GNP and market prices

Wrong signals for sustainable economic success that mask environmental destruction

Jan Tinbergen and Roefie Hueting

Society is steering by the wrong compass

The market is rightly considered a mechanism that generates manufactured goods and services according to consumer preference. This mechanism allows culture and technology to put into practice inventions enriching human life. It works efficiently and stimulates productivity increase, which is the motor raising the quantity, quality and diversity of manufactured goods thus becoming available to consumers.

An effective measure of the level of production and its changes from year to year—the national income—was devised in the 1930s (Tinbergen, quoted in Hueting, 1980). People working on this research were well aware that national income would not form a complete indicator of economic success (welfare). But given a fair distribution of income and perfect competition it no longer matters what is produced, only how much of it is produced. Consequently at that time great value was attached to the compilation of a series of figures on the total production of goods and services. In the 1930s, external effects, like environmental deterioration, did not yet play an important role.

This situation has changed drastically. Over the last forty–five years, the period in which, based on the above reasoning, growth of national income has been given the highest priority in economic policy, the following picture emerges.

The production of manufactured goods and services has increased unprecedentedly, but has been accompanied by an unprecedented destruction of the most fundamental, scarce and consequently economic good at human disposal, namely the environment. This process has already caused much human suffering. Much of what are called natural disasters, such as erosion, flooding and desertification, is caused by mismanagement of the environment. This process threatens the living conditions of generations to come. Furthermore, part of the growth of national income consists of production increases in arms, alcohol, tobacco and drugs. Few people consider this progress. Part of GNP growth is double counting. Thus, in the System of National Accounts (SNA) environmental losses are not written off as costs, but expenditure for their partial recuperation or compensation is written up as final consumption. The same holds true for expenditure on victims of traffic accidents and diseases caused by consumption, such as smoking.

Increase in production is distributed very unequally. In rich countries, people are led to consume more because of seductive billion–dollar advertising campaigns. But 20 per cent of the population in poor countries are deprived of basic needs, such as adequate food, shelter, potable water, taps and toilets. Economic research has shown that once basic needs have been met, relative income has a greater impact on welfare than absolute income. Finally, production increase has not prevented persistence of high unemployment world–wide and considerable child labour.

The market works well, but not all factors contributing to human welfare are captured by it. Consequently, market prices and economic indicators based on them, such as national income and cost–benefit analyses, send misleading signals to society and therefore must be corrected. The factor for which correction is most urgently needed is the environment.

The relationship between growth and environmental destruction

Environmental degradation is a consequence of production and its growth. The burden on the environment is determined by the number of people, the amount of activity per person and the nature of that activity. These three factors are all reflected in the level of national income. The increase and decrease of the first two burdening factors — population and per capita activity — parallel the increase and decrease of production levels. For the third factor (the nature of our activities) it roughly holds that the more burdensome for the environment our activities are, the higher their contribution is to national income, and vice versa. Thus driving a car contributes more to GNP than riding a bicycle. This emerges from an analysis of the Netherlands national accounts. The sectorial composition of the Netherlands accounts does not differ appreciably from that of the United Kingdom, nor probably from that of most other Northern countries. What follows is therefore by and large valid for industrialized countries.

Production growth results largely from increase in productivity, in which the loss of scarce environmental goods has not been taken into account. Increase in labour volume plays a minor role. A quarter to one third of the activities making up national income (notably state consumption) do not contribute to its growth, because increase in productivity is difficult to measure. Other activities result only in slight improvements in productivity. Average annual growth must therefore be achieved by much higher growth among the remaining activities. Some 30 per cent of activities generate about 70 per cent of growth. Unfortunately, these are precisely the activities which, by their use of space, soil and resources or by their pollution in production or consumption, harm the environment most. These are notably the oil, petrochemical and metal industries, agriculture, public utilities, road building, transport and mining.

Measures to save the environment will have the following effects on growth rates and on production levels. To maintain current life–styles as much as possible, all available technical measures should be applied to the fullest extent affordable. Such measures include end–of–pipe treatment, process–integrated changes, recycling, increasing energy efficiency, terracing agricultural slopes, and sustainably managing forests. Because they require extra input of labour, these measures reduce labour productivity and therefore raise product prices, which in turn checks growth of national income (corrected for double counting). The check of growth can be alleviated by the absorption of unemployed workers, up to the point where full employment has been attained.

Saving the environment without causing a rise in prices and subsequent check of production growth is only possible if a technology is invented that is sufficiently clean, reduces the use of space sufficiently, leaves the soil intact, does not deplete energy and resources (i.e. energy derived from the sun and recycling), and is cheaper (or at least not more expensive) than current technology. This is hardly imaginable for our whole range of current activities. But when such technologies become available, the above mentioned effects will be avoided.

Applying technical measures cannot completely avoid a change in our consumption pattern, because price rises resulting from the measures inevitably cause a shift toward more environmentally benign activities, such as bicycling and using public transport.

Technical measures often do not really solve the problem, either because the growth of the activity overrides the effect of the measure, or because of the persistent and cumulative character of the burden. In this case, the measure only retards the rate of deterioration. Thus, to stop the Netherlands' contribution to acidification of forests and lakes, apart from applying all available technical means, the people in the Netherlands must reduce the number of car–kilometres and farm livestock by about 50 per cent (Fransen, 1987). For some problems no technical measures are available: for instance the loss of habitat of plant and animal species as a result of the use of space, and the formation of cirrus clouds that contribute to the greenhouse effect (CO_2 accumulation may be partly solvable). In these cases, in addition to the technical measures, a direct shift in behaviour patterns must ensue, forced by do's and don'ts, rules, incentives and taxes.

A direct shift in production and consumption patterns will also check GNP growth as follows from the analysis of national accounts (the environmentally most burdensome activities contribute most to GNP growth). Moreover, in terms of national accounts, environmentally benign activities represent a smaller volume. Thus a bicycle–kilometre represents a smaller volume than a car–kilometre; a sweater a smaller volume than a hot room; an extra blanket a smaller volume than heating the whole house; beans a smaller volume than meat; and a holiday by train, a smaller volume than holiday flights. This is mainly because the exhaustion of environment and resources is not charged to national income as costs. If it were, the differences would become much smaller or nil.

From the above, it follows that saving the environment will certainly check production growth and probably lead to lower levels of national income. This outcome can hardly surprise. Many have known for a long time that population growth and rising production and consumption levels cannot be sustained forever in a finite world. The outcome of the above analysis should arouse optimism rather than pessimism, because environmentally benign activities are remarkably cheap. Thus, a bicycle is much cheaper than a car, a blanket is cheaper than central heating, and rearing two children is cheaper than bringing up ten. This means that saving our planet is indeed possible.

Our fervent goal — to arrive at environmental sustainability, as advocated by the Brundtland Report (WCED, 1987), and by politicians and institutions around the world — can indeed be fulfilled, though only under limiting conditions. In particular, population growth should be avoided as soon as possible. Moreover, activities with little or no material throughput can increase practically forever. As we have seen, this will not result in great increases in national income. Decision–makers should not become upset by this. Changes in national income levels by no means indicate the economic success of their policies because they conceal the destruction of our life support systems, as long as the figures are not corrected for environmental losses.

Correction of national income based on sustainable use of the environment

Attempts to correct national income for environmental losses started in the early 1970s with the following train of thought (Hueting, 1980). The environment is interpreted as the physical surroundings of humanity, on which it is completely dependent (from breathing to producing). Within the environment, a number of possible uses can be distinguished. These are called environmental functions. When the use of a function by an activity is at the expense of the use of another (or the same) function by another activity, or threatens to be so in the future, loss of function occurs. Environmental functions then have become scarce goods, because the use of a function implies, wholly or partly, the sacrifice of another. This fully meets the definition of scarcity that demarcates the economic discipline. This approach links ecology and economics, and places environment centrally in economic theory.

Because national income is recorded in market prices, shadow prices have to be estimated for functions (and their losses) that are directly comparable with prices of manufactured marketed goods. For this purpose, supply and demand curves for functions have to be constructed. It appeared possible to construct supply curves, consisting of the costs of measures eliminating the burden on the environment, arranged by increasing costs per unit burden avoided. But in most cases no complete demand curves can be found. This is because the possibilities for preferences for environmental functions to be manifested via market behaviour are very limited. Other methods, such as willingness to pay or to accept, do not yield complete demand curves, certainly for functions on which current and future life depends. Standard setting was also considered, but the questions of what standards were to be set and by whom could not be answered at that time.

This situation has now changed. Especially after the 1987 Brundtland Report, politicians and organizations worldwide declared themselves in favour of sustainable use of the environment. This preference, voiced by society, opens up the possibility of basing a calculation on standards for the sustainable use of environmental functions instead of (unknown) individual preferences.

Therefore, the following procedure is proposed for correcting GNP for environmental losses (Hueting 1986, 1989). First define physical standards for environmental functions, based on their sustainable use. These standards replace the (unknown) demand curves. Then formulate measures to meet these standards. Finally, estimate the money involved in implementing the measures. The reduction of national income (Y) by the amounts found gives a first approximation of the activity level which, in line with the standards applied, is sustainable. Needless to say a correction for double counting, mentioned above, must also be made. If the sustainable level is *Y'*, the difference between *Y* and *Y'* indicates, in money terms, how far society has drifted away from its desired goal of sustainable use of the environment.

The standards can be related to

environmental functions. Thus it is possible to formulate the way in which a forest should be managed in order to attain a sustainable use of its functions. Sustainability then means that all present and future uses remain available. For renewable resources such as forests, water, soil and air, as long as their regenerative capacity remains intact, then the functions remain intact (for example, the function 'supplier of wood' of forests, the function 'drinking water' of water, the function 'soil for raising crops' of soil and the function 'air for physiological functioning' of air). This means that emissions of substances that accumulate in the environment, such as PCBs, heavy metals, nitrates and carbon dioxide, may not exceed the natural assimilative capacity of the environment, and that erosion rates may not exceed natural soil regeneration. As for non–renewable resources, such as oil and copper, 'regeneration' takes the form of research and bringing into practice flow resources such as energy derived from the sun (wind, tidal collectors, photo–voltaic cells), recycling of materials and developing their substitutes.

The measures to meet standards include: reforestation, building terraces, draining roads, maintaining landscape buffers, selective use of pesticides and fertilizers, building treatment plants, material recycling, introducing flow energy, altering industrial processes, using more public transport and bicycles, and use of space that leaves sufficient room for the survival of plant and animal species.

The method is applicable for cost–benefit analyses of projects with long term environmental effects. The method seems to be the only way to confront national income with the losses of environmental functions in monetary terms. The physical data required for comparison with standards come down to basic environmental statistics, which have to be collected in any case if a government is to get a grip on the state of the environment. The formulation of measures to meet standards and estimates of the expenditure involved are indispensable for policy decisions.

In other words, the work for supplementing national income figures might be laborious, but it has to be done in any case if we wish to practise a deliberate policy with respect to the environment. We therefore strongly urge decision–makers to stimulate this kind of research in their countries. The Philippines and Sweden already are interested in following the lead of the Netherlands.

Our debt to future generations

A rough order of magnitude of the debt to future generations the world has been accumulating during the last few decades, and how it is to be paid off, is estimated below. We base this on the use of energy and corresponding CO_2 emissions.

One aspect of sustainability could be that the annual consumption of fuels such as coal, oil and natural gas, expressed as a percentage of known reserves, is equal to the rate of efficiency growth in the use of energy, while keeping the level of production constant (Tinbergen, 1990). Tinbergen found that a figure for this efficiency growth close to reality is 1.67 per cent. By this behaviour, it would be theoretically possible to use a finite stock for an infinite period of time. However, it is not certain whether this will be feasible, because it would mean that the production and consumption of today's package of goods has to be generated with an ever smaller amount of energy. Thus after 315 years, today's package must be generated with 0.5 per cent of today's energy use. 315 years is a short period in relation to the speed of natural processes in question when addressing environmental sustainability.

Therefore, if we also want to avoid the hazards of nuclear energy, development of new technologies such as flow energy (derived from the sun) is less risky.

To avoid greenhouse risks, global CO_2 emissions are estimated to have to be reduced by 75 to 80 per cent. In the period 1950–1988, CO_2 emissions, energy use and GDP ran parallel. Around 1950 both world GDP and energy use amounted to 25 per cent of the 1988 level. This means that, other things being equal, the GDP level must be reduced by 75 per cent. Assuming that a CO_2 reduction of 25 per cent is possible at low cost, and considering that a number of environmental effects are not eliminated by reduced energy use, we conclude that to pay off global environmental debt we would have to halve the level of global activities. This demonstrates the urgency of allocating all available resources, such as know-how and capital, towards the development of new technologies (such as flow energy and recycling), instead of towards increasing production, while halting and then reversing population growth. The last thing the world can afford is to wage war, such as that in the Gulf.

The outlook of such changes in technology seems to be promising. For example, Potma (1990) shows that techniques like splitting water molecules by solar energy in deserts and transporting the resulting hydrogen fuels, can provide the world with sufficient clean energy at twice current energy prices. Desertic developing countries thus have a major export potential. This would allow a sustainable use of the environment while regaining current production levels in 50 to 100 years. This is because sufficient clean energy would become available for both eliminating some environmental effects other than the greenhouse effect and compensating for the necessary decrease in production where no solutions are available with additional production of another kind. Moreover, room would be created for raising per capita production levels in the South by a factor of 2.5. This would reduce the income gap between rich and poor countries from 10:1 to 4:1, with the condition of no further throughput growth in rich countries.

The uncertainties are, of course, far too great to attach great value to the outcome of this scenario. But the above clearly demonstrates that continuing prevailing growth paths is blocking our chances of survival, for which possibilities still remain.

Conclusion

In order to achieve sustainable use of the environment, we conclude that the highest priority should be accorded to devising and implementing economic policies that: (a) accelerate development of new technologies, such as flow energy and recycling; (b) permit no further production growth in rich countries; (c) stabilize the global population as soon as possible; (d) improve international income distribution. ■

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