provide for an integration of decision making about scarce resources for alternative ends.

Policy discussions on ecological survival will be much served when researchers study in detail what Tinbergen & Hueting have wrought. When an economist hasn't read Tinbergen & Hueting (1991) and now Hueting & De Boer (2019b),⁸ then an advice on "economic growth" and ecological survival is at risk of being misguided – as indeed is shown in various cases.

Tinbergen (1903-1994) was one of the pioneers in the 1930s for what became the UN System of National Accounts (SNA) and thus was in a firm position on this issue. The main author of Tinbergen & Hueting (1991) is actually Hueting (born 1929). The two authors decided that Tinbergen would be the first author, based upon the international recognition that he had. By this gesture, Tinbergen expressed that he fully supported the findings by Hueting.

Tinbergen however also had a wider vision than Hueting, namely on the need of international co-operation, see Colignatus (2019d).

3. *A state of denial in a country that will be flooded*

Consider the proverbial lemmings that run into the sea and drown by thousands. Let us consider how this horde of lemmings would do their statistics, running at some distance $\Delta_{\text{sea}} > 0$. Conventional lemming-statisticians, currently in control at the national statistical bureaus often with PhDs from highly ranking universities, would only record the position they are at, say the GPS co-ordinates. They can agree that there is a sea, as legend has it from some survivors of generations past, but this "sea" hasn't been observed yet, and thus for them mentioning a sea would not be statistics (of the past) but "politics" (about the future). For this manner of conventional thinking it is a revolution to grow aware that there is something called Δ_{sea} which is just a current fact like the GPS position, and which can be reported about too, except that it has greater uncertainty since the sea has not been observed yet directly by GPS, but only inferred, say by changing vegetation. The uncertainty only disappears when $\Delta_{\text{sea}} \leq 0$, when statistical observation comes to an end. To my regret, the issue about the Tinbergen & Hueting approach is basically just as simple as this story about such lemmings. If the national statistical bureaus in the world, starting with CBS Statistics Netherlands, had not been so conventional thinking as can be observed as a fact too, and explained the issues better, then world policy making about environmental sustainability in the decades since Tinbergen & Hueting (1991) would have been better informed.

⁸ <http://www.sni-hueting.info/>

With the publication of Hueting & De Boer (2019b),⁹ readers can find in this book: (i) the basics from the thesis Hueting (1974a, 1980) that shows that the environment belongs to the subject matter of economics, and thus also to the national accounts, (ii) the vertical demand curve plus the methodology that measurement of national income is based upon conditional assumptions on preferences for environmental sustainability, (iii) the practical outcomes and proof of concept of $e\Delta = NI - eSNI$, (iv) documentation of the standards for environmental sustainability, (v) a review of the discussion since 1965 and deconstruction of common misunderstandings, (vi) inclusion of the Tinbergen & Hueting (1991) paper in their appendices to make it more accessible.

The distance to environmental sustainability for 1990 for Holland is estimated at around 50% of standard national income (NI or GDP), and for 2015 at 30% of NI. The shadow prices per sector that result from the calculation of eSNI are probably of greater importance for investment policies than what the official Dutch environmental assessment institute PBL gives. Vollebergh and Drissen (2018) estimate a "monetary environmental damage" of around 4.5% of NI, but they then forget that half of Holland will eventually be flooded. Kruitwagen, Van Egmond and Dietz (2019) refer to Hueting in 1970 but not to Hueting since 1986 with regard to eSNI. These authors and Bos and Ruijs (2019) present "nature points" and probably produce temporarily locally interesting results, but in the long run they also allow that half of Holland disappears under water. Bos and Ruijs (2019) suggest applications of "willingness to pay", but Hueting (1974a, 1980) has already shown that these CBA methods are fundamentally inadequate, precisely for the issue of nature and the environment. Bos refers to Hueting (1980) but apparently hasn't fully read it.

4. Conventional versus traditional national accounts and their history writing

Reviewing Diane Coyle's (2014) "*GDP: A Brief but Affectionate History*", Marcel Boumans (2014:799) observes (my footnote):

"Actually, such a general history of national accounts does not exist yet.¹⁰ It is revealing that Coyle uses a working paper on national accounts in the Netherlands (Frits Bos, MPRA paper no. 9387 [June 2008]) and an article on John Maynard Keynes's involvement with the development of national accounts in Britain (Geoff Tily in *Review of Income and Wealth* [June 2009]) as two of her three main sources for her history."

Bos (2008:50) correctly mentions Hueting's eSNI, for example in his table 5.2 "*Major events in Dutch national accounting since 1980*", and reports on it *correctly* but *incompletely*:

"Hueting (1980) stressed the economic importance of pollution and depletion of natural resources. Hueting (1991) developed a concept of Sustainable National Income (SNI): the maximum income that can be

⁹ <http://www.sni-hueting.info/EN/NA-eSNI/index.html>

¹⁰ It is not clear what Boumans would think about André Vanoli (2005), and the volumes by Michael Ward (1939- 2008) who briefly mentions Hueting.

sustained without technological development and excluding the use of non-renewable resources. According to Verbruggen et al. (2000), Dutch Sustainable National Income was in 1990 56% below the official Dutch national income. The purpose of the SNI is not to provide the policy-makers with a goal for national income as such, but to indicate the sustainability gap based on current technology.”

This is all. There is no reference to Tinbergen & Hueting (1991). Bos (2008) had already shown the important role by Tinbergen for the development of the national accounts since the 1930s, and it would be important to clarify to readers that Tinbergen since 1968 supported Hueting’s contribution for correcting those accounts for damage to the environment. However, in an email to me of March 20 2019, Bos indicates that he still hadn’t read that paper in 2019:

“If I write another article about National accounts, I will first read the article by Tinbergen and Hueting.”¹¹

Observe that Bos (2008) above refers to the *chapter* Verbruggen et al. (2000) and not the full *report* Verbruggen (ed) (2000). Why not refer to Hueting (1974a, 1980) (earlier date) and Tinbergen & Hueting (1991) and the chapter by Hueting & De Boer in Verbruggen (ed) (2000) (who refer to the first two references) ? Bos apparently hadn’t read those and specifies only what he has studied. Apparently he hasn’t studied the Tinbergen & Hueting approach yet in 2019. This situation necessitates a distinction between traditional and conventional approaches:

- The *traditional* approach in both national accounting and its history writing has a wide scope, that includes an interest in documenting the Tinbergen & Hueting approach on the economics of ecological survival.
- The *conventional* approach in both national accounting and its history writing, e.g. adopted by Bos, neglects the Tinbergen & Hueting approach. If executed correctly, *it explicitly states this neglect* and refers to other sources where the missing information can be found. If executed incorrectly, as Bos (2008) has done, *it doesn’t mention this neglect* but simply neglects the Tinbergen & Hueting approach. It e.g. doesn’t mention the Tinbergen & Hueting (1991) article, and gives only superficial and incomplete mention of some work by Hueting, with often neglect of the latest work (that might illuminate misunderstandings about earlier work).

Above distinction between “conventional” and “traditional” views on both national accounting *and its history writing*, only mentions history additionally, in order to deconstruct also the history writing by Bos. This present analysis is not about history writing by itself but is about political economy, also about national accounting. I am no historian but we cannot avoid statements about the past.

We are at risk of confusing national accounting and its history. Frits Bos includes so much history of the national accounts in his analyses that we might be inclined to judge his work as history writing while in fact his topic still concerns national accounting proper. The added history is something for historical interest, not the

¹¹ Dutch: “Als ik weer een artikel over Nationale rekeningen schrijf zal eerst ik het artikel van Tinbergen en Hueting gaan lezen.”

main issue. This sobering thought allows us to arrive at a major inference to start with. Bos failed as a national accountant, because as a national accountant he should have looked into the Tinbergen & Hueting approach. In this he is no different from the other national accountants at CBS Statistics Netherlands who evicted eSNI from CBS. If Bos were only a historian of the national accounts then he might have had more room to select his own topic of research, and e.g. look at an area without Tinbergen & Hueting (1991), but in fact Bos is not merely a historian but a national accountant who should deal with the Tinbergen & Hueting (1991) propositions and who hasn't.

In corroboration of Bos's message to me of March 20 2019, we remarkably find:

- *No work at all* by Frits Bos refers to Tinbergen & Hueting (1991) and the support that Tinbergen gave to the work by Hueting. Bos (1992) basically was written in 1991 but might have been updated. Bos (2006) and (2011a) about three centuries history repeat the above text from (2008).
- Hueting is *not at all* mentioned (i) in the thesis Bos (2003) about past, present and future of national accounting, (ii) Bos (2011b) "*National accounts: barometer, telescope and compass of the national economy*" for the Gamma Canon "What everyone must know about the gamma sciences", (iii) Bos (2013) about *meaning and measurement*, and Bos (2017) in Eurona, the journal of Eurostat. The reference to the compass is awkward since Tinbergen & Hueting (1991) show that standard national income is a wrong compass when used for the environment. Bos refers to the Stiglitz, Sen, and Fitoussi report of 2009 but their report is deficient concerning Tinbergen and Hueting.

Bos moved to the Dutch Central Planning Bureau (CPB) in 2001 and since 2012 contributed to Cost-Benefit Analysis (CBA) on the environment. When Bos entered into the field of CBA on environmental economics then he should have looked at the Tinbergen & Hueting approach anyway (whatever his interest in conventional national accounts and its history). It appears that he still is (relatively) unaware of *both* the ecological risk *and* the position of eSNI within CBA. This happenstance allows us to identify a source of miscomprehension in his lack of knowledge in 1986-2019 in general about the Tinbergen & Hueting approach.

Thus Bos (2008) hasn't fully grasped the analysis, and via him Coyle neither. In 2019 Coyle is advisor at the UK Office for National Statistics (ONS). Authors in Boumans (ed) (2007), Boumans (2014), Coyle (2014) and former director of INSEE Vanoli (2014) refer to Bos's incomplete (2006, 2008 or 2011a) or deficient (other) works. Likely these authors assume that Bos has compiled a proper history, in particular about developments at CBS where he was working, but alas. Bos might argue that eSNI has not been included in "official national accounting" and GDP, and thus doesn't form part of a "history of this official development", but eSNI has been a key element in the *discussion* within official national accounting, see also UN SEEA (2003). A proper (complete and correct) discussion of *national accounting and its history* would include the arguments why the Tinbergen & Hueting approach has not been adopted and this would allow readers to also see that such arguments are deficient. Bos however has the incomplete reporting and does not look deeper into the discussion about eSNI and thus doesn't highlight the confusion about it. It is tempting to call this "traditional history writing" but that is

the wrong term since national accounting and its history writing have a tradition that would require the inclusion of Hueting's work. Thus Bos's history writing is not "traditional" but only *conventional*, improper or biased (incomplete or deficient).

5. *Ecologists and ecological economics*

The introduction already gave the main line. Hueting worked primarily in the community of economic statistics and national accounts, at CBS Statistics Netherlands and the international conferences related to these. He opened CBS Statistics Netherlands to the physical and ecological sciences because of the prerequisites of sound environmental statistics. His contacts with academia and the journals were limited and his position was not of an academic, writing for journals. The economic journals may have been less interested in his topic of integrating the environment into the national accounts. Events brought Hueting in contact with birds of different feathers, which eventually became a community of researchers around the journal *Ecological Economics*, which published a major series of Hueting's work.¹² However, Røpke (2004:310):

"Most of the precursors were inspired by thermodynamics to rethink both natural and social processes in new terms"

These researchers were not necessarily trained in economics and even less trained in national accounting. To this amalgam of researchers, Hueting must have been as different a bird as to common economists.

While Hueting had been a founding member of the journal *Ecological Economics* the article Hueting, Bosch, De Boer (1995c) was rejected with curious comments, Hueting left the editorial team, and the paper was published at IDPAD(2). Readers may stop for a while to wonder why such a paper might not be published by EE.

The collection of articles Costanza (ed) (1997) "The Development of Ecological Economics" does not contain an article by Hueting, but contains an article by R.S. de Groot on valuation of environmental functions, Hueting's topic.

Costanza (2003), in his short review of the "early history of ecological economics", mentions Hueting, but Røpke (2004), who amplifies this history and

¹² For reference, the following statements have been copied from the April 30 2008 website of the International Society for Ecological Economics (ISEE) at <http://www.ecoeco.org/index.php>

(a) "To promote understanding between economists and ecologists in the development of a sustainable world." (b) "ISEE is a not-for-profit, member-governed, organization dedicated to advancing understanding of the relationships among ecological, social, and economic systems for the mutual well-being of nature and people." (c) "Ecological economics exists because a hundred years of disciplinary specialization in scientific inquiry has left us unable to understand or to manage the interactions between the human and environmental components of our world. While none would dispute the insights that disciplinary specialization has brought, many now recognize that it has also turned out to be our Achilles heel. In an interconnected evolving world, reductionist science has pushed out the envelope of knowledge in many different directions, but it has left us bereft of ideas as to how to formulate and solve problems that stem from the interactions between humans and the natural world. How is human behaviour connected to changes in hydrological, nutrient or carbon cycles? What are the feedbacks between the social and natural systems, and how do these influence the services we get from ecosystems? Ecological economics as a field attempts to answer questions such as these."

who interviewed Costanza amongst others, does not refer to Hueting's work and contribution to the field of "ecological economics". Costanza et al. (2004) in a citation analysis don't mention Hueting. From the cited works 92 were selected by Costanza et al. based upon their personal judgement of what was influential. Apparently, Hueting's publications have had little effect in this community. Costanza et al. did not explicitly object to the methodology of eSNI but their neglect constitutes an implicit objection.

In contrast to this, Costanza et al. (1997), "*The value of the world's ecosystem services and natural capital*", an article in the journal *Nature* – with 3rd author R.S. de Groot – caught the fancy of the time, with citations in daily newspapers around the globe, and indeed with hundreds of citations in *Ecological Economics*. That journal spent a separate edition 25(1) to it. Included there are important criticisms by trained economists Hueting et al. (1998a) and El Serafy (1998).

Leaving those aside for a moment, it is important, for reference, to restate the strong criticism by Pearce (1998):

"(...) the article by Costanza and his coauthors is deeply flawed. (...) Economists' frustration at seeing their contributions abused is therefore understandable. Getting it right has to matter. While *Nature* and the authors of the "value of everything" have got the publicity they quite reasonably sought, they have done so at the cost of some damage to the integrity of the science they attempted to use."

This criticism is repeated by Pearce, Hamilton and Atkinson (2001):

"The most celebrated recent study that tries to value global ecosystem functions is that by Costanza et al. (1997)." (p213) "Essentially, a methodology developed for valuation at the margin has been applied to a context where it is not applicable." (p215) "It follows that there is no economic interpretation of virtually all the aggregate numbers in Costanza et al. (1997)." (p215).

The criticism by El Serafy (1998:26) is that the *Nature* article uses "ecosystem services" and does not refer to Hueting's "environmental functions", yet it is possible that El Serafy does not properly distinguish state and flow here, see Colignatus (2019b) on terminology:

"On the evidence of the language (...), and in the light of the environmental literature, one might venture the guess that the authors' service is really a function, and their function is really a service (...) Such an interpretation would conform with the standard (Hueting, 1980) definition of an environmental function (...) Hueting is nowhere mentioned in the article, nor his terminology followed."

Thus the "ecological economists" are not quite "economists". While Hueting has done his best to incorporate other sciences in his work – i.e. to use as the data to proceed with – it appears that Costanza missed out on the basics of economics and national accounting. For reference, professor Costanza started out with an MA in architecture and urban planning and had his Ph. D. in systems ecology with a minor in economics. Seen from this angle, this research community on their part

has failed in synthesizing economics and ecological science, hence “ecological economics” is only a label but not necessarily convincing in content. One would wish that their studies would have been more directed towards economics. Note that the two disciplines of ecology and national accounting are not competitive but co-supportive, as different dimensions rather than opposites. Hence, both angles are important. The best approach is to express both ideas. Nevertheless, the difference in approach between Costanza and Hueting was not reported in *Nature*.

It may also be noted that Hueting’s position requires connections to the world of official national accounting and its economic theory. Alternative approaches, such as ISEW, Ecological Footprint, Genuine Progress Indicator, Genuine Savings and indeed the Costanza et al. (1997) figure arose from the world of the academia and are relatively easy to implement. Indeed, while eSNI has had only the slow development at one unique place, such other indicators are readily copied by various research groups all over the world. The proliferation fills the scientific journals, rather detached from policy making, and the main effect seems that some research finding tickles a political body to generate more funds for more research. These alternative approaches, and the *Nature* article in particular, have drawn attention by researchers and the general public away from eSNI.

Had Costanza et al. (1997) expressed international support for Hueting’s contribution to economic theory and statistical practice, then the situation would also have been easier for CBS Statistics Netherlands. Now, CBS was confronted with an outside world that for perhaps 99.9% did not understand what Hueting’s work meant.

6. *Wie es eigentlich gewesen ist*

When Tinbergen read Hueting (1967, 1968) he contacted him, and at Tinbergen’s advice, CBS Statistics Netherlands in 1969 appointed Hueting specifically for the task to correct national income for the impact on the environment. Though Tinbergen had been thinking and writing about the environment too from quite early on – which he could discuss with his brother biologist Niko Tinbergen (1907-1988), Nobel Prize in physiology and medicine 1973 – Hueting has been writing most explicitly about environmental economics. Following the contacts established for the UNEP award, the World Bank invited Tinbergen and Hueting to write a joint paper for a collection for the Earth Summit Rio 1992. This became Tinbergen & Hueting (1991).

Traditional accounting and its history includes: (i) The finding by Hueting (1974a, 1980) that the new scarcity means that the environment belongs to the subject matter of economics, and thus *also to the national accounts*. (ii) Hueting (1974a, 1980) suggested to publish NI-A (NI excl. asymmetric bookkeeping) alongside NI. (iii) Hueting (1974a, 1980) rejected standard Cost Benefit Analysis (CBA) on “willingness to pay” and “willingness to accept”. (iv) Hueting (1986b) constructed a vertical demand curve to correct the deficiency of standard CBA, and to finally find a useful approach to correct standard NI, resulting into $e\Delta = NI - eSNI$. (v) Hueting (1989b) allows the standards to be chosen by politics or science, and makes the analysis conditional to assumptions on preferences on environmental sustainability. Statistics is not only about the figures but also about what they

mean. (vi) The importance of the Tinbergen & Hueting (1991) paper is that Tinbergen with his background in national accounting and econometric modelling fully endorses this approach and regards it as a natural extension for his own work and for economics as a whole.

7. Conclusions

If ecological survival of humanity is at risk, and requires conservation (a.k.a. strong sustainability, see Dietz and Neumayer (2007)), then the Tinbergen & Hueting approach would merit support. Economists currently are malinformed and often think that “economic growth” might pay for improvement in the environment, but “economic growth” actually means production growth and should not be confused with improvements in technology and welfare, while production growth actually tends to harm the environment. When economists would understand the Tinbergen & Hueting approach then economics again becomes a force for the good instead of the bad. The academia should have more discipline and not abuse their freedom for turf wars in the ivory tower. The story of population growth and environmental degradation over the last 50 years is not only a story about conflicting political goals but also a story about grand failure at the academia and national institutes of research and advice.

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PM. Colignatus is the name of Thomas Cool in science. References are consistent with Colignatus (2019d) and Hueting & De Boer (2019b).

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