

Report on the World Bank
Seminar on Economic
Growth and Valuation of the
Environment
A Debate on Sustainable National Income

Held at the Embassy of the Netherlands
1 October, 2001, Washington, D.C.

Foundation for research on



Third edition
2007

ISBN 978-90-812122-1-2

First and second edition published by
Foundation of Associations of Dutch Economists
(Stichting Landelijke Samenwerking Economisten, LSE)

Third edition published by
Foundation for Research on Sustainable National Income
c/o CE Delft
Oude Delft 180
2611 HH Delft
The Netherlands

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Design by Bazuin-webdesign, Delft – info@bazuin-webdesign.nl

Invitation

You are cordially invited to participate in the World Bank seminar:

“Economic Growth and Valuation of the Environment”

Chaired by H.E. Minister Jan Pronk

at

The Royal Netherlands Embassy
4200 Linnean Avenue NW
Washington DC 20008

on

Monday, the First of October 2001
14 – 17 hrs
Reception to follow

Dr. Joseph Stiglitz will lead a panel to discuss the book dedicated to the work of Dr. Roefie Hueting

Prof.dr. Ekko van Ierland will outline the new book “Economic Growth and Valuation of the Environment: a Debate”. Dr. Hueting will present the scientific basis for calculating “sustainable national income”. Ir. Bart de Boer will discuss the economic model used, and the quantified results for the Netherlands. The book includes the views of leading environmental economists, such as David Pearce, Wilfred Beckerman and Herman Daly, on the subject. The concept of sustainable national income is essential to thinking about national welfare. It could have a major impact on the political discussion about environment, economy and sustainable development. These issues are relevant in the run-up to the 2002 Earth Summit. Because of the risk of demonstrations the seminar will be held in the Dutch Embassy. Minister Pronk will hand the first copy of the book to Mr. Wolfensohn, President of the World Bank Group. There will be ample opportunity to participate in the discussions.

Report on the World Bank Seminar on Economic Growth and Valuation of the Environment A Debate on Sustainable National Income

Held at the Embassy of the Netherlands
1 October, 2001, Washington, D.C.

Programme

- Opening speech by Jan Pronk, Minister of Environment for the Netherlands.
- Presentation by Dr. Ekko van Ierland, Professor of Environmental Economics, Wageningen University
- Presentation by Dr. Roefie Hueting, retired from Statistics Netherlands.
- Presentation by Ir. Bart de Boer, Statistics Netherlands.
- Comments by the Discussants Dr. Joseph Stiglitz, Professor of Economics at Columbia University and former chief economist at the World Bank and Dr. Ian Johnson, Vice President of the World Bank.
- Discussion with members of the audience, presided by Minister Pronk.

Report on the World Bank Seminar on Economic Growth and Valuation of the Environment¹

Opening Speech

Jan Pronk, Minister of Environment for the Netherlands opened the meeting at 2:15 p.m.

Minister Pronk: Roefie Hueting, who has been at the piano here on the stage, is well known in the Netherlands for his seminal work on environmental economics and sustainable national income, as well as for being the founder of the Downtown Jazz Band. The book that we are introducing today, *Economic Growth and Valuation of the Environment*, is a debate on the concept of sustainable national income. Dr. Hueting and I have been colleagues since the 1960s. I began as a lecturer on national income accounting, while Dr. Hueting was in the Central Bureau of Statistics with an interest in greening the accounts. Our careers have evolved in tandem, Dr. Hueting's in economics and accounting, and my own in politics.

The World Bank, to whom we are presenting the book today, has organized today's seminar. Both their interest in organizing this seminar and their willing-

¹ This report was prepared by Dr. Joy E. Hecht, consultant on environment and information systems in Arlington, Virginia.

ness to receive the book signify their commitment to sustainable national income. While this meeting is being held at the Netherlands Embassy, it is a World Bank event. We owe thanks to Robert Goodland for the Bank's support of the book itself and of this seminar. A copy of the book will be handed to President Wolfensohn tomorrow. Unfortunately he has been unable to join us today. I am pleased to introduce in his place Dr. Ian Johnson, Vice President of the World Bank, who is involved with mainstreaming concerns about environment and sustainability at the World Bank. The book is being presented to the Bank because as an institution it is making an intellectual contribution both within this field and in the larger context of development and globalization.

Minister Pronk presented a copy of the book to Dr. Johnson.

Dr. Johnson: Minister Pronk has been a key figure in bringing together concerns about environment and development. I hope that Minister Pronk will accomplish as much at Rio+10 as at the recent climate change meetings, which he chaired. The major issue for Rio+10 is how to make the debate real. This is a question of measurement and of the use of valuation. The new book sets out the debate well.

Presentation by Dr. Ekko van Ierland

Your excellency, ambassador, ladies and gentlemen, our environment, our climate and the world's biodiversity continue to be at risk as a result of unbalanced economic growth and rapidly expanding economic activity, world wide. The book 'Economic growth and valuation of the environment' deals exactly with these issues, in particular with the question of how to measure income, how to value the environment and how to calculate sustainable national income.

The content of the book, which is centred around the work of Roefie Hueting, is important because we need a thorough understanding of what economic growth is and how it affects the environment. That understanding is a prerequisite for formulating policies to reduce poverty and to protect the environment. The analysis in the book clearly defines the implications of the vague and often confusing concept of sustainability, by explicitly defining sustainability standards. The book focusses on three topics:

1. The shortcomings of the present system of national accounts, which can be considered a misleading compass for environmental and macro-economic policies.
2. The characteristics of the concept of sustainable national income as defined by Hueting, in particular on the divergence between standard national income and sustainable national income as calculated by Hueting and his co researchers.
3. The question of how transition towards the path of sustainable growth is to be made!

The standard system of national accounts is well-defined and serves many purposes as clearly explained in the chapter by Salah el Serafy. However, it shows very serious shortcomings in dealing with the environment: it neglects externalities; it does not reflect the overexploration of common property resources and it fails to register the overexploitation of the environment. If we think in terms of man-made

capital, human capital and ecological capital (as sketched by Paul Ekins in chapter 3 of the book) it becomes clear that the traditional system of national accounts measures what we are producing, but it fails to consider what we are sacrificing in order to produce these goods and services. In this respect the term 'steering by the wrong compass' as introduced by Roefie Hueting is relevant.

Hueting states: "These losses are not entered in the system of national accounts, nor in the majority of cost-benefit analysis. Over and against the unentered costs stand the revenues (more produced goods) which are entered". Although economists like Pigou, Mishan, Hennenpman and Tinbergen paid attention to these problems, we are still struggling with solving the most important questions. Because preferences for environmental goods can be measured only very partially from market behaviour, Hueting concludes that assumptions on preferences have to be made, as a practical solution for an unsolvable problem. Thus sustainable national income is based on the assumption of strong preferences for sustainability and standard national income on the assumption of weak preferences for sustainability.

For measuring these costs Hueting specifies sustainability standards indicating sustainable levels of emissions and resource use. Next he uses a general equilibrium model to calculate the maximum level of national income that can be reached, while meeting these sustainable standards.

The book contains a full debate on whether this approach is theoretically justified and useful, and also what its limitations are. The well known British environmental economist David Pearce and his co-authors compare the method with measurement of environmental values for example by means of the contingent valuation approach.

I consider both approaches (which are clearly different in their principles) both useful to provide information on how we value environmental attributes. One measure may be in inches, the other in centimetres; they measure different aspects but as long as it is made explicit how the yardstick is defined we obtain clear information. Herman Daly clearly pinpoints the shortcomings of the present system of national accounts "Consequently, what we currently call national income is decidedly unsustainable, necessitating the awkward pleonasm 'sustainable national income' for the connected figure, in order to convey the original meaning of income".

Daly then in a very rich and well elaborated chapter, discusses the problem of identifying sustainability standards and claims, as contrasted with Huetting, that these standards can be considered as 'objective values', based on sustainability of natural processes.

No need to say that the debate on the objectivity of these values is far from completed, and so is the debate on what economic or ecological targets (in greek: telos) should be.

Dick Norgaard (the president of the Ecological Economics Association) and his co-authors challenge in this context the utilisation approach in economics, for instance on the basis of the dilemma of the aggregation of individual values and the fact that values are socially constructed in education and social interaction. They claim that economists have systematically overlooked the limitations of methodological individualism and utilitarianism. It is time to reconsider the actual processes in which people express and act out their values and to develop a policy framework that allows for multiple, co-evolving values, referring to the co-evolution of our society and the ecological processes.

My personal opinion is that it is essential for our understanding of what our economic position is to have information on the level of sustainable national income, despite some of the unresolved methodological issues in its calculations.

By calculating sustainable national income we at least get clearly presented that there is a tremendous gap between standard national income, and the level of income that could be sustained without overexploiting the natural environment. More importantly it identifies some key areas for environmental policy, like climate change, acidification and toxic compounds.

The results of the sustainable national income calculations

The calculations are made by a research group of the Vrije Universiteit in Amsterdam, led by professor Harmen Verbruggen, in close co operation with Huetting and Bart de Boer from Statistics Netherlands. They calculated SNI on the basis of sustainability standards in a CGE model. The model comprises basically three options to meet these standards:

1. by means of end of pipe technologies (like catalytic converters);

2. by substitution: use more clean products in stead of polluting ones;
3. and by changing our life styles and reducing economic activity in certain sectors.

In the calculations these restrictions are introduced by means of tradable permits: the stricter the sustainability standard for each aspect of environmental policy, the higher will be the shadow price of the environment and the stronger are the incentives to reduce pollution, both for producers and consumers: Externalities are now internalized!

The calculations provide very interesting results of which I would like to highlight two:

1. SNI for the Netherlands is about 50 % of traditional national income, which is indeed a tremendous distance;
2. More promising, the calculations show that a long trajectory of the path towards sustainability can be made at relatively low costs: up to 70 to 80 % of the road to sustainability can be reached at cost of about 10 % of standard national income.

But, please be aware, these results apply to a highly industrialized, densely populated country with a production structure that includes highly intensive agriculture, energy-intensive petro-chemical industries and high traffic density. In addition to these interesting results, the application of the method proposed by Huetting clearly revealed the need for further improvement and extension of the analysis, in particular to include the pressure on the use of land and space and the related impact on biodiversity. Another aspect is the availability of new technologies in the future, including sustainable energy and better options for reuse and recycling.

The implications for future research and policy

Now we have confirmed some serious shortcomings of national income accounting and as we know that we are on an unsustainable path of economic growth the question arises how to make the transition towards sustainable economic growth.

It is evident that in decision making we need to use a correct compass. We need in all decisions an analysis of what is sacrificed and destroyed, and we should compensate for these losses where possible.

- In CB analysis we should continue to include externalities and impacts on the public good characteristics of the environment.
- We should use resources efficiently, where for instance the same tasks and services can be performed with only 25 % of energy used before.
- Develop clean and sustainable technologies and anticipate on their introduction, and make these widely available.
- Eliminate persistent toxic chemical compounds and dispersion of heavy metals into the environment, for example the use of mercury in gold mining.
- Reduce emissions of greenhouse gases and other transboundary pollutants.

In particular for climate change and losses of biodiversity we need to focus on avoiding irreversible changes and reducing the risk of catastrophic events (even if it is considered a risk with small probability; because the effects can be extremely large and unprecedented in history).

In order to solve the global environmental problems we need strong public institutions, strong governments, based on democratic principles to express society's preferences for environmental quality. To make correct decisions we need insight in sustainable national income and the relevant factors that determine its level.

Conclusion

I do not hesitate to conclude that the publications of Roefie Hueting, and the debate with the colleagues – sometimes 'opponents', but they are essential in the debate – have contributed to understanding environmental and ecological economics. His work is well documented and found its way to new generations of economists and politicians and to international institutions that may contribute to protecting the environment.

Finally, I would like to thank all who contributed to the completion of the book and the organisation of today's seminar, Robert Goodland in particular.

The book is the result of our common concern to fight poverty and to reduce the risk of ecological disaster. It now is a challenge for the international institutions including the World Bank and UNEP to gain national and international support for sustainable policies on climate change, protection of biodiversity and elimination of harmful and toxic compounds.

Presentation by Dr. Hueting

I must confess that I am just a salesman, selling environmental information and jazz music. I wish to draw your attention to the fact that the book may be purchased here with a large discount, and I encourage members of the audience to do so. Copies of my speech are available on the seats. I apologize for it being dull, but I feel this is an efficient way to present the information. To leave room for discussion later on, my introduction will be brief. This brevity will certainly provoke questions, but I hope these will be addressed in the second part of the seminar.

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 is entirely dependent in all its doings, whether these be producing, consuming, breathing or recreating. It is true that our observable surroundings are largely human-built. However, houses, roads and farm crops are the result of two complementary factors: labour, that is technology, and elements of the physical surroundings as here intended. Producing is defined, in accordance with standard economic theory, as the adding of value. This value is added to the physical elements of our environment.

In our physical surroundings, a great number of possible uses can be distinguished, which are indispensable for production, consumption, breathing, etcetera, and thus for human existence. These are called environmental functions, or in short: functions. As long as the use of a function does not hamper the use of other functions, an insufficiency of labour, that is intellect or technology, is the sole factor limiting sustained production growth. 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 economic goods. In this situation, in which we are now living, labour is not only reducing scarcity, and thus causing a positive effect on

our satisfaction of wants, that is our welfare, but is also increasing scarcity, thus causing a negative effect on welfare. Mutatis mutandis the same holds for consumption.

The availability of functions, or, in terms of the System of National Accounts (SNA), their volume, decreases from 'infinite', that is abundant with respect to existing wants, to finite, that is falling short. 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, 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. Without data on both preferences as well as on opportunity costs, determination of value is impossible.

The estimated costs of measures 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. Preferences for environmental functions, on the contrary, can only partially be determined, since these can be expressed only partially via the market. Therefore, it is not possible to construct a complete demand curve. Expenditure on compensation of 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. Examples are the additional measures for the production of drinking water as a result of the loss of the function 'drinking water' because of pollution, or the restoration of damage caused by flooding due to forests losing their 'hydrological regulation' function.

I mention briefly some causes through which the expression of preferences for environmental functions via the market and budget mechanism is blocked.

1. The impossibility to measure the preferences for safeguarding vital environmental functions for future generations by using expenditures on compensatory measures and restoration of damage.
2. The workings of the prisoners' dilemma.
3. The lack of correct information such as on the relationships between environment and employment and between environment and growth.

4. The confusion about money and commodities: producing and consuming without environmental destruction namely is much cheaper than with it, although often, but not always, economic sacrifice is involved, and although a shift to environmentally benign behaviour always has a negative effect on the volume of national income; thus bicycling is cheaper than driving a car and raising two children is cheaper than raising ten.
5. The complexity of the life support systems of our planet and the problem of conceptualising the effects of its disturbance and of conceiving the technological possibilities and impossibilities to cope with those disturbances.

The blocked preferences for vital environmental functions cannot be established by contingent valuation techniques since these techniques do not provide reliable data precisely for vital functions.

According to key authors like Tinbergen, Kuznets and Hicks, who pioneered and developed the practical implementation of the concept of national income (NI), changes in the level of NI are explicitly intended as one of the indicators for the development of welfare, so for economic success. This is the way such changes in the level are understood by the public, the media and governments. Which is logical. For, all economic action is aimed at the satisfaction of wants, so at the increase of welfare, so at economic success. In the nineteen-thirties, however, the environment did not play a role in economic thought. That is different today. Safeguarding the vital functions of our physical surroundings, the basis of our existence, has become the most important economic issue confronting mankind. Therefore, publication of 'green' NI's, that is NI's corrected for environmental losses, alongside the standard NI's, is indispensable information for society and policy-making. This was the firm conviction of Tinbergen, that is documented in his papers, while it is implied in the work of Kuznets and Hicks.

From the above it follows that the shadow prices for environmental functions, which are indispensable for this correction and which are determined by the intersection of the first derivatives of the constructed curves for demand and supply, cannot be determined, because individual preferences can be measured only partially. Consequently, these shadow prices 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 on the relative preferences for environmental functions and produced goods. This means that

there are as many shadow prices for environmental functions and produced goods as reasonable assumptions can be made - and consequently as many green NIs. Each of these assumptions is associated with the optimal path of the economy that belongs to it. That is the path on which, by way of assumption, the annually available package of goods, human-made goods and environmental functions, perfectly reflects the preferences. 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 this. 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 SNI 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 absolute preferences for sustainability, the unknown demand curves must be replaced by physical standards for sustainable use of the 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. 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 on the y-axis. The shadow price for environmental functions 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. This is the well-known figure from my study "New Scarcity and Economic Growth" from 1974. See Figure 1. For a correct approximation, 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. Bart de Boer would like to tell you more about that. Ekko van Ierland would like to do so, too, during the discussion.

Figure 1. Basic principles

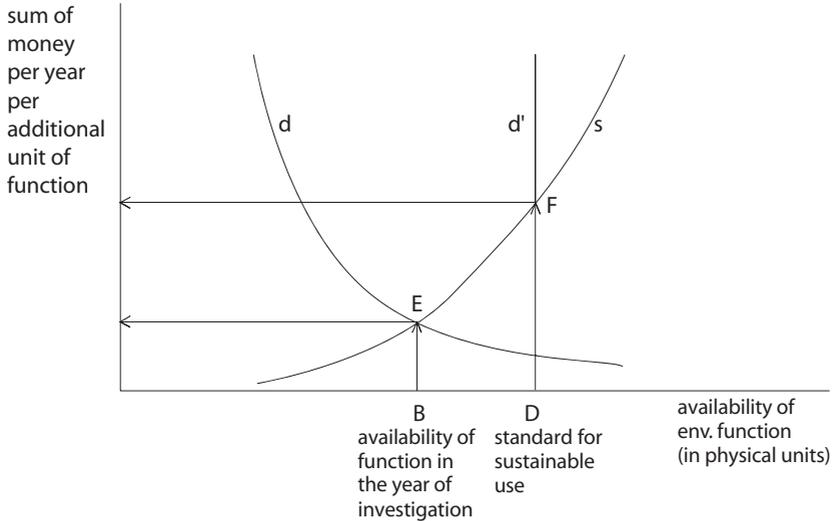


Figure 1. Translation of costs in physical units into costs in monetary units: s =supply curve or marginal elimination cost curve; d =incomplete demand curve or marginal benefit curve based on individual preferences (revealed from expenditures on compensation of functions, and so on); d' ='demand curve' 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 via 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)

The book to be presented today deals with the relationship between environment and growth of production, just like “New Scarcity”. In conclusion, I would like to make two remarks about this relationship which are based on empirics.

1. From research on the basic source material of the Dutch national accounts, it appears that roughly one third of the activities making up national income

(measured as labour volume) does not contribute to its growth, one third contributes a little, while one third contributes by far the largest part to the growth of production. Unfortunately, this latter part consists of activities that cause the greatest damage to the environment, by use of space, pollution and depletion of resources, in production and consumption.

2. Any price rise in real terms means a decline in the volume of national income and therefore a check on production growth. For a given technology, product costs will rise progressively as the yield (or: effect) of environmental measures is increased. Technological progress leads to higher yields, of course. As production increases further, however, so too must the yield of the measures in order to maintain the same state of the environment, while the fact of progressively rising costs with rising yield remains unaltered. There is thus a 'race' between environmental technology and production growth, the outcome of which cannot be predicted.

Presentation by Ir. de Boer

The subject of this presentation is the way in which the sustainable national income (SNI) is actually computed; it also shows the main results. The explanation cannot do without a brief overview of how the calculation should be done in theory, however.

Integral environmental-economic model

In theory we need a reliable model of the relevant production, consumption and environmental processes. The model takes care of the interactions, the resulting volume and price changes and consequently maximises national income under sustainability properly. The interactions in production and consumption are taken care of by production functions and welfare functions, at least one function per activity and each function with multiple inputs. The uses of the environment, or the possibilities to do so, appear in both the production and the welfare functions. The model simulates the changes of stock and flow variables in the economy and the environment in their mutual dependence. In other words, the model is dynamic. It has time dependent solutions, which form paths of the development of the state of production and environment. We discuss those paths by means of two important aggregate output variables, plotted on the same vertical axis. One of them is the volume of national income as a measure of production and consumption, the other one is a welfare measure.

The model can produce different paths by providing it with different inputs. (See Figure 2.) A crucial input is the structure of the preferences of the people for the environment and the possibilities to use it on the one hand and for produced goods on the other. This welfare function can – for a large part – only be assumed, as mr. Hueting already stated. If it is assumed that the people prefer the actual state of production and consumption in the economy, its use of the environment and the development of both, and if the parameters in the model are estimated (calibrated) well, the model reproduces and extrapolates the present development

Figure 2. Output of the integral model

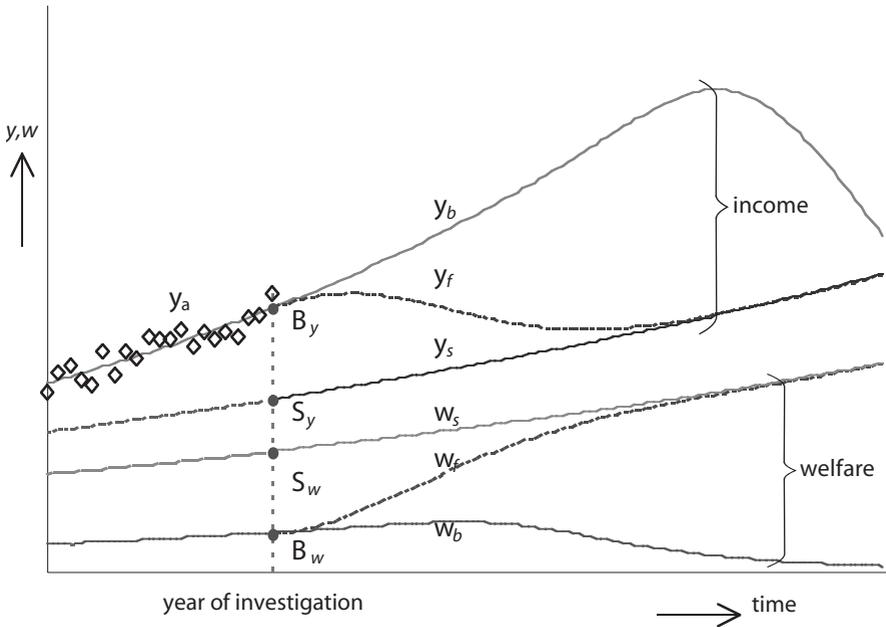


Figure 2. Actual standard national income observations (y_a , fictitious example) compared with the net national income (y) and a welfare indicator (w) on three optimal paths, calculated with a dynamic environmental economic model. The business-as-usual path (index b) approximates the actual path (index a) by assuming incomplete expression of preferences for the environment. These preferences are assumed to be completely expressed on the unfeasible sustainable path (index s) and the feasible transition path (index f). The points B_y and B_w indicate the levels of national income y and the welfare measure w on the business-as-usual path b in the year of investigation; S_y and S_w are the corresponding points on the unfeasible sustainable path s

of national income (see Figure 2, path b). Far extrapolation might even indicate a collapse of welfare and income because of depletion of vital environmental functions. Assumed stronger preferences for the environment produce a model path

with lower income, but higher welfare, and a probably delayed collapse. If dominant preferences for sustainable use of the environment are assumed, a sustainable development path will be calculated. Its characteristic is that environmental functions do not decline in future due to their use for production and consumption, because this use is limited. Two kinds of sustainable paths exist. It may depart from the present state of production, consumption and the environment; then the model produces a transition path on which environmental functions are maintained. (See Figure 2, path f.) Income will drop first when gradually more and more measures are taken to reach the sustainable equilibrium, with sustainable use of the environment. A sustainable transition path may be realistic, i.e. feasible.

A sustainable path may also start from an already sustainable state. If this initial state (in the year of calculation) is chosen such that no transition occurs, the initial point lies on the 'permanently sustainable path', called the sustainable path here. (See Figure 2, path s). As such it is a 'balanced growth' path. The path is infeasible in that it cannot be reached directly, but only by a transition path as just mentioned. Again the availability of environmental functions will not decrease on this path, but now national income does not decrease either. It may increase, but in theory, "as far as the model reaches into the future", this national income never decreases (technically, the collapse is shifted to infinity). Moreover, because national income is still maximised under the presumed preferences, this sustainable development path produces the sustainable national income.

One could ask how it is possible that we assume strong preferences for sustainability, while it is obvious that the world goes along on a non-sustainable development path. It is also obvious, however, that individual people generally do not have the power to prevent damage by large scale deterioration of the environmental and that, while they have the power to change their conduct in a sustainable way, they have objections to being the first ones to take such steps, despite their strong preferences for the result, because it would cause them disproportional costs (prisoner's dilemma). Because of the existence of these and other 'blockages' (or 'barriers'), it suffices to assume one set of preferences to explain both the actual development where the blockages are effective and the assumedly preferred more environmentally benign path where the blockages are overcome. This construction has the additional advantage that the comparison of national income on both paths is less problematic than with two different welfare functions. The distance between the sustainable path (s in Figure 2) and the actual development

path (b) in terms of national income is the distance to sustainability we have to bridge as a country in terms of the required opportunity costs. If we recalculate the expected future SNI trajectory in each year or each couple of years with the same model on the basis of new information on production, consumption and environmental protection technology, the starting point of the trajectory provides the SNI of that year in the statistical sense. The SNI's at these starting points in the consecutive years of calculation form the time series of SNI we are looking for. (See Figure 3.)

Figure 3. Dynamic calculation of time series

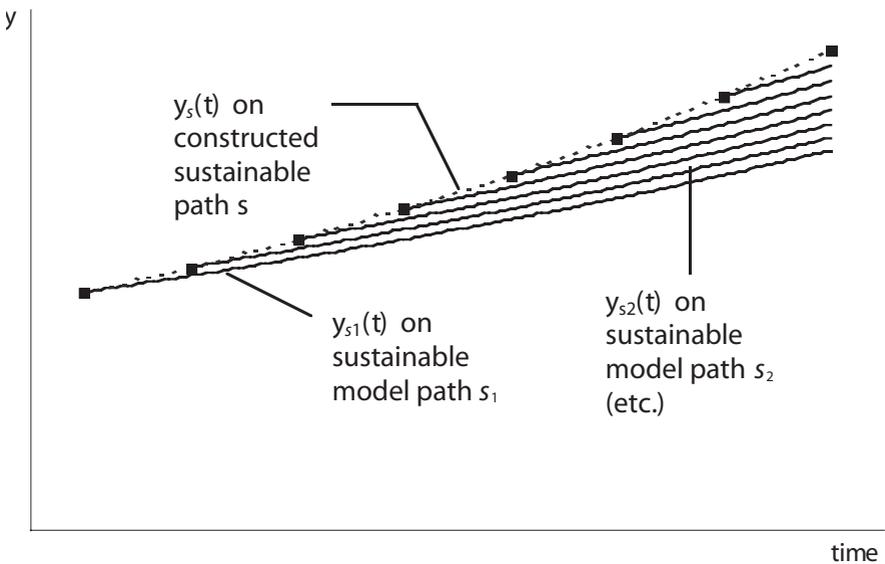


Figure 3. Construction of the unfeasible sustainable path s and the corresponding sustainable national income y_s . In the calculation of the sustainable national income according to Hueting, technological progress is ex ante assumed zero on each model path. Consequently national income on these paths $y_{s_1}(t)$, $y_{s_2}(t)$ and so on are constant and their graphs are horizontal lines. National income on the ex post constructed sustainable path s , however, may still rise due to technological progress

Practical model approach

Generally, a sufficiently accurate integral economic-environmental model is so large and complex that a sustainable solution cannot be found. Therefore, we have decided to approximate the sustainable path by using a set of models that co-operate in a sequential fashion, without the mutual feedback that would make the model collection generally valid. The case of sustainable development, however, offers a possibility to make this simplification without making a large error. Remember that the necessary condition for sustainability is that environmental functions are maintained forever, at the lowest levels of availability that enables the environment to continue supporting these levels. Less technically said, we seek the maximum levels of use of the environment that may be sustained forever, in other words, levels above which the very possibilities to continue with this use would disappear in the future. Three conditions are set up that are assumed to hold if the environment is used sustainably. These conditions must be satisfied both in the present and in the future.

The first condition is that the extinction of biological species at the global level may not be accelerated by human influence. The second condition is that any changes in the state of the environment may have only a minor, acceptable impact on human health. The third condition is that vital environmental functions must be present all over the world, that is, not equally spread but within reach for human use. These three conditions impose bounds on the acceptable variation in the state of the environment, however imprecise. Think of maximum allowable pollutant concentrations, minimal ozone column, maximum global warming etcetera. We call these bounds sustainability standards for the state of the environment. These bounds to the state of the environment are used as inputs in models of the environmental problems concerned, such as the use of natural resources and space, climate change, acidification, eutrophication, dispersion of harmful substances and desiccation. Iteration with such a model yields limits to the use of the environment by production and consumption mentioned before. We call these limits sustainability standards for the use of the environment, and they are actually approximations of the use of the environment on the sustainable path we cannot compute directly. The standards represent both the assumed preferences for sustainable use of the environment (the vertical demand line in Figure 1) and the knowledge we have of the 'behaviour' of the environment under (or close to) that sustainability, however approximate this knowledge may be.

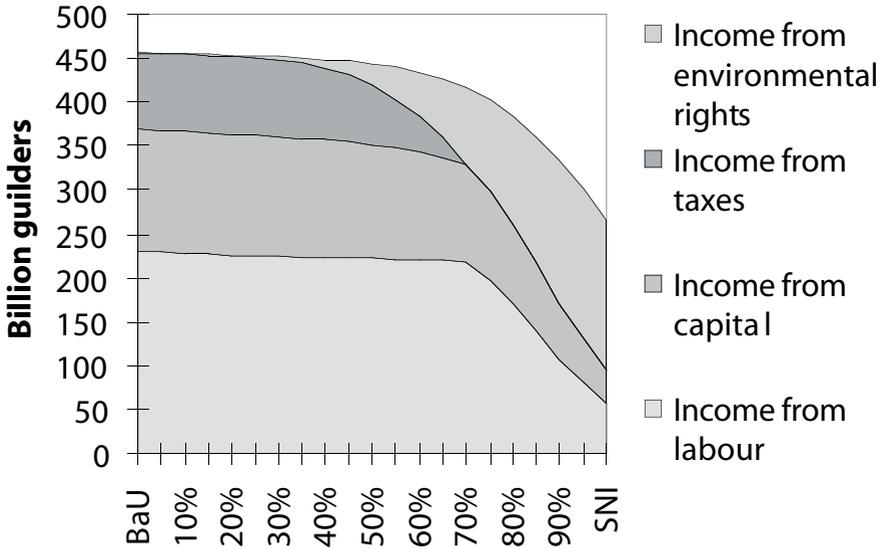
These standards are consecutively used as inputs to a dedicated general equilibrium model of the country's economy. This means that the dynamics of production and consumption, caused by changes in capital stocks and so on, are neglected. Again, this assumption is acceptable by virtue of the intended comparison between the actual development path and the permanent sustainable development path. The model calculates the sustainable equilibrium in the year involved with the maximum attainable national income, which is the practically approximated sustainable national income.

The SNI in combination with standard NI indicates the distance to sustainability as it develops in time, or in other words, as an indicator of how far we live beyond our means, or how fast we proceed in correcting it. Growth, by the way, is not unthinkable during this future development.

Results

The outcomes can be characterised in a graph showing the decrease of income as the emission standards are approached step by step (Figure 4). In the relatively flat segment, the technical emission reduction measures eliminate about 75% of the total non-sustainable use of the environment against about 10% of national income. The rest of the required emission reduction is achieved at major costs; all in all national income drops with 47% in this variant, and the correctly calculated SNI is even 56% lower than the standard national income in 1990. The almost linear rightmost part indicates that direct shifts between production activities dominate here. The graph also gives some insight in the major components of national income and how they change towards sustainability.

Figure 4. Results per production factor



In the contribution by Harmen Verbruggen, e.a., “Alternative calculation of a sustainable national income for the Netherlands according to Hueting”, chapter 11 of the book presented here today, more information is to be found, including the results per economic sector. The most extensive information can be found in “Final report on calculations of a sustainable national income according to Hueting’s methodology”, Institute for Environmental Studies, Vrije Universiteit, Amsterdam, 2000.

Comments by the Discussants

Dr. Stiglitz: I think this kind of work is very important. In my remarks, I will explain why this is so important, but why at the same time it is very difficult to implement. First, let me make a few prefatory remarks. Two underlying premises of this work are taken as a given today; first, that we must focus on long-term sustainable growth and second, that we must take intergenerational equity concerns seriously.

Why are accounting frameworks like that being presented here so important? This is not measurement for its own sake; such frameworks have an enormous impact on how we think about policy decisions. There is a view that, if we can't measure something, it doesn't exist. While that is not true, nevertheless things that are not measured often don't get the weight they deserve when policy decisions are made.

This issue is therefore part of the economics and politics of information. Accounting frameworks are one way to bring information to bear on decision-making. Policy-makers at the national and international levels must have accounting frameworks to help guide their thinking. The fact that these frameworks are imperfect, while true, does not mean we should not develop them.

Let me give some examples of where our standard accounting frameworks fall short. To begin, GDP is not a measure of welfare; it is a measure of economic activity. Recent events illustrate the difference clearly. While some people think war will raise the level of economic activity, it clearly does not increase welfare. When people do not recognize this, they say defense expenditures are good for the economy. They are not - they are a waste of resources, except to the extent that they allow us to enjoy safety and security.

Many developing country economies depend heavily on the exploitation of natural resources. The use of those resources increases the GDP. However this is

frequently no more than the conversion of assets from one form to another; the economy may not be growing in any sustainable way. This makes it important to distinguish development based on natural resources from other forms of development, such as that based on human capital.

A third point relates to innovations, such as energy conservation. A technological innovation that leads to a reduction in demand for and therefore to a reduction of production of oil, might reduce GDP, whereas in fact the standard of living might have gone up (depending on price ratios and consumption pattern). Thus a decision-maker focusing on GDP will not focus on innovations in conservation, because they might reduce rather than increase the target variable.

My fourth example relates to a set of policy decisions frequently made by macro policy decision-makers. Suppose there is a global crisis and we raise interest rates. We are interested in the implications of raising those interest rates. Such increases may lead to less food production, causing riots and the destruction of social capital, which will in turn reduce growth in the future. Higher interest rates may also lead to increased forest harvests, while the capital tied up in the forests may better be diverted to other assets whose value grows faster. Health problems will also erode human capital. None of these impacts is captured when we focus on a single variable like GDP; a broader system of accounting is needed in order to capture them.

How would we go about developing better accounting schemes that are more congruent with measures of welfare? Let me first make two preliminary observations. First, it is important to recognize that accounting frameworks are a language we use to communicate with each other. They are imperfect. However, they can still convey important information, especially in comparisons across countries. It is, therefore, important to develop new frameworks that include the environment even if they are imperfect. This is a feature of modern science; we must recognize that there is uncertainty in everything we do. We must be aware of the varying degrees of imperfection in all our measures, but those imperfections do not constitute an argument against building and using them. All accounting systems have a lot of arbitrariness; we must live with that.

Let me give you a different example that illustrates these points. This is from the area of corporate or GAP accounting (generally accepted practices). Many people think corporate accounts follow hard and fast rules. However, one of the

recent trends in many countries is that executives are paid with stock options. This amounts to taking resources from other shareholders and giving them to the management of the firm. It is important for ordinary shareholders to know the value of outstanding stock options in order to know the value of their own stock. There has recently been some discussion of how to include these stock options in the GAP methods. Firms in Silicon Valley, which make great use of such options, were strongly opposed to including them, because it would have greatly hurt them if the value of outstanding stock options were known. The argument they gave for their opposition was that we don't know how to measure the value of stock options accurately. The shareholders responded that the firms could at least estimate a minimum value, but the firms didn't want any information to be made public at all.

We must consider three key issues regarding valuation:

- what items we should include in the accounting frameworks,
- how we should quantify them, and
- how we should value them.

What we should include: There is some consensus on including environmental and resource impacts in the accounts. Most of us also think we should, if possible, include impacts on social capital.

How to quantify them: Quantifying environmental impacts is not nearly as difficult as quantifying social impacts. There is still considerable controversy over how to measure even natural resource impacts, however. For example, consider resource depletion. The accounts include all impacts on reserves, netting depletion against new discoveries. This is inappropriate, since the discovery of new reserves does not actually mean new reserves have been created (because the reserves were present already).

How to value impacts: The economic answer to this is "the shadow price." However, how do we calculate shadow prices? Are they close to prices in current markets? If you think the economy is close to the optimal path, then shadow prices are close to market prices, and there is no problem. This concern arises in particular when we think about the role of time, i.e. valuation of future impacts. If we use market interest rates to discount future impacts, then impacts a century or more in the future have very little value today. In response to this, some suggest

that we should not discount at all, or we should use very low discount rates. The shadow prices we place on emissions in the future would then be high, and the net value of income much lower. The choice of shadow prices reflects an array of judgments, and will be the subject of much controversy.

Despite all of these debates, the basic goal of attempting to assess our sustainable national income is nevertheless essential.

My final question, which I will not answer but will leave for subsequent discussion, concerns the growing sense around the world that we will only be able to sustain a focus on environment if we are able to develop these accounting frameworks. How do we get both developed and less developed countries to use them? How about if the IMF, when it announces GDP numbers, also announced a set of parallel numbers showing “true GDP?”

Dr. Johnson: I would like to pick up on a number of issues in the presentations, particularly regarding the implementation of SNI. First, this book is part of a continuing intellectual journey, which needs to be a public policy journey as well as an intellectual one. In what ways will these results make a difference for the choices we make at the level of society?

The debate over measurement of sustainable development has two components. One concerns items that are not captured in the marketplace; externalities and non-marketed goods and services. The other problem is that we are all guilty of gross myopia, both political and economic. Politicians think on a two to four year horizon, whereas economists use ten- percent discount rates that give no importance even to impacts ten years hence, much less on future generations. In the case of climate change, this is particularly important, and the use of a zero discount rate may be appropriate. These two problems are the key elements of our battle for sustainability, and have become even more apparent as we have moved further towards free market economies. This movement does not allow for a new round of creative public policy.

My second general point relates to measurement - the idea that “we are what we measure.” At the sectoral level, information has become a powerhouse; for example, in my own country – England – emissions data have become very important in marketing automobiles. At the micro level, that kind of information may be a powerful incentive for using measurement and indicators, because of the

pressure they put on public policy. However we have been less successful at the macro level in putting that kind of pressure on public policy makers to use better information.

The next point is absolutely vital; that is the issue of natural capital. In most countries of the world, it is valued at zero. Were we private accountants, we would have long since been fired for not thinking about the depreciation of natural capital. When we see the convergence of the economic costs of such depletion with the financial costs, we will get wake-up calls. This is particularly clear in the water resource business. This is going to lead to discontinuous cost curves in many countries, as they are forced to suddenly jump to new technologies due to lack of supply. Historically, policy-makers have refused to think in terms of water pricing that reflects real scarcity, but with the increased role of the market, costs formerly thought of as hypothetical are beginning to affect economic growth in the short to medium term.

Strategies for measuring the depletion and repletion of human capital will be equally important. Sustainability is not just about the environment; it is about society as well. These issues will rise rapidly up the public policy agenda. While environmental issues are more easily measured, we should not give up on measuring social capital as well.

We must think about global sustainability as well. The world is becoming so interdependent that we must think about how we capture this in national data. How do we internalize global impacts of our activities in a national accounting system? We could use trade, but this is insufficient. This concern has some ways to go before it will be resolved.

A final concern is that of equity among countries. The inequality among countries must be addressed, although doing so will increase global consumption. This is one reason why it is particularly important to start measuring what is happening in developing countries. The North must take the lead here; if they don't do so, developing countries never will. Dr. Stiglitz suggested that the IMF do this. However, until such time as the South sees the North developing, publishing, and using such data, they will not begin doing so themselves. The work of the Netherlands is particularly interesting from this perspective. How do the results in the Netherlands play out with the public and with policy-makers? This will be particularly important for seeing how this will evolve in the future.

Let us not make the search of the perfect indicator become the enemy of the good. We can do a lot with what we have, and we must not get sidetracked in the intellectual journey.

Minister Pronk: I propose that we combine the panel and audience in order to save time, and resume after a short coffee break.

Discussion

Minister Pronk: We would like to focus on two issues; first, the methodology, and second the broader issues. Both discussants have referred to particular measurements. They have said that while there are problems with measurement, it is possible to overcome them. How are Hueting and de Boer overcoming these problems?

Dr. Hueting: It is impossible to measure the value of environmental functions, because you need both a supply and a demand curve. The former reflects opportunity cost of restoring and maintaining environmental functions which can be estimated. The latter reflects preferences for those functions. Those preferences can be obtained only partially through revealed preference techniques, e.g. compensation costs, expenditure on restoration. Therefore in most cases it is not possible to value environmental functions. We offer as a practical alternative to make assumptions about preferences and see what are the opportunity costs that match these preferences. One assumption is that people prefer sustainability; based on this we can estimate the opportunity cost of that particular preference set. Of course, if we knew that that was the “real” preference set, we would no longer have any need of policy-makers. It follows from this that both standard and sustainable national income are based on assumptions about preferences.

Minister Pronk: Let me confirm. You are saying that it is not possible to value environmental functions. Instead we make assumptions regarding preferences, and then use scientific analysis to derive scientifically derived standards, which are ceilings for the level of activity (e.g. emissions). Given that, my question to Dr. El Serafy is whether it is possible to make such calculations, leading to standards, for a country such as India or an African country? Could you measure SNI in a developing country?

Dr. Salah El Serafy: My friend Roefie is more interested in showing the gap between conventional and this “welfare-oriented” concept of income. I am an

imposter in this group because I am not an environmentalist. I am an economist concerned about the false numbers used by economists, and the fantastic models they build using them. Countries sell their natural assets and call that growth, but this is not growth. Professor Stiglitz did not touch upon the fact that conventional GDP is wrong because it does not capture that loss in natural assets. I am disappointed in his treatment of the subject when he was at the World Bank. I agree entirely with Roefie because his contribution is to tell us that we must not read welfare from these numbers.

Minister Pronk: Dr. Stiglitz, you are being attacked by an imposter.

Dr. Stiglitz: The whole point of my remark was to say that the sale of natural resources does not lead to a good measure of welfare.

Minister Pronk: Would like Dr. El Serafy to answer the question I posed to him, whether it is possible calculate SNI in the developing world?

Dr. El Serafy: Of course it is. We can't afford to have different systems for rich and poor countries; we must have one standard system. If it can be done for the Netherlands, it can be done anywhere.

Minister Pronk: Does the lack of data in developing countries make this less feasible?

Dr. El Serafy: Yes, but we haven't attempted to generate these data in countries like Mali.

Minister Pronk: Let me address a question to Dr. Herman Daly. Roefie considers himself a positivist, whereas Daly says in his chapter in the book that he thinks on normative lines. Could you explain this?

Dr. Daly: I very much support Roefie's methodology and think it correct. As he has emphasized, you must make an assumption about preferences. He assumes a preference for sustainability. This is not a revealed preference, it is assumed. In my contribution to the book, I wanted to add further support for the vertical demand curve that results from this assumption. I wanted to see factual or normative arguments for it. Roefie is more of a positivist, in that he prefers to simply think of it in these analytical terms, whereas I argue that if you want this

to be more than simply a set of interesting numbers, you must determine which assumptions about preferences are most normatively correct. This takes you out of the economic framework in which one person's preferences are as good as another; you need some meta-preference system to decide which are best.

Minister Pronk: Your question is which preferences are normatively most correct. I think, in my terminology, that this is all based on preference for strong sustainability. You (Bart de Boer) translated this into three boundary conditions presented in your talk - no further acceleration of extinctions, no impacts on health, and environmental functions available to people worldwide. Dr. Daly, do you consider these sufficient?

Dr. Daly: Those are normative. They reflect deeply held values that we must analyze. The idea behind sustainability is that we must extend our system of justice.

Minister Pronk: Yes, but are they sufficient to ensure sustainability?

Dr. Daly: I'm not really sure, but they are sufficient for the time being.

Minister Pronk: Could Bart and Roefie please explain why they chose these? Why were there no assumptions about the availability of natural resources?

Ir. de Boer: An assumption concerning natural resources should be added in, that was simply an omission. However the biodiversity constraint is more important. It was developed based on an intuition that this was closely linked to the functions of the environment on a global scale. The constraint related to health stems from a belief that the world will not be sustainable if we are all ill.

Minister Pronk: In this methodology the SNI is also to be based on assumptions about standards that impact international as well as domestic relations. Is that reasonable, to include an ecological footprint thinking in a sustainable national income analysis?

Dr. Stiglitz: First, a different point. Zero is not a sustainable level of extinctions, since they occur all the time. So assuming that what you meant was to minimize rather than eliminate extinctions, the question is at what resource cost we wish to do this.

Minister Pronk: The SNI does not say no extinction, it says no acceleration of extinctions.

Dr. Stiglitz: Okay. We must include global effects in any welfare SNI measure. With a globally integrated world, we must talk about impacts on the global atmosphere.

Minister Pronk: The results were for the Netherlands, SNI about 55% lower than conventional NI in 1990. Would the gap be equivalent for countries such as India or the US?

Dr. Johnson: We must begin by looking at the damage functions for depletion. The impact is probably much greater in a country like India than for this country. Then we must look at what price we are paying for that depletion - it is probably much higher in India. For this reason, their real savings rates would be much lower than what would be otherwise estimated. However, I'd like to turn this around, and focus on the "so what" debate. At what point does this analysis tell you that you may need to look at policy options? At what point do these measures introduce uncertainty about your policies? That's what we should be looking at in developing countries.

Minister Pronk: I would still like an intuitive answer to my question.

Dr. El Serafy: Here's a non-intuitive response. Developing countries derive their prosperity from resources that are being depleted, much more so than do wealthy countries. This would make the gap larger there than in the Netherlands.

Minister Pronk: In other words, the difference between SNI and conventional national income would be greater in the developing world?

Dr. El Serafy: Yes.

Dr. Hueting: If the future will be worse in the developing world than in the Netherlands, then their SNI would be less than 50% of conventional income. From my experience in the Sahel, we see the deserts advancing because of excess pressure on the resource base.

Minister Pronk: According to the SNI methodology, the intuitive answer is that the gap would be larger in a poor country than in a wealthier one. How about a richer country?

Dr. Stiglitz: Let me raise an aspect that I find troubling. One element in calculating sustainability relates to the rate of technical progress. If innovation is very fast and you can conserve resources and extend their lifespan, then the level of sustainable income is higher. If the US had a higher rate of technological progress, its SNI might be higher than for other countries.

Minister Pronk: Ian Johnson, you said that you are very much in favor of such efforts, at both sectoral and macro level. Could the Bank, on the basis of such an approach, make an effort to make these SNI calculations in countries where it is very active? Would this be helpful for country policy-making by the Bank?

Dr. Johnson: Yes. We have worked for a number of years, including the work of Salah El Serafy and Kirk Hamilton, making estimates of real savings, which focus on depletion of resources. This points out that if you are living off of your natural capital and not investing for the long term, you are living off your capital. This is very imperfect, of course. We are concerned not only about how you deplete your capital, but also about how you invest it, since if you are reinvesting in human capital, you may do more for future development in the long run than the harm you cause by depleting your natural resources. We must think more about the circumstances under which this makes a difference. To get that debate going, you must see developed countries taking the lead. Until there is global equity in the ability and willingness to measure, you will not make headway. If the north is not measured by the same standards as the developing world, we will not make progress.

Dr. Stiglitz: There is another reason why this is important - because many inferences about economic policy and the impacts of international capital flows are contingent on our assessment of what economic output is. If we only capture some capital investments but not others, our interpretations will be incorrect.

Minister Pronk: That means all measures must be comparable, and we must use the same methods in all countries. But how many different green national incomes are there? Is this method - the Huetting one - worth repeating in other countries? Is it possible? Is it too costly? Would it be useful for international policy functions, or would we prefer a less elaborate methodology?

Dr. Johnson: The search for the perfect indicator is rapidly becoming the enemy of the good. Instead, I would like to see agreements at Rio+10 that countries will measure welfare and income (or GDP) in a different way. Countries must agree that this is a public policy issue for which all of them must be held accountable across the board. There is enough information to be able to make plausible information available across all countries. The conventional accounts are imperfect in many other ways as well, but we move forward anyway; the same could happen here.

Minister Pronk: Why doesn't the Bank offer to make these SNI calculations for some other countries, and not only developing countries? Would that not be useful?

Dr. Stiglitz: Some standardization is worthwhile. However, regarding this methodology, we do not yet have a sense of how robust the results are. To what extent would different assumptions about technology or preferences lead to markedly different results? This method tries to be parsimonious with regard to preferences and technology. If there is support for this, then calculating it for other countries will be useful. As economists, we think more in terms of what the shadow prices are. A translation of this into assessment of how different methods would lead to different shadow prices would be useful.

Dr. Johnson: The United States is not one of our clients at the Bank. In terms of the precise approach, I am not sufficiently informed to make a judgment as to whether it would be useful. At the end of the day there are not huge differences of methodology among the different approaches - we all agree on the need to handle depletion of natural capital differently.

Dr. Daly: I'm interested in moving from concepts of measurement to their implications for policy decisions. If, for example, to measure sustainable GNP we hypothesize these environmental limits, the next step would be to institutionalize the limits, so we actually generate something that is sustainable. That would imply the implementation of these vertical demand curves. How might we do that? Through existing cap-and-trade systems for pollutant emissions? I was intrigued by the example of the impacts of interest rate increases.

Minister Pronk: Are there people here who think better policies could be defended if there were a better information base? For instance, would the SNI measurement make a difference?

John Fitzgerald (USAID): USAID has noted development of these measures with favor, because we expect to be able to use them to assess what we do and what the Bank does and proposes to do. We would like to see them applied to individual loans, to see whether “the micro meets the macro.”

Minister Pronk: As a policy maker, I understand that micro-level analysis and action are not sufficient. I wonder, however, whether I am greatly helped by such a macro national figure. I think sectoral figures would be more useful. Must it be either micro or macro, or is there something in between that is more useful for policy-makers?

Ir. de Boer: The calculation also gives insights into sectoral effects on production and environmental burden. These effects and the measures causing them can be integrated into national economic and environmental planning.

Dr. Stiglitz: I can offer one concrete example of how macro-level figures have influenced policy - the opposition in the US to taking action on global warming was based on estimates of the impacts on GDP.

Hans Verolme (British Embassy): One example is the proposal to elevate EPA to a cabinet level organization. Opposition to this has been fueled by the economic cost of regulation, and by an estimate that 90% of regulatory costs in the United States were caused by environmental regulation. With a measure like that of Huetting, this figure might be cut in half.

Minister Pronk: Could Mr. Fitzgerald comment on that?

John Fitzgerald: He might be right, but that is an academic question if we have not done the calculations.

Chris Herman (USEPA): I would support the point made by Hans Verolme, though I haven't seen the figures. This points to another issue, which is the increasing use of cost-benefit analysis in regulatory rule making. This starts from the opposite perspective, by establishing a fixed value for human life and then authorizing all environmental policies that cost less than the value of the lives that would be lost otherwise. If you have underestimated the value of a life, you will end up with results that are not sustainable, because you will not invest enough to sustain human life. Have the panelists reflected on the disconnect between the

implications of this use of cost benefit analysis at the micro level and the national analytical framework you raise here?

Minister Pronk: Could Dr. Hueting comment on this, and also on whether the assumptions here also apply to cost benefit analysis?

Dr. Hueting: This is a cost benefit analysis, because we compare the costs with the benefits. On the cost side are the opportunity costs of attaining a specified standard. The benefits are the decrease of the demand curve, or the damage done. As far as they cannot be measured because of blockages, then the benefits are simply fulfilling the assumed preferences.

Chris Herman: I understand that you are making fixed assumptions about a set of values or standards, and are proceeding from there. If, as occurs in cost benefit analysis in the US, you work in the opposite direction by assuming a fixed value for human life (as a proxy for environmental benefit) and let that be the drive of your decision-making, then you will end up with a different result.

Minister Pronk: Please continue this discussion later, as it is too technical.

Kristalina Georgieva (World Bank): You asked whether we need to move towards a system of national accounts that includes environmental assets and impacts as well as social assets. Clearly we do, and more discussions are needed. You also asked whether we can apply this methodology to developing countries. Here I am less optimistic, because of the data requirements. These data simply are not available. I would move forward by asking for this to be applied to more OECD countries first. We should work on it in the developing world, but it will be better to begin in the OECD countries. I would also like to raise a third point. Why does this framework not include anything on population growth? National income per capita will make a great deal of difference in how we interpret the results.

Ir. de Boer: Regarding data requirements, the search for the data required to get a general picture of the use of (or pressure on) the environment is going on in developing countries, whether or not we calculate SNI. Once the data are available, calculating SNI is worth the additional cost.

Dr. Hueting: The standards for specific countries are derived from global standards, so the first step for every country has been made. Regarding popula-

tion, we are working on a geological time scale, so the time frame within which population is an issue - a few hundred years - is only a split second. If population growth continues, then no technology will be sufficient to attain sustainability. If technical measures entailing direct shifts from burdening to benign activities are insufficient to achieve sustainability, we assume population will drop in order to arrive at a sustainable development path. Therefore policy-makers must include a population policy to manage that drop.

Dr. Stiglitz: GDP numbers are very imperfect. There was an enormous discussion on this when the SNA was being developed. Now this is not even taught in graduate schools, we simply assume that these are meaningful measures. I conclude, therefore, that as we develop environmental frameworks, there will be a lot of discussion, but we will end up with standards that will allow for a reasonable degree of comparability. They will be imperfect, but they will be used anyway. Moreover, GDP numbers in developing countries are much worse than those in developed countries. Accounting frameworks in developing countries are better now than they were thirty or forty years ago. Low quality of data is not an argument for not doing the work at all.

Dr. Johnson: We are closer to the truth with poor data than we would be with no data. The 55% gap in the Netherlands will not lead to immediate policy conclusions, but it will stimulate debate and lead to more detailed analysis of the causes of this gap and the development of better information and analysis to determine policy solutions.

Minister Pronk: As we are past our time, I will close now with a few remarks. First, the international community is in the process of moving towards Rio+10, asking whether we could get better indicators of sustainable development. This is a pervasive issue at the moment. This book offers us a methodology for how to get indicators, and it also makes it possible for us to compare in time and across countries with the help of better, more explicit assumptions. You all seem to agree that we need better assumptions. The book is good, it is very much worth reading, and I hope it will play a role.

Second, it is clear from the discussion that the debate must continue. We need more research, and some suggestions have been made along those lines. However, policy-makers should never be put in a situation where they can say that they will not change policies until they have more complete information and knowledge.

Report on the World Bank Seminar on Economic Growth and Valuation of the Environment

So while research and debate continue, policies must also be improved at the same time.

Minister Pronk closed the seminar at 5:25 p.m.

Annex

- Contents of the book
- Programme of the Amsterdam Seminar on april the 23e 1999

Economic Growth and Valuation of the Environment

A Debate

Edited by EKKO C. VAN IERLAND, Wageningen University, The Netherlands
JAN VAN DER STRAATEN, Tilburg University, The Netherlands and
HERMAN VOLLEBERGH, Erasmus University Rotterdam, The Netherlands

The debate on the valuation of nature and the environment, sustainable national income and economic growth is one of prime importance in environmental economics. "Economic Growth and Valuation of the Environment" deals with the fundamental approaches to calculating sustainable national income and their implication for the valuation of the environment.

Leading economists present their views on how the UN system of national account could be adjusted to include environmental impacts and the depletion of natural resources. The discussion centres on the appropriateness of national income as an indicator for welfare, and specific attention is paid to the question of how to value changes in environmental quality or emissions of pollutants.

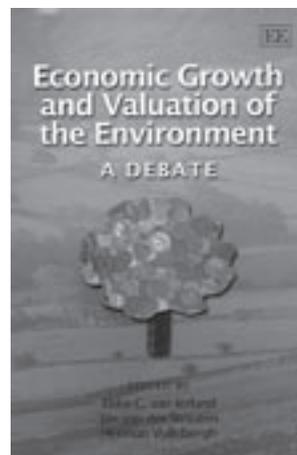
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International Symposium Valuation of Nature and Environment

Royal Netherlands Academy of Arts and Sciences
The Trippenhuis, Kloveniersburgwal 29

April 23, 1999, Amsterdam

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## Programme

To discuss most recent developments in Environmental Economics on Valuation of Nature and Environment, Green GDP and Economic Growth, referring to the contribution by dr. Roefie Hueting

### *Programme:*

Chairman: Ekko van Ierland

09.15 - 09.30 Registration

09.30 - 09.35 Opening

### *I. Key issues in Environmental Economics*

09.35 - 10.00 Paul Ekins, Key Issues in Environmental Economics

10.00 - 10.25 Herman Daly, Economic Activity and Environmental Quality

10.25 - 10.40 Discussion

10.40 - 11.00 Coffeebreak

*II. Valuation of Nature and Environment*

|               |                                                           |
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| 11.00 - 11.30 | Salah El Serafy, Steering by the Right Compass            |
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|---------------|-------------------------------------------------------------------------------|
| 13.30 - 14.00 | Martin O'Connor and Sylvie Faucheux, National Accounting and the Environment  |
| 14.00 - 14.30 | Harmen Verbruggen, Methodologies for Establishing Sustainable National Income |
| 14.30 - 14.45 | Discussion                                                                    |
| 14.45 - 15.15 | Teabreak                                                                      |

*IV. Growth*

|               |                                                                                                       |
|---------------|-------------------------------------------------------------------------------------------------------|
| 15.15 - 15.45 | Karl-Göran Mäler, Economic Growth and the Environment                                                 |
| 15.45 - 16.15 | Wilfred Beckerman, Technological Progress, Finite Resources and our Obligations to Future Generations |
| 16.15 - 16.45 | Discussion                                                                                            |
| 16.45 - 17.30 | Reception                                                                                             |

*Symposium Committee: Prof. dr. E. van Ierland, dr. S. Keuning, dr. J. van Straaten and drs. H.R.J. Vollebergh*

*Committee of Recommendation: Prof. dr. A.P.J. Abrahamse, Prof. dr. W.J. Beek, J. van den Biggelaar, Prof. dr. W.F. Hafkamp, Prof. dr. J. Pen, drs. J. P. Pronk, J. Stekelenberg and Prof. dr. J. Terlouw*

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*The symposium is organised and sponsored by: the ministeries of Foreign Affairs, Economic Affairs, Housing Spatial Planning and the Environment, The provinces Gelderland, Groningen, Limburg, Noord-Brabant and Zuid-Holland, Statistics Netherlands, St. Landelijke Samenwerking Economisten and St. Natuur en Milieu*