To: the Commission on the Measurement of Economic Performance and Social Progress

Subject: draft summary of the report on indicators dated June 2, 2009

From: [T.S. , address, email], The Netherlands
With assistance from Ir. Bart de Boer [address, email]

Date: 5 July 2009

Dear members of the Commission,

Thank you for giving me the opportunity to comment on the above mentioned report as an interested citizen. After having read your report with great interest my first reaction is surprise that the forty years of pioneering work of Dr. Roefie Hueting on the environmentally sustainable national income (eSNI) is not mentioned.

In the mid sixties he started publishing articles about the relationship between growth and the environment. In 1969, on recommendation of Tinbergen, Hueting founded the department of environmental statistics at Statistics Netherlands. In 1974 Hueting obtained a Ph.D. in economics (cum laude) on the study 'New scarcity and economic growth: more welfare through less production?'. Between 1965 and 2009 he published over 150 articles, half of which in English. Between 1983 and 1989 Hueting was a writing member of the UNEP-World Bank Working Group on Environmental Accounting. In 1999 an international symposium was held in the Academy of Sciences in Amsterdam dedicated to his work. The articles of the participants (Daly, Pearce, Beckerman and others) have been bundled in the *Festschrift* 'Economic growth and valuation of the environment: a debate' [1]. The first copy was offered by Minister of Environment Jan Pronk to the president of the World Bank at a symposium dedicated to the eSNI in Washington D.C. Dr. Joseph Stiglitz was one of the discussants with positive comments on the eSNI [2].

Below I give a short summary of the eSNI theory quoting from articles on eSNI, because it offers solutions to a number of objections raised in your report against the discussed indicators. I am aware that some of the points mentioned are also in your report. However, this is done for the sake of consistency and clarity.

Hueting [3] posits the following. All economic activity is aimed at the satisfaction of wants, in other words at welfare, defined as the satisfaction of wants derived from our dealings with scarce means. Welfare is, besides on production, dependent on quite a few other factors. Consequently the term 'economic growth' can mean nothing other than increase in welfare, defined as the satisfaction of wants derived from our dealings with scarce goods. Welfare is not a quantity that can be measured directly 'from outside'; it is a category of individual experience. For this reason the statistician focuses in practice on charting trends in factors that *can* be measured and that can plausibly be argued to influence welfare. Some important welfare-influencing factors are: the package of goods and services produced; scarce environmental functions; time, i.e. leisure time; the distribution of scarce goods, i.e. income distribution; the conditions under which scarce goods are acquired, i.e. labour conditions; employment *casu quo* unemployment.

These factors often conflict with one another. For scarce goods it holds by definition, however, that more of one is less of another, for a good is scarce when something else has to be sacrificed in order to obtain it (sacrificed alternative, opportunity cost). Nowadays environmental functions (see below) have become scarce goods. All other things remaining equal (including the technological state of the art), more production therefore means less environment and vice versa. When (1) in a small or broad margin, preference is given to the environment over production, so when people are willing to sacrifice part of the production to obtain a safer environment, and (2) a government imposes controls on production processes and consumption habits that lead to a smaller volume of goods and services produced, then there will be an

increase in the overall satisfaction of wants obtained by means of scarce goods. *A decrease in production will then lead to greater welfare.*

In the theoretical basis for the calculation of sustainable national income, the environment is defined as the non-human-made physical surroundings, or elements thereof, on which humanity entirely depends, whether producing, consuming, breathing or recreating.

In our physical surroundings, a great number of possible uses can be distinguished, which are essential for production, consumption, breathing, et cetera, thus for human existence. These are called environmental functions, or in short: functions; see Hueting [3, 4, 5]. As long as the use of a function does not hamper the use of an other or the same function (by overuse), so as long as environmental functions are not scarce, an insufficiency of labour (that is: hands and brains, intellect or technology that increases traditional productivity) is the sole factor limiting production growth, as measured in standard NI. As soon as one use is at the expense of another, though, or threatens to be so in the future, a second limiting factor is introduced. The emergence of competition between functions marks a juncture at which functions start to fall short of meeting existing wants. Competing functions are by definition scarce and consequently economic goods. Indeed they are the most fundamental economic goods at the disposal of humanity. In the situation of severe competition between functions, which prevails today, labour not only reduces scarcity, thus causing a positive effect on our satisfaction of wants (welfare); but it also increases scarcity, thus causing a negative effect on welfare. The same holds for consumption. In the SEEA manual of the UN Statistical Office is written: “Much of the initiative to look at an alternative path for the economy rather than a different measure of the economy came from the work of Hueting in the late 1960’s and the 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 (…) [6].

The availability of functions, or, in terms of the System of National Accounts (SNA), their volume, decreases from ‘infinite’ (abundant with respect to existing wants) to finite, that is falling short with respect to existing wants. As a result, the shadow price of environmental functions rises, and with it their value, defined as price times quantity, from zero to an ever-higher positive value. *This rise in value reflects a rise in costs*. To determine the extent of the loss of function, in order to estimate the environmentally sustainable national income (eSNI) (see below), we must know the value of the function. Since environmental functions are collective goods that are not traded on the market, supply and demand curves have to be constructed. Because, according to standard economic theory, determination of value is impossible without data on *both* preferences (demand) *and* opportunity costs (supply).

The estimated costs of measures necessary to restore functions, that rise progressively per unit of function restored, can be seen as a supply curve. We call this the cost-effectiveness curve or the elimination cost curve, because it refers to measures that eliminate the pressure on the environment. Except in the case of irreparable damage, this curve can always be constructed. The most severe environmental problems such as climate change and biodiversity occur at a global scale. In those instances first the global burden is established, then the contribution of a country to the global burden is determined and finally the costs of eliminating this contribution are estimated.

Preferences for environmental functions (demand), on the contrary, can only partially be determined, since these can be expressed only partially via the market, while willingness to pay techniques cannot yield reliable data precisely for vital functions; see Hueting [8]. Therefore, it is not possible to construct a complete demand curve. Expenditure on compensation for loss of function and restoration of physical damage resulting from loss of function, however, constitute revealed preferences for the availability of functions, so that some impression of these preferences can be obtained. One example is the additional measures for the production of drinking water as a result of the loss of the function ‘drinking water’ because of pollution (overuse of the function ‘water as dumping ground for waste’). Another example is the restoration of damage caused by flooding due to excessively cutting forests etc. (overuse of the function ‘provider of wood’ etc.) that consequently are losing their function ‘regulation of the water flow’.

Because individual preferences can be measured only partially, shadow prices for environmental functions, which are determined by the intersection of the first derivatives of the constructed curves for demand and supply (see Figure 1 page 5), cannot be determined. Consequently, these shadow prices – and the value of environmental functions – remain unknown.

This means that the *correct prices for the human-made goods* that are produced and consumed at the expense of environmental functions remain *equally unknowable*.

However, to provide the necessary information, *assumptions* can be made about the relative preferences for environmental functions and produced goods. *One* of the possible assumptions is that the economic agents, individuals and institutions, have a dominant preference for an environmentally sustainable development. This assumption is legitimate since governments and institutions all over the world have stated support for environmental sustainability, the national income connected to this path is the eSNI. *Another* possible assumption is that the economy is currently on an optimal path that is described by the changes in the standard NI. So *both the eSNI and the standard NI are fictitious* in the context of what is at issue in economic theory and statistics, namely to provide indicators of the effect of our actions on our welfare.

When assuming dominant preferences for sustainability, the unknown demand curves must be replaced by physical standards for sustainable use of the physical environment. The standards are scientifically determined and in this sense objective. They must, of course, be distinguished clearly from the subjective preferences for whether or not they should be attained. Examples are: the man-made rate of extinction of species should not exceed the rate at which new species come into being, for safeguarding the many functions of ecosystems; the emission of greenhouse gases has to be reduced by 70 to 80 % in order to let life support systems restore the climate; the rate of erosion of topsoil may not exceed the rate of formation of such soil due to weathering, for safeguarding the function: 'soil for raising crops'.

From an economic perspective, sustainability standards approximate demand curves that are vertical in the relevant area of a diagram that has the availability of functions measured in physical units on the *x*-axis and the demand for functions and their opportunity costs (the factor costs involved in attaining a certain degree of their availability) on the *y*-axis. The shadow prices for environmental functions – and their value - based upon the assumed preferences for sustainability then follows from the intersection of the vertical line and the marginal cost-effectiveness curve. In this manner the distance to sustainability, denoted in physical units on the *x*-axis, is translated into monetary units. See Figure 1 page 5, which shows the relationship between economy and ecology. Of course, bridging the gap requires a transition period.

For a correct approximation of the eSNI (see below), such calculations have been done with the aid of a general equilibrium model, which also generates the shadow prices for produced goods in a sustainable economy. From this, the level of sustainable national income follows. The model is used to trace the consequences of (1) the reactions to the change in price ratios (environment burdening activities become relatively more expensive, whereas environmentally benign activities become relatively cheaper) and (2) direct shifts to environmentally less burdening activities.

Environmental sustainability is defined as the situation in which vital environmental functions are safeguarded for future generations. So the issue at stake is that the *possibilities* to use them remain available. Environmental sustainability can only be attained with drastic changes in the price ratios between environment burdening and environmental benign products in all countries of the world [9]. So the eSNI evidently does not work with current market prices.

Environmentally sustainable national income (eSNI) is defined as the maximal attainable production level by which vital environmental functions remain available for future generations, based on the technology available at the time; see Hueting and De Boer [9]. The OECD has accepted this definition [10].The difference between NI and eSNI indicates the volume of production that is produced and consumed unsustainably. Thus the eSNI provides information about the distance between the current and a sustainable situation. In combination with standard national income, time series of the NI and the eSNI indicate whether we are approaching environmental sustainability or drifting farther away from it. Because of the precautionary principle, future technological progress is not anticipated in the calculation of eSNI. When constructing a time series of eSNIs, technological progress is measured after the event on the basis of the development of the distance between the eSNI and standard NI over the course of time. If the distance has decreased it can be estimated which part of the decrease has been caused by progress in environmental technology and which part by direct change to environmentally benign production and consumption (e.g. more biking).

A first rough estimate of the eSNI for the world in 1991 by Tinbergen and Hueting [11] arrives at about fifty percent of the production level of the world: the world income. The Institute of Environmental Studies estimate for The Netherlands in 2001 also arrived at about fifty percent of

the production level or national income of The Netherlands [12]. Estimates for the years 1990, 1995 and 2000 show that in the period 1990 - 2000 the distance between NI and eSNI increased by 10% or 13 billion euros [13].

According to standard economic theory, producing is adding value. National income (NI) equals the sum of the values added. So NI measures - the fluctuations in the level of -production. It does so according to its definition and according to the intention of the founders of its concept to get an indicator for one of the factors influencing welfare - and a tool for quite a few other purposes. See Tinbergen and Hueting [11]. (Nobelist Jan Tinbergen was one of the founders of the concept of NI and its quantification).

This value is added to the non-human-made physical surroundings. Consequently, environmental functions remain outside the measurement of standard NI. This is logical and easy to understand, because water, air, soil, plant and animal species and the life support systems of our planet are not produced by humans. So losses of functions, caused by production and consumption, are correctly *not* entered as costs. However, expenditures on measures for their restoration and compensation *are* entered as value added. This is asymmetric. These expenditures should be entered as intermediate, as they are costs. By entering these expenditures as final instead of intermediate, the growth of production is overestimated, thus obscuring what is happening with both environment and production.

I think the above text shows that the eSNI offers the following remedies for some objections to indicators discussed in your report.

1) The problem of leaving out the international nature of sustainability (paragraph 166, the fourth full paragraph on my page 2 and the fifth full paragraph on page 3).
2) The problems with respect to the stocks of the non-human made physical surroundings (if you wish natural capital) as well as the problems with respect to weak and strong sustainability are solved by using the concept of environmental functions. Then the only thing that matters is that the possible uses of our physical surroundings remain intact for future generations. This can be accomplished by technical measures, direct shifts to environmentally benign activities, developing alternatives for non-renewables (see the method developed by Tinbergen, Hueting and Bosch [9]) and population policy.
3) The eSNI is an environmental sustainability indicator which is directly and completely comparable with the National Income, that is an indicator for the level of production, because it uses the procedures of the system of national accounts (SNA). This solves the problem of confusion of having two GDP indicators (your paragraph 180). They should be used together to observe the development of the distance between the current production level GDP and an environmentally sustainable production level eSNI.
4) The ANS is based on current market prices (your paragraph 164), while the eSNI uses prices including the cost for attaining sustainability standards.

I do hope that the information given above convinces you that the eSNI theory should be included in your report.

With kind regards,

[T.S.]

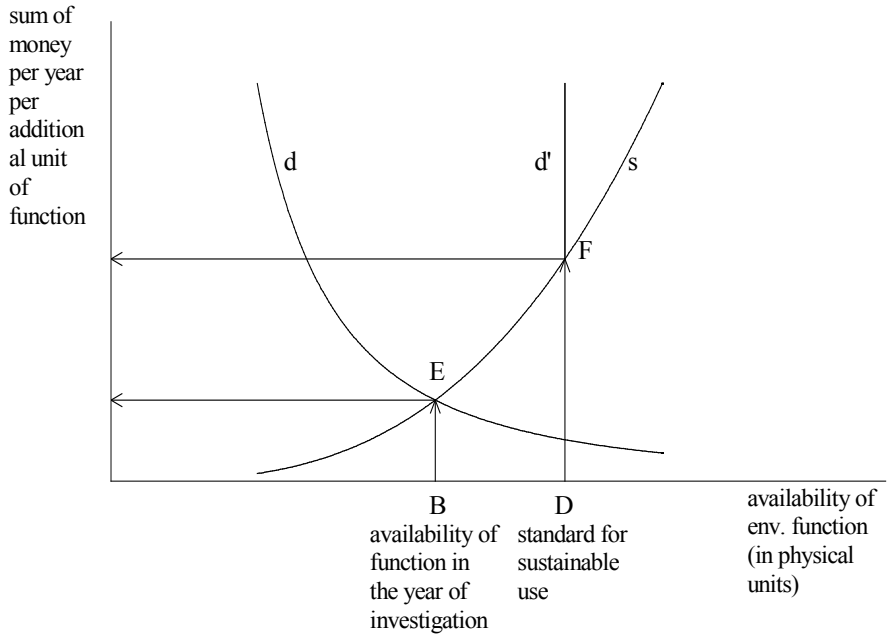

Figure 1, *Translation of costs in physical units into costs in monetary units: s=supply curve or marginal elimination cost curve; d=incomplete demand curve or marginal benefit curve based on individual preferences revealed from expenditures on compensation of functions, and so on; d' = 'demand curve' based on assumed preferences for sustainability; BD = distance that must be bridged in order to arrive at sustainable use of environmental functions; area BEFD=total costs of the loss functions, expressed in money; the arrows indicate the way in which the loss of environmental functions recorded in physical units is translated into monetary units. The availability of the function (B) does not need to coincide with the level following from intersection point (E).*

[1] E.C. van Ierland, J. van der Straaten and H.R.J. Vollebergh (eds)), *Economic growth and valuation of the environment, A debate*, 2001, Edward Elgar, Cheltenham, UK – Northhampton, MA, USA.

[2] Foundation for research of sustainable national income, 2001, Report on the World Bank seminar on economic growth and valuation of the environment, A debate on sustainable national income, Delft.

[3] Hueting R. New Scarcity and Economic Growth: More Welfare through Less Production? Amsterdam: North Holland Publishing Company, 1980. Original Dutch edition published by Agon Elsevier, Amsterdam, 1974.

[4] Hueting R. Functions of Nature: Should Nature Be Quantified? London, World Wildlife Fund, 1969.

[5] Hueting R. The Economic Functions of the Environment. In: Ekins P, Max Neef M, editors. Real Life Economics: Understanding Wealth Creation. London, Routledge, pp. 61–69,1992.

[6] Integrated Environmental and Economic Accounting 2003 (SEEA 2003)

[7] Easterlin RA. Does Economic Growth improve the Human Lot? Mim. paper, University of Pennsylvania, 1972.

[8] Hueting R. The Economic Functions of the Environment. In: Ekins P, Max Neef M, editors. Real Life Economics: Understanding Wealth Creation. London, Routledge, pp. 61–69,1992.

[9] Hueting R, De Boer B. Environmental Valuation and Sustainable National Income According to Hueting. In: Van Ierland E. C. *et al.*, editors. Economic Growth and Valuation of the Environment: A Debate, pp. 17–77. Edward Elgar, London, 2001.

[10] http://stats.oecd.org/glossary/detail.asp?ID=6587

[11] Tinbergen J, Hueting R. GNP and Market Prices: Wrong Signals for Sustainable Economic Success that Mask Environmental Destruction. In: Goodland R, Daly H, El Serafy S, Von Droste B, editors. Environmentally Sustainable Economic Development: Building on Brundtland. United Nations Educational, Scientific and Cultural Organization, Paris, 1991. Also published in: Goodland R *et al.*, editors. Population, Technology and Lifestyle, The Transition to Sustainability. Island Press, The International Bank for Reconstruction and Development and UNESCO, Washington, D.C., 1992. Also published in: Goodland R *et al.*, editors. Environmentally Sustainable Economic Development: Building on Brundtland. Environment Working Paper No 46, The World Bank, Washington, D.C., 1991.

[12] Verbruggen H., Dellink RB, Gerlach R, Hofkes MW, Jansen HMA. Alternative Calculations of a Sustainable National Income for the Netherlands According to Hueting. In: Van Ierland EC *et al.*, editors. Economic Growth and Valuation of the Environment: A Debate. Pp. 275–312, London, Edward Elgar, 2001.

[13] Milieu- en Natuurplanbureau. Milieubalans 2006, p. 21, 2006.