



Munich Personal RePEc Archive

**The Old Man and the SNI: A review of
advance and adversity in Hueting's
research in sustainable national income
(SNI), economic growth and the new
scarcity from the environment**

Colignatus, Thomas
Samuel van Houten Genootschap

16. June 2008

Online at <http://mpra.ub.uni-muenchen.de/9152/>
MPRA Paper No. 9152, posted 16. June 2008 / 10:09

The Old Man and the SNI

A review of advance and adversity in Hueting's research in sustainable national income (SNI), economic growth and the new scarcity from the environment

June 16 2008

Thomas Colignatus

<http://www.dataweb.nl/~cool>

“If you are not tired, fish, ’ he said aloud, ‘you must be very strange.’”

Hemingway (2004:50), “The Old Man and the Sea”

Abstract

Roefie Hueting (1929), recently turned 78 years of age, has been working on the subject of economics and the environment since around 1965. Seminal results are his notion of environmental functions (WWF, 1969), his Ph.D. thesis “New Scarcity and Economic Growth. More welfare through less production ?” (1974), the definition of (environmentally) sustainable national income (eSNI, UNEP/Worldbank 1989), the eSNI methodology (CBS Statistics Netherlands 1992) and his contributions to the 1999 Hueting Congress (presentation and rejoinders, 2001bc). The figure of national income NI gives production while the figure of eSNI gives the production level that maintains the availability for future generations of the vital environmental functions. For many economists, the current focus is on climate change but the ecological challenge is much wider and more fundamental, see also the Convention on Biological Diversity, Bonn 2008. The figure for eSNI still isn't included in the system of national accounts (SNA) which means that current statistical reporting on national income and economic growth provides incomplete information to policy makers and the general public. With the dictum “What you measure is what you get”, we currently get “economic growth” that works against sustainability. This review provides a reflection on advance and adversity in 40 years of Hueting's research in a world that only slowly recognizes the global environmental problem. How do governments decide under risk, how do they grow aware of that very risk, what is the role of the national statistical offices in providing information on that risk, especially when that risk concerns survival for large sections of the planet ? The reflection provides insights that themselves are useful for our understanding of the political economy of research on issues that are politically sensitive.

Contents

1. Introduction	3
1.1 A topic in political economy	3
1.2 Making a compass for economic policy on the environment	4
1.3 A guiding diagram	5
1.4 A guiding table	7
2. The period up to “New Scarcity and Economic Growth” 1974	9
3. Some conclusions from “New Scarcity and Economic Growth”	9
4. Reception of “New Scarcity and Economic Growth”	10
4.1 On the positive side	10
4.2 Six year delay in the publication of the English translation	10
4.3 No adoption of the key proposal	11
5. The period up to the Brundtland report 1987	11
5.1 SNI and eSNI	11
5.2 The notion of (environmentally) Sustainable National Income (eSNI)	11
5.3 Hueting on the Brundtland report	12
6. The period up to the Hueting Congress 1999	13
6.1 Tinbergen and Hueting 1991	13
6.2 CBS and CPB	13
6.3 Inside CBS Statistics Netherlands 1991-1999	14
6.4 eSNI and ecological economics	19
6.5 The Hueting Congress 1999	21
7. The period till now 2008	22
7.1 Retirement	22
7.2 Dutch eSNI trend 1990-2000	22
7.3 A missed chance for Germany and Eurostat	22
7.4 A mysterious disappearance of a crucial subsidy	23
8. Concluding remarks	23
Literature	26

1. Introduction

1.1 A topic in political economy

In 2006, the film “An inconvenient truth” by Gore et al. (2006) caught the public’s fancy while the UK Stern Review (2006) provided an impetus for economic policy making to recognize the problem of climate change. At bottom, it are not these publications but the experiences by the general public of abnormal weather patterns and some disasters like the 2005 Katrina hurricane. In 2007, both the Intergovernmental Panel on Climate Change (IPCC) and Mr. Gore received the Nobel Peace Prize “for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change”.

Yet, these issues have been known for much longer. Also, the true ecological challenge is much wider and more fundamental and quite a lot larger. Even if climate change is kept within limits then there still remains the proper issue of environmental exhaustion and destruction of the ecological base for large sections of the planet. Braat and Ten Brink (eds) (2008) review the challenges for the Convention on Biological Diversity, but this is only a part of the whole issue, for example since the issues of erosion and pollution have more impact than just on biodiversity. Tinbergen and Huetting (1991) estimated the challenge of environmental sustainability at around half of world income. A calculation for The Netherlands by Verbruggen et al. (2001) gives approximately the same value. The result will not differ much for other advanced countries. If Joe and Jane Sixpack are to become sustainable, their income would need to be halved, which implies a reallocation towards activities that are friendly to the environment. The economic challenges for sustainability thus are enormous, and they often are not properly recognized in full for what they are.

Why is this challenge not properly recognized ? Since recognition depends upon information, a major aspect in answering that question concerns the management of information. The question then becomes: how do we deal with the information about our economic activities (that affect the environment) ? To understand the Tinbergen and Huetting (1991) and Verbruggen et al. (2001) estimates we need to consider national income accounting. In economic theory, national income (NI) expresses the annually available production level available for consumption, as a factor for optimization of social welfare. Economists have been designing various “green GDPs” such as ISEW, Ecological Footprint, Genuine Savings, Genuine Progress Indicator, and the like. Of these indicators, Huetting’s concept of (environmentally) sustainable national income (eSNI) gives the production level, associated with NI, that maintains the availability for future generations of the vital environmental functions, i.e. the possible uses of the non-human made physical surroundings. Of the various indicators only eSNI satisfies the basic condition on the environmental functions. eSNI thus would warrant our attention as the indicator of interest for sustainability. The difference between NI and eSNI expresses the economic challenge to achieve environmental sustainability. According to Verbruggen et al. (2001) $eSNI \approx 50\% NI$, which is the “half of income” mentioned above. And here we arrive at part of the answer to our question. In the United Nations System of National Accounts (UN SNA) only NI is listed as a measure while eSNI is not listed. The national statistical offices around the world only publish data on NI but not on eSNI. A well-known dictum is: “You get what you measure.” Currently we measure NI and get more NI, but for sustainability we rather should measure eSNI and get more eSNI.

The usefulness of eSNI shows less from the absolute level and more from the dynamic development over time, where the unyielding laws of arithmetic come into play. Suppose that, with NI at 100 and eSNI at 50, NI grows by 5% to 105 and eSNI drops from 50 to 49, then it is obvious that such growth is unsustainable. Suppose that policy is adjusted so that eSNI would grow by 5% too, then we get $1.05 * 50 = 52.5$ in terms of the original year. But then the absolute gap has also increased. With NI now at 105 and eSNI now at 52.5 the absolute gap has grown from 50 to 52.5 in terms of the original year. If we want to maintain that absolute gap, eSNI would have to grow twice as fast, at 10%, and if we want to close the gap it has to grow even faster. In this way, eSNI provides information on the direction and speed of the sustainability of economic development.

We can see that eSNI provides crucial information for monitoring economic policy with respect to environmental survival and the sustainable availability of environmental functions for future generations. The key question in this review is: why is this figure not standardly available as information for national economic decision making ?

For economics, there appears to be a theoretical crisis at the very roots. Sir John Hicks once commented that accounting may be the prime contribution of economics to mankind, e.g. see Hicks (1983:365-375). With respect to the environment and environmental policy, we must observe that national income accounting indeed plays a key role in the provision of information for policy making. Traditionally, national income and economic growth are intended to approximate the social welfare function by tangency of the hyperplane, so that “more” indeed is “better”. However, this procedure for NI assumes that preferences are expressed in market prices, while for sustainability we know that the market is inadequate. National income accountants at the national statistical offices currently tend to adopt “measurement without theory” or with respect to some “universal model” so that “data” are “for the user”. The latter approach runs counter to what the whole exercise was intended for and turns theory into ritual. Data are generated, we can do calculations on them, but the figures have no theoretical economic meaning. Apparently there has arisen an institutional gap between the academic economists interested in theory and the operational economic statisticians at the national statistical offices. Since these authors started to write and publish for different audiences, this crisis at the root of economic theory does not resound in the economic literature.

To some extent, there are historical forces at work here. The economists who designed the theory of social welfare and national income accounting, economists like Jan Tinbergen, Paul Samuelson, Simon Kuznets, John Hicks, James Meade and Richard Stone, were leaders in their generations and made their presence count in more areas. All received Nobel Prizes. Once the system of national accounting was in place, it became a matter of operational activities indeed, and the leading economists of our own time were and are inclined to be concerned with other issues. Indeed, Bos (2007) states: “Among economic researchers there is a worldwide illiteracy in national accounting. A decade ago, national accounting has been dropped as a separate topic of research on the list of the Journal of Economic Literature. The economic researchers skilled in national accounting have become more and more extinct.” Of this disappearing breed, again only a few noted the relation between the environmental challenge and national income accounting. On this historical stage, this review now considers the work done by Hueting.

It are ethics and morality that deal with survival. The ethical issue features strongly in this discussion. Above figure of eSNI uses data for the small country of The Netherlands, though derived from world data when necessary. However, the proper question is how it can be that figures for eSNI are lacking for other modern and much larger nations ? How do intelligent people deal with the situation that their grandchildren are at risk that their environment is largely gone ? Apparently there are not only blind spots in economic policy making with respect to our physical surroundings, causing governments around the world to pursue the goal of NI, but there are even blinding mechanisms that make us unwilling to generate the information on eSNI that clarifies what we actually do. Mechanisms that blind us even to survival and the possible destruction of the ecology that mankind depends upon. The study of this phenomenon is a topic of political economy. Why is it, and, more specifically, how is it, that developed democracies harbour such mechanisms that close their eyes to the issue of survival ?

1.2 Making a compass for economic policy on the environment

The Dutch economist Roefie Hueting (born 1929) has been studying and writing on this issue for 40 years and has given a seminal contribution to our understanding of how the environment enters economics and economic theory. His findings received support from Jan Tinbergen, see Tinbergen and Hueting (1991), where Tinbergen is the Dutch economist who joined Ragnar Frisch in the first Nobel Prize in economics. Hueting wrote extensively and contributed to various conferences of the United Nations, OECD, the European Union and separate countries such as India and Indonesia. He

was awarded the Dutch royal knighthood and in 1994 the UN Global 500 Award. Yet, one of his prime suggestions, to calculate a figure for “(environmentally) sustainable national income” (eSNI) alongside the common figure for “national income” (NI), is still not adopted by the international community of national income accounting. Only the Dutch government has provided funds for some calculations, for the years 1990, 1995, 2000, while the calculation for 2005 is in progress. But somehow, there it stops. All this is amazing since it would be rather obvious that policy making requires sound information if it is to be effective.

The concept of environmental functions, the possible uses of the non-human made physical surroundings, including eco-systems and life support systems, on which humanity completely depends, is the basis of this approach. In the case of (actual or expected) excessive use at the expense of another or the same function, functions have become economic goods by definition. Environmental sustainability then is defined as safeguarding vital functions for future generations.

This review deals with some events of advance and adversity in this research. This paper is targetted to highlighting some key mechanisms.

To properly value this review it is useful that the reader knows a bit more about Hueting’s analysis. Van Ierland et al. (2001), already referred to, also contains a chronology by Goodland (2001). Colignatus (2001) gives a two-page review, and more will transpire further below. A useful source is also Hueting’s website at www.sni-hueting.info.

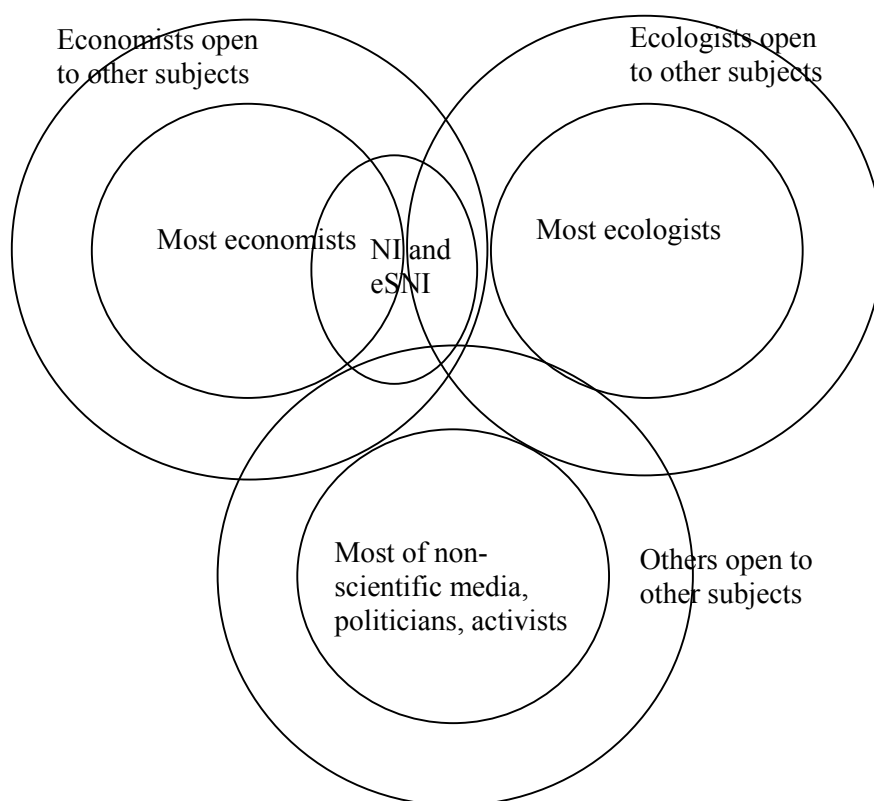
A key point in Hueting’s theory is that both NI and eSNI are conditional concepts, thus “what if” figures based upon assumptions. Preferences on the environment and the new scarcity cannot be expressed by the market when that market is left by itself without ideal regulation that truly reflects the preferences – including the complex question how to aggregate preferences when some prefer sustainability and others don’t. NI is conditional on the assumption that the package of goods – produced goods and environmental functions – becoming available in the study year perfectly reflect the preferences of the subjects (which cannot be measured). Thus, NI is conditional on the assumption that all preferences are expressed in the observed data, even though it is not certain that the individual preferences actually are expressed in those data. eSNI is conditional on the assumption of preferences for sustainability. Both indicators provide only information and don’t imply a position on the subject. This conditionality is quite common in scenario studies. Nevertheless, NI is commonly misunderstood while eSNI is not generally accepted yet.

Calculation of eSNI costs only 0.25% of the budget of CBS Statistics Netherlands (2,500 employees) while the Consumer Price Index costs 1.3%, and the department of national accounts itself costs 4.2%. The 0.25% for eSNI is only possible because of the integration of work processes, where the environmental data are already collected for other purposes and where the calculation involves corrections at a relatively high level of aggregation.

1.3 A guiding diagram

Figure 1 depicts relationships that are relevant to our discussion. There are economists and ecologists, and agents who tend to be none of these, such as media people, politicians and societal activists. There are likely few people who understand a decent amount of both economics and ecology. Most economists concentrate on their own subject and similarly for ecologists. Around these majorities there are zones of co-operation. National income accounting can be studied with different degrees of openness. Ecologists open to economics but without knowledge of national income accounting will miss out on eSNI. An author like Hueting who is an economist open to the subject of ecology and who works in the field of national income accounting, clearly will be little understood by others with different positions. Even societal activists who lobby for a better environment are likely not to understand him since he is not an activist but an economist speaking the language of national income accounting. The discussion will stagnate unless bridges of communication are built and unless greater desires arise to understand what eSNI is about.

Figure 1: A diagram of relationships



The diagram may strike the reader as a bit superfluous. Once these different positions are identified, it becomes obvious that there will be miscommunications. However, it is a major step towards comprehension of environmental economics and policy to see that the field is so fragmented. The fragmentation of knowledge may cause perverse effects. To understand the issue of eSNI requires 100% clarity, and, while many arrive at 90%, each researcher misses a different 10%, and each 10% may be sufficient for the issue to be rejected. For example, many think along the lines “different assumptions, different eSNIs” but in Hueting’s perception (i) there are different green NIs but only one eSNI, (ii) within eSNI the uncertainty only causes different estimates but does not invalidate the concept. Points (i) and (ii) provide decision makers with a framework of decision making under risk. The scope for misunderstanding is huge. Subsequently, the diagram will guide and enlighten the discussion below where we can identify actors and where we can explain advance and adversity due to positions.

Obviously, the diagram puts “most economists” in the center and the “zone of co-operation” on the fringe. It would be incorrect however to call this center the “core of economics”. Hueting works on the subject of scarcity and describes the environment as the “new scarcity”, so that his work can be seen as belonging to the “core of economics”. Most economists however see it as still on the fringe.

With scarcity as the core of economics, only a subgroup studies social welfare and national income accounting *and* has some interest in the new scarcity of the environment. This subgroup is fragmented as well. Core subgroup 1 includes Hueting, Tinbergen (deceased) and the reviewer, who support the inclusion of eSNI in the UN system of national accounts (SNA). Core subgroup 2 includes the current London Group of the UN statistical division and opposes that inclusion. Core subgroup 3 includes those researchers who have no clearly voiced opinion. Below we will consider the various positions.

Not included in the diagram are economic paradigms. A new paradigm is “evolutionary economics” that sees itself as different from “neoclassical economics”, and which is altogether something else than “ecological economics”. Though Hueting sees himself involved only with national income

accounting, he may also be classified as neoclassical, which explains part of the communication gap within economics itself and with the new approaches of our time.

Not included in the diagram is the distinction between the academic world and the national statistical offices. As mentioned, the intellectual gap between these realms has grown large. In the 1930s academics were brought into government service to develop the system of national income accounting but somehow the exchange dropped to a minimum once the system was in place. Academics who invent some indicator of economic welfare commonly have students who write theses so that islands of quotations arise, while methods can be copied around the world. Examples are ISEW, Ecological Footprint, and Genuine Savings. An analysis like eSNI has to blossom in the bureaucratic environment of national statistical offices, which means that it may have little chance to do so and that it neither has an easy link to the outside academia. Clearly, an academic will not write a National Science Foundation research application for something that copies what should be done at the national statistical office. Also, an emphasis has grown in the academic journals on econometrics and mathematics such that a conceptual approach basically relying on high school mathematics and a lot of tedious calculation falls out of favour.

Given this fragmentation of knowledge, it may only be the ongoing destruction of the environment and the impact that this has on the economy and human survival that causes us to have some interest in the present subject. Unfortunately, times of crises may also cause people to focus more on their own and to listen less to others. Perhaps the moment of imminent danger is the most fruitful for a change in thought.

1.4 A guiding table

Guidance is also provided by **Table 1**. National income accounting finds its *raison d'être* in social welfare theory. This has been developed in the period 1930-1950 by economists like Jan Tinbergen, Paul Samuelson, Simon Kuznets, John Hicks, James Meade and Richard Stone. At issue is the question how to deal with non-market aspects.

Table 1: Economic indicators

	<i>Social welfare function (SWF)</i>	
	<i>Traditional economics</i>	<i>Broad indicators</i>
<i>Traditional economics</i>	NI	B
<i>No asymmetric entries</i>	NI minus asyms	(B minus asyms)
<i>Sustainability</i>	eSNI	BS

Asymmetric entries, here abbreviated to the neologism “asyms”, mean that loss of environmental functions is not entered in NI, and this is correct because our physical surroundings fall outside of NI, but their restoration and compensation are incorrectly entered as value added in NI, which is incorrect because they should be entered as intermediate deliveries (costs).

Though non-market aspects have been recognized since Pigou if not earlier, the focus in traditional economics is on activities valued in money to keep matters practical. Nominal values are collected already for tax purposes (“statistics” derives its name from measurement of “state” activities) and the challenge for economic theory is to find the split between price and quantity. The basic issue is to compare two points in time and to determine whether welfare has increased or not. Since the Bergson-Samuelson social welfare function (SWF) cannot be observed, income - that follows from the tangent hyperplane - can be used as a proxy, and observed market prices can be used to deflate to real values. Thus there are three elements to keep in mind: (i) the basic context is economics and it is only secondary that this venture applies statistics, (ii) the basic statistical challenge concerns not

income *per se* but the development of welfare, and it is useful to keep welfare in mind when considering the proxy, (iii) observed market prices are used because of the assumption of optimality - whence tangency. Hueting simply proceeds in this tradition of research and sees what happens when the environment becomes scarce, now or at some future moment. Overall, Hueting's contribution derives its power from accepted notions of welfare analysis and the framework of national income accounting, and indeed from Lionel Robbins's definition of economics itself as the allocation of scarce means over alternative ends.

Over the course of years, various researchers became dissatisfied that nonmonetary elements of social welfare were not included in the NI figure. Partly there are measurement errors on productivity (e.g. when unvalued home labour is replaced by valued activities), and partly there are aspects in the utility functions that may be as relevant as NI. These ideas lead to broad indicators. However, as Hueting & Reijnders (2004) clarify, broad indicators can be misleading for survival because they can give positive signals while sustainability decreases.

Clarity in this discussion can only be achieved by some classification with a small example. Let production consist of $w =$ wheat and $c =$ clothing. In traditional economics, social welfare only depends upon production, in this case as $SWF[w, c]$ with $NI = p_w w + p_c c$ e.g. in prices of a base year. "Economic growth" is traditionally linked to the growth of NI. In contrast to traditional economics, a broad concept of welfare arises when we consider other factors such as $d =$ the income distribution, $u =$ unemployment, $r =$ the rest (labour conditions etcetera) and $s =$ sustainability. In this case we get $SWF[w, c, d, u, r, s] = SWF^*[NI, d, u, r, s]$. Hueting emphasizes broadness, as he distinguishes welfare from NI, and where he relates NI to "production growth" instead of "economic growth". While Hueting emphasizes broadness he does not want to measure welfare in one indicator, but wants to measure the factors that influence welfare separately. In his practical research he chooses to focus on sustainability, that cannot be substituted with other sources for well-being. The resulting situation might be denoted as $SWF^{**}[eSNI, d, u, r]$. Both NI and eSNI are based upon assumptions concerning preferences. The three indicators NI, NI minus asyms and eSNI and the (other) separate factors (or even indicators of factors) are required to monitor economic development. See Colignatus (2000) for a discussion that the choice between these SWF^* and SWF^{**} , or regime switch, might be represented by a meta-SWF.

Given the relation $SWF^*[NI, d, u, r, s]$ we can find statements in the literature like "NI is the indicator for welfare" (traditional), "NI does not cover welfare" (broadness), "NI and eSNI are some of the factors that influence welfare" (broadness, Hueting), which can be somewhat confusing, but should be clear now.

Figure 1 interacts with **Table 1**. We can distinguish researchers interested in theory or not. Over time, economists interested in theory primarily concentrated on broadness. The historical alliance between policy making and economic theory that convened on NI has since eroded, and, while policy making still focussed on NI, the theorists went off to new horizons. A recent development is called "beyond GDP" with a focus on "happiness", with roots in much of the earlier literature. An important practical point is that national income accounting has been operationalized by its theorists and designers in such a manner that it doesn't seem to require theory any more. Statisticians can collect sales slips and can construct Laspeyres and Paasche indices without resort to the finer details of welfare theory. Over the years the notion that NI was intended as a proxy for the SWF eroded. In circles of national income accounting, a philosophy has arisen of "measurement without theory". Market prices are used, not because of what they are supposed to mean under tangency to the SWF but because they are merely "observed". That "NI at constant prices grows" has become to be seen as a goal in itself, with the criterion "more" rather than "better", whatever "more" means. Hueting has had to grapple with all these developments.

2. The period up to “New Scarcity and Economic Growth” 1974

The period up to Hueting’s thesis can be seen as advance. Being an economist at the Ministry of Social Affairs, doing labour market research, Hueting discovers the environment around 1965, a period when world population stood at 3 billion. Hueting (1969) introduces the concept of environmental function for an international audience. He writes articles for a Dutch economics magazine ESB and bundles these in “What is nature worth to us?” (in Dutch, 1970). From his first article onwards, Hueting states that the national income (NI) figure is incomplete, as he states it now in Hueting (2008): National income is the sum total of the values added by man. These are added to the non-human made physical surroundings. Producing is adding value. Water, air, soil, species and life support systems are not produced by man. So the physical base of human existence falls by definition outside of national income. Hueting: “Now I am only repeating what I stated around 1965.” (Quotes like these are personal communications.) These were the years of Meadows (1972), “The limits to growth”.

His articles led to contact with Tinbergen and eventually, also via other contacts, to an invitation by CBS Statistics Netherlands. Hueting: “The intention was that I would start in the department of National Accounts. However, the head Theo Bouthoorn planned to retire in a few years and did not want new issues in his department. Co-ordinating director Kees Oomens then decided to create a separate department for environmental statistics. In hindsight it might have been better to be part of the NA dept, but anyway we required a base of physical data, and now we had ample opportunity to do so.” Tinbergen, Pen and CBS now urged that Hueting put his findings in a thesis. Its genesis was straightforward and it became Hueting (1974) “New Scarcity and Economic Growth. More welfare through less production?”. Hueting (also a jazz pianist): “I composed the book as a fugue of 5 voices, economics, ecology, history, social issues, unemployment, all flowing together into in the figure of national income.”

3. Some conclusions from “New Scarcity and Economic Growth”

The following quotes indicate some highlights:

“The crucial question ‘What is nature worth to us?’ cannot be answered by means of the instruments available to us. But in my opinion the study has shown that at the same time another question remains unanswered, namely ‘What is the worth to us of goods that are produced and consumed at the expense of the environment?’. For when the value of the environment cannot be determined in the conflict between production and the environment, the market price of produced goods may no longer be accepted as an indicator of the economic value of these goods.” (p185)

“Corrections to national income (in order to arrive at a series of figures to place alongside the existing ones) are possible only for losses of function in which the want for the function may be derived from market data.” (p186)

“All the information now available suggests that an unchanged continuation of growth of production and of population will almost certainly lead to ecological or climatic disasters or to a collapse of our civilization as a result of the exhaustion of energy and national resources, shortages of food, pollution or lack of space.” (p187)

“Environmental deterioration is therefore above all a problem of future generations, for which this generation is responsible. (...) In this situation, which has no precedent in the history of mankind, the level of activities will, in my opinion, have to be limited to such an extent, on the strength of ethical considerations, that the future is given a fair chance.” (p187)

“Man’s wants are to a considerable extent determined historically and culturally. They are also open to influence to a high degree. (...) If this view is correct, optimism with regard to human happiness is justified, even if the availability of means of satisfying wants decreases.” (p188)

“The hope for a livable environment for our children seems best served by optimism regarding human imagination and ingenuity, which are great, and pessimism regarding human institutions, which are slow to react.” (p189)

It is important to observe that Hueting’s analysis here is national income accounting, no more, no less. There are two elements, one part pure science based upon observed market prices and another part beyond that with the suggestion of an ethical approach with respect to merit and demerit goods. Only the first is included in national income. It is only after more than a decade in 1989 that Hueting arrives at his “what if” approach to bring sustainability also within the realm of national income. NB. There are authors who interpret the later development of eSNI as reflecting purely a political or ethical choice, and who reject eSNI for this reason. These authors then agree with the Hueting (1974) conclusion that politics and ethics are no part of national income, but they miss out on the Hueting (1989) analysis on the role of assumptions in national income accounting and the “what if” approach designed after 1974.

4. Reception of “New Scarcity and Economic Growth”

4.1 On the positive side

“The thesis was received with hosanna,” Hueting recalls. The hall where he defended the thesis was overcrowded, he received a Cum Laude, later he presented a copy to the Minister of the Environment Irene Vorrink with the national press present, there was an invitation to the Royal Palace where he presented a copy to Prince Bernhard, and over the next year 5000 copies were sold – which is a sizable number for a small country.

This reception reminds one of the reception in Britain of David Pearce’s “Blueprint for a green economy” in 1989 – also a UN Global 500 Award winner (see Turner (2005)).

4.2 Six year delay in the publication of the English translation

4.2.1 Manuscript sold to a U.K. publisher

The connection to Prince Bernhard appeared valuable since he was the first president of the World Wildlife Fund, later renamed World Wide Fund for Nature, and WWF International financed the English translation of the thesis. The translator Trevor Preston had worked parallel with Hueting and the English version was available a few months after the Dutch version. Sadly, its actual publication was delayed to 1980, for reasons that remain obscure to this day. Elseviers sold the manuscript to Liverpool University Press, for unclear reasons. The editor there had all kinds of objections and didn’t do much. The ordeal lasted six years and it required an initiative by both Tinbergen, the Minister of Economic Affairs Hargert Langman, the Minister of Environment Roelof Kruisinga and some more people, to resolve it. A letter went out to Elseviers stating that the publication was a “case of national interest”, Elseviers bought the manuscript back, and it was published within a few months, finally in 1980. “The delayed publication was a major setback,” Hueting observes. “I had become a member of various international committees and without the backing of the book people would not understand my argumentation or would not consider it with proper attention. There was no base for discussion and understanding. The book missed the international impact that it could have had. By the time that it became available, there were already other approaches by others, that distract from the argument.”

4.2.2 Mishan’s reaction of “nothing new”

In the ordeal with Liverpool University Press, the editor produced a letter from E.J. Mishan whom he had invited to review Hueting’s manuscript. Mishan appeared to give a very negative review, stating that Hueting’s book contained “nothing new”. Hueting rejects that statement and suspects that Mishan did not enjoy his remarks on K.W. Kapp (1950) whom Hueting considers much more comprehensive than Mishan (1967). On Mishan’s book Hueting (1974, 1980:75) states: “As in the

case of Kapp – who, strangely enough is not mentioned, any more than Boulding is – the effects on the environment form only a part of the adverse effects of the growth of production discussed. (...) Mishan includes (...) also the influence on our cultural pattern. The later facet, where, in my opinion, he arrives at a number of highly disputable conclusions, will not be discussed here.”

The UN, EU, IMF and OECD (2003) Handbook on Integrated Environmental and Economic Accounting (SEEA 2003), Section 10 paragraph 199 reads:

“Much of the initiative to look for an alternative path for the economy rather than a different measure of the existing economy came from the work of Hueting in the late 1960’s and early 1970’s. He introduced the concept of environmental function referred to throughout this manual, explaining how pressure on functions leads to scarcity or competition for these functions. As with any economic good or service, this scarcity gives rise to an economic value due to the opportunity costs involved in their use or appropriation.”

Mishan’s judgement thus was too quick. Given Mishan’s important position in the field at that time this was a major set-back.

4.3 No adoption of the key proposal

Despite the enthusiastic reception of the book in Holland, the key proposal in it, i.e. to create a corrected figure alongside the official figure for national income, was not adopted, neither by policy makers nor by CBS Statistics Netherlands itself. Hueting identifies two causes: “One cause lies with myself. The result of the thesis was that the environment could only be valued partially, for the reason that the preferences express themselves in the market only partially. They show only by expenditures on elimination and compensation, or what I now call the “asymmetric entries”. I was afraid for the “pars pro toto effect”, i.e. that if a corrected figure was published then people might think that it would be sufficient to consider only this figure. I was leaning to the idea that at least the thesis showed that, while there was no figure available for the scarcity of the environment, this also meant that the NI figure is incorrect.” The other cause lies on the receiving end. Hueting: “The colleagues at the department of National Accounts didn’t see a reason for change. I myself didn’t exert as much force as I might have, because of the “pars pro toto effect”. The CBS directorate has always been in favour of my research but neither saw a reason to go against the will of the Department of National Accounts.” A critical impression by the reviewer is that it seems that Hueting was also surprised that his strong and coherent exposition apparently was not convincing by itself – and that he did not know what else to say.

5. The period up to the Brundtland report 1987

5.1 SNI and eSNI

In 1986 Hueting already applies physical standards, yet the theoretical presentation of the “vertical demand curve” appears for the first time in 1989. He uses the term “sustainable national income” but the literature starts to abound with so many different concepts of adjustments for sustainability, that in 2007 he adds a prefix for the proper kind of sustainability: “(environmentally) sustainable national income” (eSNI). For a discussion of the various measures arising over time, see Hueting (2001a) “Parable of the carpenter”, Hueting’s (2001b) “Rejoinders” and Hueting and Reijnders (2004).

5.2 The notion of (environmentally) Sustainable National Income (eSNI)

In the period since his 1974 thesis, Hueting develops the Dutch environmental statistics, participates in international committees, and writes papers on how to practically resolve the insoluble issue of valuing nature. In 1983, the U.N. General Assembly passed a resolution, speaking about “sustainable development”, and established the World Commission on Environment and Development also known as the Brundtland Commission. In 1987 it published the report “Our common future”. In this period, Hueting came to realize that the political choice for sustainability actually was an expression

of a preference. What was hitherto unknown and unobserved, now became tangible, and what was insoluble up to then came to a solution. This led to the Hueting approach to represent the assumption of preferences for sustainability by a vertical line, based upon a physical standard which expresses the sustainable burden on the environment. This approach thus includes the conditional or “what if” calculation: *If you want sustainability then this gives a figure for “(environmentally) sustainable national income” (eSNI).*

Goodland (2001:320) discusses the events:

“In 1983, UNEP, led by Yusuf Ahmad, convened the first international workshop to explore how sustainable national income should be calculated within the whole UN system by modification of traditional SNA. I supported this new and potentially powerful approach and managed later to bring in Salah El Serafy who led the World Bank into Green Accounting. As Hueting was the only person in the world to have been working on adapting the accounts of any nation up to that point, he contributed greatly to what became known as the “UNEP-World Bank Working Group on Environmental Accounting”. The World Bank hosted the second workshop in Washington in 1984, OECD a third workshop in Paris in 1985, and again in Washington in 1986, by which time Environmental Accounting had become institutionalized. This group focused mainly on incorporating the exhaustion and depletion of environment and natural resources in national income, notably in developing countries. (...) The results were published in 1989 in “Environmental Accounting for Sustainable Development”. Progress on Environmental Accounting then slowed down from the early 1990s until the present, and the World Bank Group still relies more on unadjusted national accounts which exclude environmental losses.”

Goodland (2001:320) also records where Hueting’s approach originated:

“Much of Hueting’s work originated in developing countries. After having worked on sustainable national income for the Netherlands, Hueting extended his approach to Indonesia. His proposal to approach sustainability for environmental functions was first made during his visit to Jakarta in 1986, on invitation of H.E. Emil Salim, Minister of Population and Environment (Hueting, 1986b). Hueting then broadened his approach while on the team that produced the “Taiwan 2000” study.”

5.3 Hueting on the Brundtland report

Hueting’s 1988 paper, presented in New Dehli, rejects the Brundtland report since it combines sustainability with conventional growth of production, while proper sustainability cannot be attained in such manner.

The Baumol effect has the emblematic example that a Beethoven string quartet requires the same input now as 200 years ago. The shift in the economy from agriculture to industry to services has already been observed by Sir William Petty, and has recently been documented in the World Bank (2000) “Beyond economic growth”. However, the “Hueting effect”, if one may call it that, is that the greater part by far is generated by precisely those activities that burden the environment most, see Hueting (1981ab). The core of productivity growth is generated by the agricultural and industrial base, and this explains the impact of “economic growth” on the environment. Hueting prefers “production growth” for the relative change in NI since economic welfare would be much wider. Production growth tends to reduce sustainability while growth in economic welfare would probably benefit from reallocating activities (that reduce NI growth).

6. The period up to the Hueting Congress 1999

6.1 Tinbergen and Hueting 1991

In an important step, Hueting maintains the support by Jan Tinbergen. In a joint article, Tinbergen and Hueting (1991) for the World Summit on Sustainable Development (WSSD) in Rio 1992 present the Hueting approach of the “what if” calculation by eSNI:

“Standard setting was also considered, but the questions of what standards were to be set by whom could not be answered at that time. This situation has now changed. Especially after the 1987 Brundtland Report, politicians and organizations worldwide declared themselves in favour of sustainable use of the environment. This preference, voiced by society, opens up the possibility of basing a calculation on standards for sustainable use of environmental functions instead of (unknown) individual preferences. Therefore, the following procedure is proposed for correcting GNP for environmental losses (Hueting 1986, 1989).”

The authors arrive at a rough estimate that world eSNI is about 50% of world income, which estimate is corroborated by later findings.

6.2 CBS and CPB

In Holland, there exists a historical specialization of tasks between CBS Statistics Netherlands that provides the statistics, necessarily for the past, and the Central Planning Bureau (CPB) that provides projections for policy making, necessarily for the future. Tinbergen actually helped create that distinction by moving his planning section from CBS to create the new CPB in 1945, just after WW II. Hueting worked at CBS and the reviewer has worked at CPB.

Hueting’s position at CBS has always suffered from the fact that “future generations” sounds like “the future” and not “the past”. The generation currently alive has an influence with regards to future generations and thus by necessity a paternalistic preference for good or for bad. Those future generations aren’t present yet and cannot express their preferences. Using that paternalistic preference we can consistently define “sustainability” using only the current generation. However, some authors don’t seem to understand this and they consider it confusing that a statistical bureau would investigate preferences of future generations. eSNI however relies on assumptions on individual preferences of those currently alive.

In the Dutch set-up, Hueting’s concept seemed to run opposite to the two different institutional paradigms. Perhaps he should have moved from CBS to CPB, to project sustainable paths for the future and include some “base values” for the past as a side product. As it happened CPB did not understand or agree with Hueting’s approach anyway. Various economists at CPB comprehend the notions of national income accounting but not all people at CPB understand all of it. At CBS Hueting had ample contact with colleagues and there was more scope for discussion but with CPB these moments were essentially limited. Around 1983 the CPB abolished its own section on the environment (Passenier (1994:298)) while Hans den Hartog, member of the CPB directorate and a good contact for Hueting, suddenly dies in 1992, 58 years of age. Hueting and Den Hartog worked together on the first publications by CBS and CPB on the environment, see CBS (1972) and CPB (1972).

The Hueting et al. (1992) methodology for the calculation of SNI basically uses statistical averages for the estimate. This met with criticism that behaviour would be affected by sustainability measures and price changes, and that this required a model. Though CBS already had a model created by Wouter Keller, the CPB claimed that model making was its province as well and that CBS should stay out of that realm.

The dispute between CBS and CPB was rather strong. (a) In 1993, there was an incident concerning an article by Hueting for economics magazine ESB. (b) In 1996, the Minister of the Environment Margreeth de Boer and Minister of Economic Affairs Hans Wijers were misinformed by some of their officials about eSNI, also leading to a misinformation of Parliament. (c) When a meeting between Wijers and Hueting resolved this, CPB claimed its monopoly at making models and

succeeded in getting Wijers and the CBS to accept this. A separate project was created with a special subsidy to calculate eSNI, joining CBS, environmental institute RIVM and university group IVM. This group actually used the Keller model but a consequence was that eSNI was moved out of CBS. Also, Hueting now had to clarify the entire issue and the principles of national income accounting to the people at IVM, both Frank den Butter as chairman of the overseeing committee and Harmen Verbruggen and the other members in the actual research group.

In this process, internal doubts at CBS were key. The setup for eSNI was only on paper, it was experimental and based upon new theory. The directorate of CBS did not wish to rock the boat and required general support, which it did not get. In a way the criticism that a model would be required may have been a blessing in disguise since eventually that model was created, increasing the robustness of the measure. The Dutch institutional deadlock was worked around and the number of people involved was enlarged. Nevertheless, had there been international support then the directorate of CBS might have taken a stronger position. Below, we will first consider the internal discussion at CBS and then look at the international situation.

6.3 Inside CBS Statistics Netherlands 1991-1999

In 1994 Hueting reaches the age of 65 and retires but maintains his office and in practice works like before. Jan Tinbergen also passed away in 1994, 91 years of age, and could no longer support Hueting. In the years around Hueting's retirement, the then head of the Department of National Accounts Steven Keuning (currently Director General Statistics at the European Central Bank) formulates a more conventional view on the national accounts and the environment, Keuning (1992), finds support for this with the CBS directorate, and thus effectively creates the CBS position that differs from Hueting's position. The statistics generated by Hueting's Department of Environmental Statistics are turned into satellite accounts, similar to the social accounting matrices in the Keuning (1995) Ph. D. thesis. The transformation is done under joint responsibility of Hueting and Keuning. Keuning also participates in the London Group of the U.N. Statistics Division, see www.unstat.org, that is instrumental in national accounting and the environment. A reference for this period is De Haan and Keuning (1996) on the NAMEA. De Haan is the current chairman of the London Group. When the London Group meets on occasion at CBS in Voorburg, Hueting is not invited for some participation in the meeting, causing the spectacle of different paradigms working on different floors. The reviewer and Keuning were fellow students in the 1973 enrollment class in econometrics at the University of Groningen and the reader must take into account that relations have always been friendly.

6.3.1 *The onset of SEEA*

The work done at CBS Statistics Netherlands appears to have had an impact on international environmental economic accounting. Looking back in 2006, Robert Smith (2006) reports on the SEEA 2003:

“The preparation of the System of Environmental and Economic Accounts 2003 marks an important milestone in the world of official statistics. Just as the development of the original guidelines for national accounting in the 1950s was the first step toward today's robust, internationally comparable economic statistics, the System of Environmental and Economic Accounts 2003 offers hope to bring order and comparability to environmental statistics.”

Currently, UNStat has installed the Committee of Experts on Environmental Accounting (UNCEEA) to guide SEEA to the same status as SNA and to oversee implementation.

Both eSNI and NAMEA are part of SEEA 2003. Hecht (2007:7-8) in her short historical review correctly observes:

“The Netherlands was also a leader in the development and adoption of environmental accounting. Dutch interest in this area originated with the work of Roefie Hueting, who developed and sought to implement a measure of sustainable national income that would take into account the degradation and depletion of environmental assets resulting from economic activity. Although his approach was not implemented at that time, his work led the national income accountants to develop the national accounts matrix including

environmental accounts (NAMEA), which builds on portions of the national income accounts by adding physical data on pollutant emissions by sector. The NAMEA approach has been adopted by Eurostat, implemented in many other European countries, and integrated into the environmental accounting procedures developed under developing it several decades earlier. (...) Despite its limitations, it is a valuable framework for organizing economic data about the environment, and is an essential input into the analyses desired by economists and environmentalists.”

6.3.2 eSNI and NAMEA

The key point to observe is that dr. Hueting apparently did not succeed in convincing his younger colleague dr. Keuning of the value of eSNI so that Keuning preferred NAMEA. *The Economist* (1998) reported:

“Steven Keuning, head of the Dutch national accounts department, points out that the entire attempt to attach cash values to environmental goods and bads is a bit nonsensical. The reason is that, had the environment been priced in the way that statisticians might value it, people would have behaved differently. The valuation exercise, he says, postulates a situation that could never have existed. (...) The lobby for crafting separate environmental measures that avoid monetary valuations has been bolstered by Eurostat’s copious research money, and by Mr Keuning’s impressive presentational skills. The lobby for green GDP and valuation has its headquarters in the World Bank, and draws its main support from developing countries and from environmentalists.”

The newspaper opposes NAMEA to environmentalists at the World Bank and seems to neglect, perhaps not in background research but at least in its publication, the alternative of eSNI present at CBS itself. Hueting rejects the quote that eSNI is a “valuation exercise”. Also, he agrees that eSNI is fictitious, and based upon a model, but emphasizes that NI is fictitious as well. NI is only informative if you postulate that there is no “broadness” and that there are no preferences for sustainability (which leaves you to explain that governments express such preferences but perhaps don’t really mean that).

Stauvermann (2006) agrees with Keuning’s point of view:

“The exercise should be carried out if the public is interested in such numbers, but it should not be published by statistical bureaus, because one important characteristic of the SNA is, that its numbers are not based on ideologies and political ideas. (...) This conclusion coincides with the decision of the CBS regarding the question how to account for the environment. Nowadays the NAMEA is part of the official statistics of the Netherlands and the SNI was rejected as an accounting tool. The SNI was calculated by the IVM (Free University of Amsterdam) as a political indicator. In some sense the developments regarding green accounting on the Dutch and international level were very similar. In the Netherlands a commission of economists was founded to decide about the most preferable accounting system. On the international level the London Group, which consists of national accountants from different countries, was selected to solve the same problem. Both groups came to the result that it is preferable to adopt the NAMEA instead of a GNI or SNI.”

It must be noted that Keuning participated in both the CBS decision and Eurostat and that of the London Group. It may be that international participants let themselves be guided by Keuning’s view on eSNI instead of studying the original author. His arguments won the day, in succession at CBS and the London Group, but need not be convincing in the end. Stauvermann neglects that both NI and eSNI are based upon assumptions and both are “what if” figures, and that both are equally non-political.

6.3.3 What is not generally known

Hueting takes a different position. At a conference in The Hague, he openly expressed his annoyance at some manipulation and censorship:

“Steven Keuning, (...) as head of the Department of National Accounts of the CBS, has written a number of articles where he first presented eSNI in a wrong manner and then

attacked it, whereby he arrives at sometimes bizarre conclusions that turn the case upside down. One of those articles appeared in the CBS book “The value added of the national accounts”. I have refuted the arguments by Keuning and some other authors for the CBS *Liber Amicorum* for Henk van Tuinen (...). That article has been refused without stating a reason, an event without precedent that boils down to censorship. That article is now (...on the internet [Hueting (2003)]...).” Hueting (2006)

A newspaper report by Robles (1997) gives an excellent review of the period, for Dutch readers, but does not mention those details.

6.3.4 The key question

Let us return to the question whether a national statistical office or the United Nations SNA “should” include eSNI alongside NI. Hueting has expressed his judgement that NI, NI minus asyms and eSNI (see **Table 1**) are best published by the national statistical office, but has agreed, in practice, since it was not feasible otherwise, that eSNI was calculated in a project group outside of CBS but with help of CBS. A joint presentation of all figures might only happen though if they are provided by the same institute. Recently, the Dutch national government planning department for the environment MNP reported in the same edition both that the environmental pressure had been reduced and that the gap between NI and eSNI had increased, see MNP (2006), so it seems that they don’t understand eSNI. Thus, it remains useful to consider the arguments that originally caused Hueting to regard eSNI as part of the system of national accounts (SNA).

Consideration of these arguments causes an element of repetition. In **Figure 1** and **Table 1** and the discussion around them, this article already summarized the various relevant angles, and hence one might suspect or hope that the argument would be crystal clear by now. The argument can also be enlivened by referring to the proverbial lemmings. When lemmings run into the sea and drown by thousands, scientists can record how many steps are taken into what direction, and they can measure the distance and time to the sea, without any qualms that such measurements would reflect a political choice in any way. Such measurements neither imply that the lemmings, arriving at the sea board, will indeed get into the water. Scientists can calculate a probability for how many will cross a line and tumble in. However, when it concerns mankind veering off the sustainable path, these scientists seem to lose their cool, they only measure steps and refuse to calculate the distance and time to the sea. The true cause may be that they are not quite open to the ecological conclusion, are not located in the zone of co-operation, and thus really don’t see the sea and are not aware of the problem. Under what conditions will they open up to the scientific finding of ecologists ? Then the question becomes: what does it *mean* to national income accountants that the calculated figure of eSNI is about 50% of NI and that the absolute gap is widening ?

With the advantages and disadvantages of repetition:

- (1) **Social welfare.** For NI we don’t need a model but NI still is only interesting because in the traditional view it approximates social welfare or in the broad view forms a factor for it. Otherwise it would not make much sense to split the nominal tax data into price and quantity components. But if NI is thought to relate to preferences, and if society has expressed a preference for sustainability, but NI does not express sustainability, then SNA cannot maintain that this NI figure really represents what it intends to measure, and the whole exercise becomes rather pointless. Thus, the economists involved in national income accounting might rather hand back their jobs to the government, reporting that the government is giving inconsistent signals if it states that sustainability is in the SWF but it does not act on that.
- (2) **Objectivity.** The eSNI figure is as objective as NI. It requires a model but that can be realistic and reflect the state of the art in econometrics. eSNI is not a number based upon ideologies and political ideas but derives from the objective notion of environmental sustainability. eSNI provides information about a possible policy objective that is widely being discussed and can be found in official statements. The only “force” exerted is by such statements and not by the information provided by eSNI.
- (3) **Scientific assumptions.** Both NI and eSNI depend upon assumptions. Economists Tinbergen, Samuelson, Kuznets, Hicks, Meade and Stone created an edifice of national income accounting

that now employs millions of people (including those working at companies sending their data to the national accounting offices) which edifice was based upon assumptions, but those assumptions may no longer apply nowadays. National income accounting has turned into some ritual in the application of Laspeyres and Paasche indices, with little meaning since society has become rather schizophrenic on its preference for sustainability. For many statisticians, the national accounts have become “measurement without theory”, which may be fine at the operational level, but is a distinct loss for economic science and our understanding of the world.

- (4) **Information.** Many governments have expressed an interest in environmental sustainability. But they have not instructed the statistical bureau’s to calculate an eSNI. To what extent can a scientist “understand” the situation and become “pro-active” ? A key point is risk. Sustainability itself involves a notion of risk and it is measured with uncertainty. There is a role for science here. Conditionality (“what if”) is a way to deal with risk. At least one economist involved in national income accounting indeed decided to do some calculations. Nothing in Huetting’s work “forces” society to choose for sustainability. This was decent scientific work, and nothing should stop other scientists to proceed in the same manner. Alternatively, scientists can lack interest in studying this subject and then let politicians decide in darkness without the proper information. Then perhaps Parliaments should resolve the issue by explicitly instructing national statistical bureau’s to include eSNI alongside NI. But we can acknowledge that there is room for scientific interest and responsibility.

6.3.5 The CBS rejection of eSNI

It is useful to reconsider some papers produced at CBS Statistics Netherlands in the light of Huetting’s 2006 remark on maltreatment. One of the considerations by Keuning (1992:9) is:

“Contrary to the de-facto measurement which is applied in conventional national accounts, the construction of an adjusted NDP or National Income is *not accounting but modelbuilding*. [Footnote: This was the core of Eurostat’s comments on an early draft of the section on environmental accounting in the next SNA. (...). End footnote.] If the (substantial) costs subtracted in these approaches had been charged in reality, we would have lived in a totally different world and it is quite naive to assume that all economic subjects would have swallowed these costs without an adjustment of their behaviour. In fact, environmentalists often argue for certain protection measures just because of their dynamic substitution and supply effects. This implies, obviously that the negative effects of such measures on NDP are probably less than the simple computations of “Eco-Domestic Product” or “sustainable national income” would suggest. (...) Anyhow, these consequences can only be approximated with the help of a formal model. Replacing GDP by a figure which is an erratic combination of a statistic and the outcome of an (implicit) model thus amounts to throwing out the baby with the bath-water.”

These considerations restate the basic specialization of jobs between CBS and CPB. They can be evaluated in the following way, again at risk of repetition:

- (i) See the four points mentioned above.
- (ii) At any moment in the past, the economy is sustainable or not. At issue is to measure that situation in the past. This gives an account of where society would have preferred to have been, given the assumed preference for sustainability.
- (iii) Use of a model is not in itself “wrong”. When the CPB gives a projection for the next year, with a model that represents the best insights at this moment, then that model with its relationships might also be used for assumed behaviour in a past year.
- (iv) There can be uncertainty about the assumptions required to properly estimate sustainability but those can be handled. It is feasible to include eSNI in SNA.
- (v) It is *accounting* to record that the model (a) is state of the art, (b) reproduces NI, (c) produces eSNI when sustainability is imposed.
- (vi) In the model, behaviour indeed changes to arrive at sustainability. That namely is the purpose. But as such it does not invalidate the estimate for sustainability.

- (vii) The distance between NI and eSNI of necessity is a simple subtraction, but that does not imply that the model is that simple.
- (viii) While NI is directly observed in the sense of counting sales slips, eSNI as a model based figure is still a “statistic” in the mathematical statistical sense of the word. A doctor can directly listen to a chest, which is lean on theory, and a CT scan involves much more theory, but both methods would still be considered “observation”, since there is no implication that the patient “should stop smoking”. The combination of NI and eSNI is not in itself “erratic” and does not imply “throwing out the baby with the bath-water” but actually supplements information. The eSNI figure will still be based upon the environmental data collected by CBS, subsequently upon the NAMEA based upon those, if that is regarded as the baby.
- (ix) The term “national income accounting” has three words and the whole does not mean that the emphasis is on “accounting” in the sense of only processing sales slips. At issue is the *combination* of the words and the body of economic theory behind it. In traditional economics NI is intended as a proxy to social welfare, and the theoretical emphasis is on welfare and not on national income seen as counting sales slips.

Hueting states, in a paper intended for the *Liber Amicorum* for Henk van Tuinen but that thus was censored for that publication:

“Steven Keuning gives in his contribution to the CBS book “The Value Added of National Accounting” [1993] first a completely wrong review of eSNI. Upon this he subsequently bases six objections that all six are off the mark. But the most bizarre objection is: “This may lead to misleading policies: in the event of enormous damage which can be prevented or restored inexpensively, one is not encouraged to apply this measure precisely because it does little to improve ‘green income’.” In that one sentence Steven overlooks three essential aspects of eSNI. (i) The measures are arranged by increasing cost per unit avoided environmental burden (...). (ii) Whether environmental damage is enormous is determined by the preferences (...) From this it follows (iii): the lower the costs the higher (not the lower) the eSNI, the smaller (not the larger) the distance to sustainability and the bigger (not the smaller) the encouragement to take a measure.” Hueting (2003)

A key article for a wider audience is Keuning (1996). Based upon this article, a Member of Parliament, Ferd Crone, stated in Parliament that an eSNI is impossible. When Hueting contacted Crone and asked why, he replied: “But the article was by someone of CBS, so I presumed that you agreed.” This reaction is a bit imprecise since the Keuning article explicitly states that it was written as a personal opinion. Eventually, the misunderstanding was ironed out and Parliament, including Crone, supported a subsidy for the calculation of eSNI. Yet, somehow, possibly by this course of events, the optimal solution that eSNI was calculated at CBS, became unattainable.

6.3.6 A costly choice

The internal CBS process can currently only be seen from the vantage point of today, for example with the availability of the Van Ierland et al. (2001) book. The statistics developed by Hueting, as head of the CBS environmental department, and the NAMEA based on those, eventually have appeared to be important for the development of international statistics on the environment, SEEA 2003. eSNI still has to follow. The statements by Keuning do not differ from so many other international authors. Admittedly, international statisticians might have relied on Keuning’s reports on eSNI rather than consulting the original work by Hueting, just like The Economist newspaper, cited above.

When the 1999 Hueting Congress was held, Hueting (2003) recalls: “Steven congratulated me (...) and said: “We don’t differ in theory but in politics.” To this day I still do not understand what he meant by that.” To the reviewer it suggests that Keuning thought that eSNI was based upon political choice and that he wanted to keep it out of CBS Statistics Netherlands. Above we saw that Keuning missed some points in Hueting’s analysis but this of course still allows him to think that he didn’t miss anything. The argumentation provided by Hueting has convinced this reviewer that eSNI actually is not a political choice but a conditional statistical figure, just like NI is conditional to its assumptions. Yet, it is difficult for one scientist to decide that another scientist ought to be convinced

as well. It is not uncommon in science that theorists working on the same subject have strongly different approaches while onlookers cannot understand why that is so.

Figure 1 can help us towards clarity. It is tempting to diagnose Keuning as a “majority economist” and less “open to the ecology” and not located in the “zone of co-operation”. However, Keuning like Hueting works in the core of economics, studies social welfare (SESAME) and national income accounting, and, with NAMEA, he clearly is open to issues of the ecology. While Hueting is in core subgroup 1, Keuning is in core subgroup 2, while retired CBS Director and former head of the Department of National Accounts Van Tuinen (2008) is in core subgroup 3. **Figure 1** importantly helps to clarify that the following question may be key. Hueting is not only “open to the ecology” but also “open to the risk of survival”. Hueting (1974, 1980) refers to the finding by E.P. Odum that ecological collapse cannot be predicted and can be observed only when it is too late. This causes his essential insight that national income accounting in our times has become an issue of risk information management. It may well be that Hueting’s colleagues were not open to this very point and still leaned to a belief in “economic growth”. In other words, for economists in general, the key question becomes whether they are aware to the current ecological risk.

Since the design of eSNI, 15 years have passed. The historical circumstances are such that a period of 15 years may mean an increase in world population of 1 billion. It is unfortunate that there has been a delay of that length with eSNI. But of course, there already was the Tinbergen and Hueting (1991) article that governments could have reacted to, perhaps the NAMEA was the best approach anyway to start with internationally, and, we must also consider the role of the ecologists.

6.4 eSNI and ecological economics

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 sciences and the ecology because of the prerequisites of sound environmental statistics. His contacts with the academia and the journals were limited and his outlook 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 a journal called *Ecological Economics*, which published a major series of Hueting’s work.¹ 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 income accounting. To this amalgam of researchers, Hueting must have been as different a bird as to common economists.

Costanza (2003), in his short review of the “early history of ecological economics”, mentions Hueting, and Røpke (2004), who discusses this history more at length and who interviewed Costanza amongst others, does not refer to Hueting’s work and contribution to the field of “ecological

¹ PM. 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.”

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 personal judgement of what was influential. Apparently, Hueting's publications have had little effect in this community.

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*, 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 to reactions. Included there are important criticisms by trained economists Hueting et al. (1998) 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 both "environmental services" and "environmental functions" as separate terms, while these actually are the same:

"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, the ecologists have failed on their part in synthesizing economics and the ecology, and hence "ecological economics" is only a label but not necessarily convincing by content. One would wish that their studies would have been more directed towards economics. Note that the two disciplines of ecology and national income 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*.

Hueting recalls a workshop "Valuation Methods for Green National Accounting: a Practical Guide", organized by The World Bank, the U.N. Statistical Office and the journal *Ecological Economics*, in Washington, D.C., March 1996. There Hueting presented his "Parable of the carpenter":

"But I am worried about the existence of more than ten different methods in the literature of ecological economics for the valuation of environmental losses, with outcomes that differ by a factor of ten or a hundred or more. As far as I know, there is nothing similar in the beta sciences. I predict that, as long as this situation continues to exist, politicians and the public will react by saying: "What are we supposed to do with these outcomes, for heaven's sake?". I will therefore try to provide a solution to this problem with the aid of the parable of the carpenter." (1996, published as Hueting (2001a))

Hueting recalls that Costanza was not amused. Likely, Costanza et al. were already starting with the *Nature* article while this parable was critical of their methods.

We may also observe that Costanza is a leading figure in the world of "ecological economics":

“Daly says about Costanza: “He is extremely good at working and organizing. . . I continued to help out, but the entrepreneurship of the journal was really his”. With Costanza, ecological economics got an entrepreneur who really knew how to manage in the highly competitive academic world.” Røpke (2004:311)

Given this leading position it is especially unfortunate that Costanza saw no reason to reflect and publish on Hueting’s results. Hueting’s work actually invalidates Costanza’s work on “valuing nature” yet it is quite ignored by him.

Currently, there is the initiative of the “Encyclopedia of Earth”, see <http://www.eoearth.org/>:

“(…) there are many resources for environmental content, but there is no central repository of authoritative information that meets the needs of diverse user communities. Our goal is to make the *Encyclopedia of Earth* the largest reliable information resource on the environment in history.”

Dr. Costanza has been Topic Editor there for ecological economics, and a search on “Hueting”, done on April 30 2008, provides only two citations, taking from the earlier book “An Introduction to Ecological Economics”, edited by Costanza et al.. For the reviewer this is quite surprising, given the contribution of Hueting to our understanding of the economics of the environment.

Both the *Nature* article and this EoE cause one to raise one’s eyebrows. At this moment in 2008 a conclusion is that Hueting has hardly had any impact in this field of “ecological economics”, while, on the other hand, his concept of environmental function and design of environmental statistics are widely used in the United Nations SEEA – and in fact by Costanza et al.

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. 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.

6.5 The Hueting Congress 1999

The 1999 Hueting Congress came about with subsidies from CBS Statistics Netherlands, various Ministries and Provinces, and the Committee of Recommendation was chaired by dr. Jan Terlouw, former Minister of Economic Affairs. The occasion was held at the Royal Academy of Arts and Sciences in Amsterdam and the papers were edited by Ekko van Ierland, Jan van der Straaten and Herman Vollebergh (2001). The book constitutes an important document since it contains (1) a clear review of the theory by Hueting and Bart de Boer, (2) a calculation by Harmen Verbruggen et al. (3) opposing views, (4) a rejoinder by Hueting that clarifies the various misunderstandings. Especially the latter is enlightening reading.

To mention just one example, Pearce, Hamilton and Atkinson (2001) repeat the frequent criticism that Hueting replaces economics with politics. In their view Hueting requires the government to impose a level that defines sustainability and they rightly criticize this because of unreliability and political aspects. However, Hueting’s rejoinder is that he does no such thing, and he in fact provides a great number of quotes from his publications in which indeed the opposite of that PHA claim is stated. His eSNI is conditional, “*if ... then ...*”. The level and kind of use of nature that defines sustainability is established in the realm of the natural sciences, and economics only takes those as datum to calculate eSNI. This is just a calculation and not an actual imposition. To the present reviewer too it is a mystery indeed why such intelligent economists fail to observe this difference between a conditional and an unconditional. Also, the norms for sustainability have been formulated by the Dutch environmental planning agency MNP as part of the project team. Here, Pearce et al. mix “government” with “science”.

The calculation of eSNI by Verbruggen et al. and the Hueting Congress provide an impetus for a World Bank seminar in 2001 where Minister Jan Pronk presents the first copy of the Congress book to WB president J. Wolfensohn. Other seminars were held at the WSSD in Johannesburg 2002 and at the OECD 2003.

7. The period till now 2008

7.1 Retirement

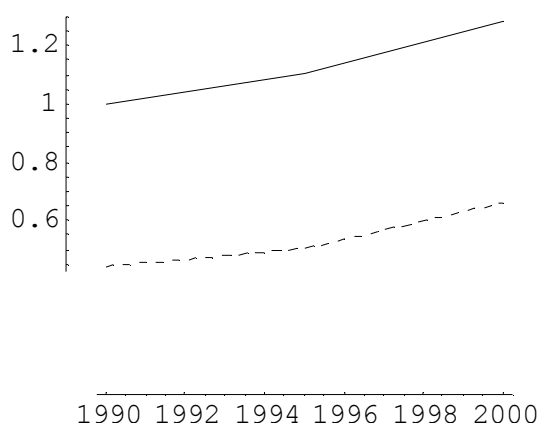
As said, at the end of 1994, Hueting turns 65, and retires from CBS Statistics Netherlands. The directorate allows him to keep his office and Hueting works almost as if still employed. This continues till the Hueting Congress. But shortly after that, in October 2000, the directorate decides that it is better to go separate ways. Hueting receives the special CBS medal and the directorate helps to install a PC with internet link at his home. “It felt like being fired,” he confesses nevertheless.

The directorate’s decision also implied that Bart de Boer, Hueting’s collaborator at CBS Statistics Netherlands, was scheduled to increasingly different activities. Eventually it was decided that the research on eSNI moved out of CBS and became dependent upon external subsidies, and that De Boer moved to CE Delft to stay with the research and those subsidies. De Boer moved, but those promised external subsidies never materialized.

7.2 Dutch eSNI trend 1990-2000

Hofkes, Gerlagh and Linderhof (2004) construct estimates for 1995 and 2000, and perform a decomposition analysis for the trend 1990-2000. Let us consider Net NI, constant trade shares, new equilibrium prices. Over the period, Dutch NNI rose by 28% or 2.5% annually on average. eSNNI rose from 44% in 1990 to 52% in 2000, relative to NNI of each year, which can be seen as somewhat of a success. In constant values, eSNNI started at 44% and rose to 66% of 1990 NNI, thus grew 4% annually. Actually, the effort has not resulted in a reduction of the absolute gap. In 1990 the gap was $100\% - 44\% = 56\%$ and in 2000 the gap was $100\% - 66\% + 28\% = 62\%$, and thus widened by 8% points, in terms of 1990 values. The results are depicted in **Figure 2**.

Figure 2: Dutch NNI (line) and eSNNI (dashed), 1990-2000, 1990 = 1



7.3 A missed chance for Germany and Eurostat

Hueting showed the reviewer an email by Walter Radermacher, the President of the German statistical office (Statistische Bundesamt) and soon in 2008 the General Director of Eurostat:

“Especially I do not think that target setting can in any way be done "objective" by the scientific community. On the contrary, in my opinion it is a core task to the societal and political discussion process.” (Email by Radermacher to Hueting, 2007)

This repeats the misinterpretation, as Pearce et al. (2001) have voiced as well, that Hueting’s work would be politics or ethics instead of objective statistics, while the latter should be obvious from his work. Hueting observes that this email apparently was intended as a closing statement, an explanation of disinterest, and hence not an opening statement that started an enquiry. It is awkward to be sent a statement of disinterest that misrepresents your position.

7.4 A mysterious disappearance of a crucial subsidy

The calculations by Verbruggen et al. (2001) that were finished in 1999 were discussed in the appropriate commission in Dutch Parliament. In that discussion, Parliament passed a motion for continued research and Jan Pronk, the Minister of the Environment 1998-2002, also speaking for the Minister of Economic Affairs, promised continued funding for model improvements and for eSNI estimates for other countries. However, this subsidy has not materialized yet, now writing 2008, causing a serious delay in research for almost six years, including the impact that results would have had in those years. Hueting in April 2008:

“In Autumn 2007, I attended the EU conference “Beyond GDP” in Brussels and encountered the official at the Ministry of the Environment who deals with eSNI. He said to me: “Well, Roefie, you can see that you missed the international connection.” My reply was: “Only because the subsidy that has been promised to Parliament for urgent improvements in the model and for calculations for more countries never has been paid out so that eSNI was killed four years ago.” He replied: “No, not at all, that money had been included in the research fund for the Environmental Assessment Agency (MNP).” I replied: “But you advised negatively for the request for subsidy by SMOM for the eSNI.” That request was by the CE project team for eSNI. The official: “In my judgement the MNP had already received money for that.” I asked the management of the MNP whether their allocation had included this condition on eSNI. The answer was “No”.”

This situation thus caused that two Ministers have not kept their promise to Parliament. This is only the latest event in a longer story that started around 2002 when that extended research on eSNI was discontinued.

8. Concluding remarks

The figure for national income (NI) is conditional on the assumption that market prices reflect the preferences, so that “more” means “better”. During the last 40 years there is a theoretical crisis in economic theory because this assumption no longer holds since we know that preferences for sustainability cannot be expressed in the market when there are no adequate regulations in place. Governments all over the world have expressed an interest in sustainability. Mainstream economist then advise and support the growth of NI with the argument that this allows the finance of expenditures for the environment. In this way NI remains a target for economic policy. Pursuing this target however increases the destruction of the environment and the physical base for survival of large sections of mankind, and thus exactly achieves the opposite. The situation is like a patient who grows ill from some medicine and the doctors advising to take more of the medicine to cure this. What mainstream economists are not aware of is that NI has become entirely fictitious, and they neglect that there is a distinction between technological productivity growth using less resources and “productivity growth” that relies on continued destruction of the environment.

In these 40 years of research, dr. Roefie Hueting has contributed not only to the development of environmental statistics and the related concepts now in use in the UN Handbook of National Accounting: Integrated Environmental and Economic Accounting 2003, referred to as SEEA 2003,

but he also provided a firm base of the environment in economic theory, by relating it to the notion of scarcity and linking up to the notions of Pigou, Robbins, and a string of economists working on social welfare and national income accounting. Outstanding in this contribution is that he makes economists aware of the conditionality of NI while he also provides for the concept of eSNI conditional on the assumption of preferences for sustainability. Social welfare theory and national income accounting thus are shifted from a single tangent to the realm of decision making under risk.

It would be improper to reduce Hueting's research only to the topic of eSNI, the issue under consideration here. Nevertheless, on this topic Hueting encountered (i) support and encouragement, (ii) criticism with reasoned argumentation, (iii) a frequent criticism that science would be mixed with ethics and politics, which criticism changes the subject from science to politics, (iv) opposition and obstruction without argumentation or with mock arguments.

The first kind of response can impress us: the cum laude thesis, the support by Tinbergen, Pen and Hennipman, the support to a great extent by the directorate of CBS Statistics Netherlands, the interest and subsidies by Dutch Ministers and Parliament, and the international acclaim such as the UN Global 500 Award, the Hueting Congress, the seminars at international institutes such as the World Bank, OECD, WSSD, and the results already included in the UN SEEA.

We must observe however that by time of this writing eSNI has not been adopted by the community of researchers working on economic statistics and national accounts. The cause must lie with the other three responses.

With respect to the second kind of response this paper observed a surprising number of misunderstandings. Let us hope that these can be resolved in some near future. Answers normally can be found in Hueting's work so that resolution of most questions only requires digestion of that work, and not new research. New research would rather be on new topics, given that the concept of eSNI has been accepted.

The third kind of response has played an important role. The argument that eSNI would be ethics or politics is unwarranted. Key researchers, both at CBS Statistics Netherlands and at institutes like the World Bank, apparently do not understand or accept the conditional assumption or "what if" approach to risk in national income accounting. These scientists could have a scientific role just like Hueting has a scientific position but they hand the decision to calculate eSNI back to the political decision maker. Parliaments are advised to sooth these qualms by indeed taking the decision that eSNI is to be calculated and included in SNA alongside standard NI. Yet it must be emphasized at the same time that national statistical offices are scientifically free to decide themselves to calculate eSNI alongside NI. Even, there is the scientific obligation to explain what the current figure of NI stands for. The current reference to a "universal model" (see Bos (2007)) is quite inadequate, leaving us to wonder "a model of what?". It is not correct to present NI without adequate instruction what it means and while knowing that the user is likely to misinterpret it.

The fourth kind of response is important too since it means that there was not a level playing field. Over the course of many years, eSNI has frequently been rejected not for content but for petty causes. Key events were: (1) the six year delay in 1974-1980 in the English publication of "New Scarcity and Economic Growth", (2) the delay around 1996 by officials manipulating two Ministers and subsequently Parliament, that has also contributed to moving eSNI out of CBS Statistics Netherlands, (3) the disappearance in the community of "ecological economists", where Hueting's work is not mentioned or included, (4) the disappearance in 2002-2008 of research funds promised by two Ministers to Parliament. These observations are not pleasant to make but have to be made. This kind of response explains the slowness and friction.

This review has identified various steps of advance and adversity, some small some large. **Table 2** gives an overview of the larger events.

Table 2: Major steps of advance and adversity

<i>Advance</i>	<i>Adversity</i>
1974 Cum Laude thesis with Jan Pen	1974-1980 delay English publication
1965-1994 Support by Jan Tinbergen	1996 eSNI moved out of CBS
1994 UN Global 500 Award	No participation in the London Group
1999 Hueting Congress and book	1997 <i>Nature</i> article by Costanza et al.
Seminars at WB, OECD, WSSD	No citations in <i>Ecological Economics</i>
Calculation for 1990, 1995 and 2000	2002-2008 disappearance of research subsidy

It is debateable what a review like this can establish. However, it is worth a try. The planet confronts a huge environmental challenge, with world population rising from 6 towards 9 billion in a few decades to come, and 15 years can mean a difference of 1 billion. Both national income & production growth and their sustainable varieties provide important indicators / factors for economic welfare and guide us in the allocation of resources. If an indicator like eSNI does not make it to the official publications, is not used in policy discussion, is not printed in daily newspapers to inform the general public during national elections, then the general presumption is that this indicator is not necessary. The presumption is that we live in an information society, the world is a village, our scientists and economists are well-trained and have sharp critical minds. “Surely,” people think, “if an indicator would be required, we would already use it.” Somewhere that presumption however fails and **Table 2** paints the mixed picture of how that was possible. The true cause in the background might have been human fallibility or a general belief in economic growth. Yet the events in the table mark the opportunities, both taken and missed, and it is important to see that key opportunities actually have been missed.

Jared Diamond (2005), in “Collapse: How Societies Choose to Fail or Succeed”, contemplates world environmental sustainability, and considers how societies in the past have faced similar choices. One of his main suggestions is that the Dutch “polder model” might help the world to avoid a new collapse. Interestingly, the above has discussed events in Holland, and found that this “polder model” has only limited success in dealing with scientific information. A property of the “polder model” seems to be that it often comes into action only after some big disaster. Notably, Dutch climatologists Katsman et al. (2007) refer to the common estimate of a rise of the sea level by about 1 meter by 2100, and suggest “given the uncertainties” not to worry about rises above 1.5 meter. Yet, it are precisely those uncertainties, e.g. a surprise meltdown of Greenland, that turn the matter into decision making under risk and that would warrant precautionary measures. It is amazing that precisely Dutchmen are so mild to risks on the sea level. It is this blindness towards risk, and measures expressing that risk, that play such a key role in the issue of eSNI.

In the flux of advance and adversity the last force currently is stronger and eSNI is in the limelights. In December 2009, dr. Hueting hopes to turn 80. He is undoubtedly the only person alive with a thorough knowledge of the trident of welfare theory and national income accounting and the environment. While he is with us, young researchers would benefit a lot from his experience. We can only hope that the leading economists of our days find time to reflect on the economic theory that he has been crafting so diligently.

Literature

Note: Colignatus is the name of Thomas Cool in science. Some archives may not recognize that name.

The list of publications by Hueting is available at <http://www.sni-hueting.info>.

- Braat, L. and P. ten Brink (eds), (2008), 'The Cost of Policy Inaction. The case of not meeting the 2010 biodiversity target', Alterra, Wageningen / Brussels, study for the European Commission, DG Environment, <http://ec.europa.eu/environment/nature/biodiversity/economics/pdf/copi.zip>
- Bos, F. (2007), 'Use, misuse and proper use of national accounts statistics', National accounts occasional paper Nr. NA-096, CBS Statistics Netherlands Voorburg, <http://mpa.ub.uni-muenchen.de/2576>
- CBS (1972d), 'Waterverontreiniging met afbreekbaar organisch en eutrofiërend materiaal', CBS Statistics Netherlands, SDU The Hague ('Water pollution with decomposable and eutrofying materials').
- Colignatus, Th. (2000), 'The choice on sustainability: information or the meta-SWF approach to a shift of preferences', <http://econpapers.repec.org/paper/wpawuwpot/0004004.htm>.
- Colignatus, Th. (2001), 'Roefie Hueting and Sustainable National Income', translation of ESB, August 24, p652-653, available at www.sni-hueting.info
- Costanza, R. (2003). 'The early history of ecological economics and the international society for ecological economics (ISEE)', ISEE, Internet Encyclopaedia of Ecological Economics
- Costanza, R., D. I. Stern, B. P. Fisher, L. He and C. Ma (2004), 'Influential Publications in Ecological Economics: A Citation Analysis', *Rensselaer Working Papers in Economics* No 0408
- Costanza, R., R. d'Arge, R. de Groot, S. Farber, Monica Grasso, B. Hannon, K. Limburg, S. Naeem, R.V. O'Neill, J. Paruelo, R.G. Raskin, P. Sutton and M. van den Belt (1997), 'The value of the world's ecosystem services and natural capital', *Nature* 387, May 15, p253 – 260
- CPB (1972), 'Economische gevolgen van de bestrijding van waterverontreiniging met afbreekbaar organisch materiaal', Monograph 16, The Hague ('Economic consequences of the abatement of water pollution with decomposable organic materials')
- Diamond, J. (2005), 'Collapse: How Societies Choose to Fail or Succeed', Viking.
- Goodland, R. (2001), 'An appreciation of Dr Roefie Hueting's ecological work', in Van Ierland et al. (2001) p315-332
- Gore, A. and D. Guggenheim (2006), *An inconvenient truth*, Paramount
- Haan, M. de, S.J. Keuning (1996), 'Taking the environment into account: the NAMEA approach', *Review of Income and Wealth* 42 (2) , 131–148
- Hecht, J.E. (2007), 'National Environmental Accounting: A Practical Introduction', *International Review of Environmental and Resource Economics*, 1: 03–66
- Hemingway, E. (2004), *The Old Man and the Sea*, Arrow books
- Hicks (1983), *Collected essays on economic theory, volume III; Classics and moderns*, Blackwell
- Hofkes, M. W., R. Gerlagh and V. Linderhof (2004), 'Sustainable National Income: A Trend Analysis for the Netherlands for 1990-2000', Institute for Environmental Studies, Report R-04/02, June 28, Available at SSRN: <http://ssrn.com/abstract=1009284>
- Hueting, R. (1969), *Functions of Nature: Should Nature be Quantified?*, London, World Wildlife Fund.
- Hueting, R. (1974, 1980), *New Scarcity and Economic Growth: More Welfare Through Less Production?*, Dutch edition: Agon Elsevier, Amsterdam; English edition: North-Holland Publishing Company, Amsterdam, New York, Oxford, 1980.
- Hueting, R. (1981a), 'Comments on the report "A Low Energy Strategy for the United Kingdom", compiled by G. Leach et al. for The International Institute for the Environment and Development (IIED)', Working Party on Integral Energy Scenarios, The Hague, 20 May.
- Hueting, R. (1981b), De relatie tussen produktiegroei en energieverbruik, maakt groeifanatisme blind? *ESB*, nr. 3310, p. 609-611.
- Hueting, R. (1986b), 'A Note on the Construction of an Environmental Indicator in Monetary Terms as a Supplement to National Income with the Aid of Basic Environmental Statistics', Report to Prof. Dr. E. Salim, Minister of Population and Environment, Indonesia. Jakarta, March.
- Hueting, R. (1989), 'Correcting National Income for Environmental Losses: Towards a Practical Solution', in (Y. Ahmad, S. El Serafy, E. Lutz (eds.)), *Environmental Accounting for Sustainable Development*, The World Bank, Washington, D.C., 100 p.

- Hueting, R. (2001a), 'The Parable of the Carpenter', (with Bart de Boer), *International Journal of Environment and Pollution*, 15(1), pp. 42-50.
- Hueting, R. (2001b), 'Rejoinders to symposium authors: Ekins, Daly, Norgaard et al., Beckerman, El Serafy, Pearce et al., Faucheux and O'Connor, Verbruggen et al., Goodland and Mäler', pp 333-378 in (E.C. van Ierland, J. van der Straaten and H.R.J. Vollebergh (eds)), *Economic growth and valuation of the environment, A debate*, Edward Elgar, Cheltenham, UK – Northampton, MA, USA.
- Hueting, R. (2003), 'Ter overpeinzing op het wijde water. Voor Henk van Tuinen bij zijn afscheid van het CBS, van een vriend', ('To think about while sailing the seas. For Henk van Tuinen at his departure, from a friend') April, <http://www.sni-hueting.info/NL/index.html>
- Hueting, R. (2006), 'Het DNI & politieke belemmeringen', ('eSNI and political impediments') (http://www.managementissues.com/duurzame_ontwikkeling/duurzame_ontwikkeling/het_dni_&_politieke_belemmeringen._20060605373.html)
- Hueting, R. (2008), 'Why environmental sustainability can most probably not be attained with growing production', Conference on "Economic de-growth for ecological sustainability and social equity", Paris, 18-19 April 2008.
- Hueting, R. and B. de Boer (2001c), 'Environmental valuation and sustainable national income according to Hueting', p17-77 in (E.C. van Ierland, J. van der Straaten and H.R.J. Vollebergh (eds)), *Economic growth and valuation of the environment, A debate*, Edward Elgar, Cheltenham, UK – Northampton, MA, USA.
- Hueting, R. and L. Reijnders (2004), 'Broad Sustainability contra Sustainability: The proper Construction of Sustainability Indicators', *Ecological Economics* 50, 249-260.
- Hueting, R., L. Reijnders, B. de Boer, J. Lambooy and H. Jansen (1998), 'The Concept of Environmental Function and its Valuation', *Ecological Economics* 25(1): 31-35.
- Hueting, R., P. Bosch and B. de Boer (1992), 'Methodology for the Calculation of Sustainable National Income', *Statistical Essays*, M44, CBS Statistics Netherlands, SDU/Publishers, 's-Gravenhage 64 p. Also published as WWF International report, Gland, Switzerland, June 1992.
- Ierland, E. C. van, J. van der Straaten and H.R.J. Vollebergh (2001), *Economic Growth and the Valuation of the Environment, A Debate*, Edward Elgar
- Kapp, K.W. (1950), *The social costs of private enterprise*, Cambridge (Mass.)
- Katsman, C., e.a. (2007), 'Zee rijst, maar niet de pan uit', NRC-Handelsblad 19 januari ('Sea rises, but not over the dikes')
- Keuning, S.J. (1992), 'National accounts and the environment: The case for a system's approach', CBS Statistics Netherlands, Occasional Paper Nr. NA-053
- Keuning, S.J. (1995, 1996), *Accounting for economic development and social change*, IOS Press, Amsterdam
- Keuning, S.J. (1996), 'De fictie van een Groen Nationaal Inkomen', *S&D* p479-483
- Meadows, D.H. (1972), *The limits to growth*, New York
- Mishan, E.J. (1967, 1993), *The Costs of Economic Growth*, Greenwood Press
- MNP, Milieu- en natuur planbureau (2006), 'Milieubalans 2006', <http://www.mnp.nl/bibliotheek/rapporten/500081001.pdf>
- Passenier, J. (1994), *Van planning naar scanning. Een halve eeuw Planbureau in Nederland*, Wolters-Noordhoff
- Pearce, D. (1998), 'Auditing the Earth: The Value of the World's Ecosystem Services and Natural Capital,' *Environment*, vol. 40, no. 2 (March)
- Pearce, D., K. Hamilton and G. Atkinson (2001), 'Valuing nature', in Van Ierland et al. (2001), p211-224
- Robles, M. (1997), 'Oplaaierende ruzies over Groen Nationaal Inkomen', *Intermediair*, 13 maart, 33e jaargang nummer 11, p55 and 57
- Röpke, I. (2004), 'The early history of modern ecological economics', *Ecological Economics* 50, p293–314
- Serafy, S. el (1998), 'Pricing the invaluable: the value of the world's ecosystem services and natural capital', *Ecological Economics*, vol. 25, issue 1, pages 25-27
- Smith, R. (2006), 'Development of the SEEA 2003 and its implementation', *Ecological Economics*, Volume 61, Issue 4, 15 March 2007, Pages 592-599
- Stauvermann P.J. (2006), 'Why and How Should We Account For the Environment?', *Rensselaer Working Papers in Economics*, <http://econpapers.repec.org/paper/rpirpiwpe/0606.htm>
- Stern, N. (2006), *The economics of climate change: Stern Review on the Economics of Climate Change*, Cambridge
- The Economist (1998), 'An Invaluable Environment', April 16

- Tinbergen, J. and R. Hueting (1991), 'GNP and Market Prices: Wrong Signals for Sustainable Economic Success that Mask Environmental Destruction', (with Jan Tinbergen). In (R. Goodland, H. Daly, S. El Serafy and B. von Droste zu Hulshoff (eds)), *Environmentally Sustainable Economic Development: Building on Brundtland*, Ch 4: 51-57, United Nations Educational, Scientific and Cultural Organization, Paris, 1991. Also published in (R. Goodland et al. (eds)), *Population, Technology and Lifestyle: The Transition to Sustainability*, Ch. 4: 52-62. Island Press, © The International Bank for Reconstruction and Development and UNESCO, Washington, D.C., 1992. Also published in (R. Goodland et al. (eds)), *Environmentally Sustainable Economic Development: Building on Brundtland*, Environment Working Paper 46, The World Bank, Washington, D.C.
- Tuinen, H. van (2008), 'Innovative Statistics to Improve our Notion of Reality', paper for the OECD Global Project - Measuring the Progress of Societies, Conference, June 27-30 2007, Istanbul, Turkey, <http://www.sni-hueting.info/EN/Others/2007-06-VanTuinen-38780056.pdf>
- Turner, T. (2005), 'The Blueprint Legacy – a review of Professor David Pearce's contribution to environmental economics and policy', CSERGE Working Paper PA 05-01, http://www.uea.ac.uk/env/cserge/pub/wp/pa/pa_2005_01.pdf
- UN, EU, IMF and OECD (2003), 'Handbook on Integrated Environmental and Economic Accounting (SEEA 2003)', Unstat, ST/ESA/STAT/SER.F/61 REV.1 (Final Draft)
- Verbruggen, H., R.B. Dellink, R. Gerlach, M.W. Hofkes and H.M.A. Jansen (2001), 'Alternative calculations of a sustainable national income for the Netherlands according to Hueting', in Van Ierland (2001) p275-312
- World Bank (2000), 'Beyond economic growth', Chapter IX. Growth of the Service Sector, <http://www.worldbank.org/depweb/beyond/global/chapter9.html>
- World Commission on Environment and Development (WCED) (a.k.a. Brundtland Commission) (1987), *Our common future*, Oxford University Press