‘Sustainable Development’: Is it a Useful Concept?

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ABSTRACT: It is argued that ‘sustainable development’ has been defined in such a way as to be either morally repugnant or logically redundant. ‘Strong’ sustainability, overriding all other considerations, is morally unacceptable as well as totally impractical; and ‘weak’ sustainability, in which compensation is made for resources consumed, offers nothing beyond traditional economic welfare maximisation. The ‘sustainability’ requirement that human well-being should never be allowed to decline is shown to be irrational. Welfare economics can accommodate distributional considerations, and, suitably defined, the concept of welfare can include the subjective effects of changes in – as well as the levels of – well-being. Hence there is no reason why welfare maximisation should not remain an overriding policy objective. Nor can sustainability be regarded as a ‘constraint’ on welfare maximisation unless there is a clear conflict between the two – which has yet to be demonstrated. This is not to deny the importance of intergenerational justice, nor the need for economic incentives to correct market imperfections if the environment is to be managed in a socially optimal manner. Apart from a few small developing countries heavily dependent on minerals or other finite primary products, the measurement of some wider concept of ‘sustainable’ GNP is a waste of time and such estimates as have been made are virtually worthless.

KEYWORDS: Environmental policy, intergenerational justice, measurement of GNP, optimality, social discount rate, sustainability constraints, sustainable development, welfare maximisation.

1. ‘SUSTAINABLE DEVELOPMENT’: TECHNICAL CONDITION OR MORAL INJUNCTION?

During the last few years the fashionable concept in environmental discourse has been ‘sustainable development’. It has spawned a vast literature and has strengthened the arm of empire builders in many research institutes, Universities, national and international bureaucracies and statistical offices. Environmental pressure groups present the concept of sustainable development as an important new contribution to the environmental debate. It is claimed that it brings new insights into the way that concern for the environment and the

Environmental Values **3** (1994): 191-209

interests of future generations should be taken into account in policy analysis. But in fact it only muddles the issues. As two distinguished authorities in this area, Partha Dasgupta and Karl-Göran Mäler, point out '...most writings on sustainable development start from scratch and some proceed to get things hopelessly wrong. It would be difficult to find another field of research endeavour in the social sciences that has displayed such intellectual regress.'[2]

It seems high time, therefore, for somebody to spell out why, if the Emperor of Sustainable Development has any clothes at all, they are pretty threadbare. In this article I maintain that 'sustainable development' has been defined in such a way as to be either morally repugnant or logically redundant. It is true that, in the past, economic policy has tended to ignore environmental issues, particularly those having very long run consequences. It is right, therefore, that they should now be given proper place in the conduct of policy. But this can be done without elevating sustainability to the status of some over-riding criterion of policy. After all I am sure that the reader can easily think of innumerable human activities that are highly desirable but, alas, not indefinitely sustainable!

In 1992, at Rio de Janeiro, the United Nations held a Conference on Environment and Development (UNCED), in which almost all the countries in the world participated. At this conference the countries adopted a major document of several hundred pages, known as 'Agenda 21', which set out, amongst other things, the agreed intentions of the countries to take account of environmental objectives in their domestic policies, to monitor their own developments from the point of view of their 'sustainability' taking full account of environmental changes, and to submit regular reports on these developments to a newly established 'Commission on Sustainable Development' (CSD).[3]

Agenda 21 is full of references to 'sustainable development'. For example, Chapter 8 states that 'Governments, in cooperation, where appropriate, with international organisations, should adopt a national strategy for sustainable development...'. It goes on to say that countries should draw up sustainable development strategies the goals of which '...should be to ensure socially responsible economic development while protecting the resources base and the environment for the benefit of future generations'. But what are socially responsible goals in this area, how far should we protect the resource base, whatever that means, and what are the legitimate interests of future generations that have to be protected?

All these, and many other, questions arise immediately one asks what exactly does 'sustainable development' mean, and what is so good about it? As many writers have pointed out, there is a danger that sustainable development is treated as a 'motherhood and apple pie' objective.[4] But, as Harvey Brooks puts it, 'For the concept of sustainability in the process of development to be operationally useful it must be more than just an expression of social values or political preferences disguised in scientific language. Ideally it should be defined so that one could specify a set of measurable criteria such that individuals and groups

with widely differing values, political preferences, or assumptions about human nature could agree whether the criteria are being met in a concrete development program.'[5]

It may well be that this is asking too much of the concept of sustainable development and that it can be of some use without being fully operational. But, as it stands, the concept is basically flawed. This is because it mixes up together the technical characteristics of a particular development path with a moral injunction to pursue it. And a definition of whether any particular development path is technically sustainable does not, by itself, carry any special moral force. The definition of a straight line does not imply that there is any particular moral virtue in always walking in straight lines. But most definitions of sustainable development on the market tend to incorporate some ethical injunction without apparently any recognition of the need to demonstrate why that particular ethical injunction is better than many others that one could think up. One obvious rival injunction would be to seek the highest welfare for society over some specified time period.

The result of the fusion of technical characteristics with moral injunctions is that the distinction between positive propositions about the threat to the continuation of any development path and normative propositions concerning the optimality of any particular pattern of development is hopelessly blurred.[6] Instead, a sustainable development path should be defined simply as one that can be sustained over some specified time period, and whether or not it *ought* to be followed is another matter. It should be treated, in other words, as a purely technical concept – not that this necessarily makes it easy to define operationally.[7]

This is most clearly seen when evaluating the desirability of embarking on some specific project. Consider, for example, a simple mining project in a poor country. Implementing the project might be the best way for the people concerned to obtain some funds to keep alive and to build up productive facilities that would enable them to survive in the future. This might include investing in some other activity – such as promoting sustainable agriculture, or investing in their education and technical training. In this case although the project will not be technically sustainable, it ought to be carried out. In the economist's jargon it will be 'optimal'. And one can also imagine the opposite scenario of specific projects that might be sustainable – such as certain forestry projects where replanting can offset the cutting – but that are not 'optimal', perhaps because they are not worthwhile from an economic point of view and would involve the community in excessive costs of cutting and transport relative to the revenues it could earn from sale of the timber.

In other words, immediately one draws the distinction between sustainability, defined as a purely technical concept, and optimality, which is a normative concept, it is obvious that many economic activities that are unsustainable may be perfectly optimal, and many that are sustainable may not even be desirable,

let alone optimal. As Little and Mirrlees put it in the context of project analysis 'Sustainability has come to be used in recent years in connection with projects.... It has no merit. Whether a project is sustainable (forever? – or just a long time?) has nothing to do with whether it is desirable. If unsustainability were really regarded as a reason for rejecting a project, there would be no mining, and no industry. The world would be a very primitive place.'[8]

2. CHANGING FASHIONS IN 'SUSTAINABLE DEVELOPMENT'

One of the most famous of the definitions of sustainable development is that contained in *Our Common Future*, the 1987 report of the World Commission on the Environment and Development.[9] This report, which is known as the 'Brundtland Report', after its chairperson, Mrs Brundtland, the Prime Minister of Norway, defined sustainable development as '...development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. But such a criterion is totally useless since 'needs' are a subjective concept. People at different points in time, or in different income levels, or with different cultural or national backgrounds, will differ with respect to what 'needs' they regard as important. Hence, the injunction to enable future generations to meet their needs does not provide any clear guidance as to what has to be preserved in order that future generations may do so.

Over the past few years innumerable definitions of sustainable development have been proposed.[10] But one can identify a clear trend in them. At the beginning, sustainability was interpreted as a requirement to preserve intact the environment as we find it today in all its forms. The Brundtland report, for example, stated that 'The loss of plant and animal species can greatly limit the options of future generations; so sustainable development requires the conservation of plant and animal species'.

But, one might ask, how far does the Brundtland report's injunction to conserve plant and animal species really go? Is one supposed to preserve all of them? And at what price? Is one supposed to mount a large operation, at astronomic cost, to ensure the survival of every known and unknown species on the grounds that it might give pleasure to future generations, or that it might turn out, in 100 years time, to have medicinal properties? About 98 percent of all the species that have ever existed are believed to have become extinct, but most people do not suffer any great sense of loss as a result. How many people lose sleep because it is no longer possible to see a live Dinosaur?

Clearly, such an absolutist concept of 'sustainable development' is morally repugnant. Given the acute poverty and environmental degradation in which a large part of the world's population live, one could not justify using up vast resources in an attempt to preserve from extinction, say, every one of the several million species of beetles that exist. For the cost of such a task would be partly,

if not wholly, resources that could otherwise have been devoted to more urgent environmental concerns, such as increasing access to clean drinking water or sanitation in the Third World.

As it soon became obvious that the 'strong' concept of sustainable development was morally repugnant, as well as totally impracticable, many environmentalists shifted their ground. A new version of the concept was adopted, known in the literature as 'weak' sustainability. This allows for some natural resources to be run down as long as adequate compensation is provided by increases in other resources, perhaps even in the form of man-made capital.[11] But what constitutes adequate compensation? How many more schools or hospitals or houses or factories or machines are required to compensate for using up of some mineral resources or forests or clean atmosphere? The answer, it turned out, was that the acceptability of the substitution had to be judged by its contribution to sustaining human welfare.

This is clear from one of the latest definitions provided by David Pearce, who is the author of numerous works on sustainability. His definition is that ''Sustainability' therefore implies something about maintaining the level of human well-being so that it might improve but at least never declines (or, not more than temporarily, anyway). Interpreted this way, sustainable development becomes equivalent to some requirement that well-being does not decline through time.'[12]

The first important feature of this definition is that it is couched in terms of maintaining 'well-being', not in terms of maintaining the level of consumption or GNP, or even in terms of maintaining intact the overall stock of natural capital, a condition that is found in many definitions of sustainable development including one to which David Pearce had earlier subscribed, (though in collaboration with two other authors who clearly had a bad influence on him[13]). This implies, for example, that sustainable development could include the replacement of natural capital by man-made capital, provided the increase in the latter compensated future generations for any fall in their welfare that might have been caused by the depletion of natural capital. In other words, it allows for substitutability between different forms of natural capital and man-made capital, provided that, on balance, there is no decline in welfare.

But this amounts to selling a crucial pass in any struggle to preserve the independent usefulness of the concept of sustainability. For if the choice between preserving natural capital and adding to (or preserving) man-made capital depends on which makes the greatest contribution to welfare the concept of sustainable development becomes redundant. In the attempt to rid the original 'strong' concept of sustainable development of its most obvious weaknesses the baby has been thrown out with the bath water. For it appears now that what society should aim at is not 'sustainability', but the maximisation of welfare. In other words, it should pursue the old-fashioned economist's concept of 'optimality'.

3. OPTIMALITY AND SUSTAINABILITY FOR THE RATIONAL INDIVIDUAL

Suppose somebody wants to choose between two possible courses of action – e.g. which of two possible careers to pursue. Let us assume, for the sake of the argument, that the only difference between the two careers is the level of income she would earn in each and hence the level of consumption that she can enjoy, and that they are roughly the same as regards conditions of work, prestige, job satisfaction, life expectation, location and everything else. Let us also assume that her welfare at any point of time – her 'instantaneous welfare' – is correlated with her income at that point of time.[14] Suppose now that one of the careers will ensure her a steady but very modest level of income, and hence welfare, throughout her life, and the other will ensure her an income/welfare level that is higher than in the first alternative *in every single year of her life*, but that includes a decline in income/welfare in the middle of her life, say, when it may decline for a few years (possibly followed by a further rise, though this condition is not essential to the argument). Which path will she choose? Obviously she will choose the latter.[15] Her 'optimal' path is the one that maximises her welfare over her lifetime. In this simplified example, the 'present value' of her lifetime income must be higher in the latter case than in the former.

Why should she care about a temporary decline in her income/welfare if it is by choosing the path containing it that she will maximise the present value of her total welfare over the whole of her life? Insofar as the prospect of a temporary decline in income worried her she would simply invest more heavily in earlier years and use the subsequent extra income to boost her income in the years when income would otherwise decline. If this entailed too great a loss of welfare earlier – e.g. the subjective cost of the greater risk burden that such an investment policy would imply – the path containing the decline in income would be the one that maximised the present value of her welfare over her life.

Of course, in this example, the problem is simplified in two ways. First, it was assumed that the level of welfare expected in the non-sustainable path is greater in every year than it is in the sustainable path, in spite of the temporary decline in welfare in the former. Secondly, only one person is involved, so there is no need to take account of the way in which the two income paths differ with respect to their effect on the equality with which incomes are distributed among different members of the population, let alone between different generations. We shall examine these distributional considerations in the next section, when we consider welfare maximisation for society as a whole.

Meanwhile, as regards the first problem, suppose our rational individual is faced with a choice between two paths of income which intersect – i.e. one is higher than the other in some years but lower in others. In this case, to compare the 'present values' of the two income streams she would discount future incomes at whatever rate of interest she could get on her savings and investment.

But, again, there seems to be no reason why the rational individual should attach special importance to a temporary decline in income during her lifetime. The time path of her income stream throughout her life will be taken care of in the discounting exercise. She will be free to borrow, or lend, in such a way as to allocate her consumption over time in such a way that it maximises the present value of her welfare.

4. OPTIMALITY FOR SOCIETY AND THE DISTRIBUTION PROBLEM

As regards the second simplification in our example, when one is concerned with optimality for society as a whole, rather than for an individual, account has to be taken of distributional considerations. This applies whether one is maximising welfare of society at any moment of time or maximising welfare over some time period. Making due allowance for distributional considerations means that when we are seeking to maximise total social welfare at any point of time we will be concerned with the manner in which the total consumption of society is distributed amongst the population at the point in time in question – e.g. how equally, or justly (which may not be the same thing) it is distributed. And if we are seeking to maximise welfare over time whilst making allowance for distributional considerations we would be concerned with the distribution of consumption over time – e.g. how equally, or justly, consumption is distributed between different generations.

Both procedures fit easily into welfare economics. Environmentalists may not be aware of the fact that it has long been conventional to include distributional considerations into the concept of economic welfare – which is a component of total welfare – that one seeks to maximise. In the opinion of the great economist A.C. Pigou, who might be regarded as the father of welfare economics, 'Any cause which increases the absolute share of real income in the hands of the poor, provided that it does not lead to a contraction in the size of the national dividend from any point of view, will, in general, increase economic welfare'.[16] Distributional considerations are even included in standard techniques of cost-benefit analysis pioneered by Ian Little and J.A.Mirrlees.[17] I myself have published estimates of growth rates of national income in different countries adjusted for changes in their internal income distributions, and others had already done so before me.[18]

Welfare can also be defined to include considerations of social justice and freedom, and so on. Of course, the more widely one draws the net of welfare to include such variables the greater the difficulty in making them all commensurate with each other. It is true that this makes it more difficult to define exactly what is meant by the 'maximisation' operation. But the same difficulty is encountered by any proposition to the effect that 'welfare' (or 'well-being') had declined in any specific time period.

How one should maximise the present value of society's welfare over time in a way that takes due account of the interests of future generations raises difficult, and relatively novel, problems of inter-generational justice that lie outside the scope of this article.[19] In the absence of any obvious consensus view to the contrary we shall assume here that a unit of *welfare* accruing to some future generation should be given the same weight in arriving at the present value of the stream of welfare over time as an equal unit of welfare accruing to the present generation. In other words, we should not discriminate against future generations. We should not, therefore, discount *welfare* for time per se. This means that we do not advocate 'pure' time preference, which is a preference for consumption now, rather than later, purely on account of its precedence in time. There may, of course, be good reasons for doing so, such as the possibility that the human race will become extinct in a relevant time period.[20] Or one may simply wish to impose on the discounting operation some particular ethical views concerning the relative importance – or lack of it – of *welfare* accruing to different generations.[21]

But although we shall abstain from any such discounting of welfare, this does not mean that we should not discount *consumption*. That is to say we have to allow for whatever increase in productivity we may expect to take place over time as a result of investment and technological progress. For an increase in productivity would mean that any particular item of consumption will be 'cheaper' in future than it is now (allowing for inflation, of course). Hence, we would not value a unit of consumption to be delivered in ten years' time, say, at the same price as we would value it for delivery today. For instead of paying now for it to be delivered in ten years' time one could invest the money so that in ten years' time one could buy it and still have something left over. In the long run, for society as a whole, how much is left over depends on the (real) rate of growth of the economy, since that determines, roughly speaking, the (real) rate of return we could get on our money today.

We might even want to go further than that in our discounting procedure. We might want to make an additional allowance for the fact that, as consumption levels rise, the welfare that one can obtain from additional ('marginal') units of consumption will fall. This application of the law of diminishing marginal utility would be one particular way of taking account of distributional concerns. That is to say, it would allow for the fact that higher consumption will not provide *proportionately* higher welfare to rich people as to poor people. Taking account of differences in the incomes accruing to different generations in this way would be the inter-temporal counterpart of some conventional cost-benefit methods of allowing for the way that, say, any specific project at any moment of time may confer benefits on different income groups in society by attaching weights to their income levels. In applying this procedure to inter-generational comparisons of income and welfare levels one would still not be discounting 'welfare'

at all. One would be simply assuming that higher levels of consumption do not bring proportionately higher levels of welfare.

Finally, in the same way that we may assume that individuals derive less welfare from additional consumption the higher is their consumption, we may also decide that society as a whole derives less welfare from the sum of the welfare of its members if this is distributed unequally among them. In our estimate of the present value of welfare over time, therefore, one could then attach lower weight to a unit of welfare accruing to society when social welfare was expected to be high than in periods when it was expected to be low. But this would be nothing to do with discounting for time per se.[22]

Thus the use of a discount rate does not necessarily mean, as most environmentalists – and some philosophers – appear to believe, that we attach less value to the *welfare* of future generations simply because it comes later in time.[23] On the contrary, rationing investment according to the discount rate helps to ensure that we invest now in projects that will give future generations more welfare than if we invested, instead, in projects – some of which may be environmental projects – that yield lower returns. In this way it maximises the welfare of future generations. It is in no way 'unfair' to them since we would discount future returns in the same way even if we expected to live for another two centuries and hence be amongst the generation that has to bear the consequences of our present decisions. [24]

5. OPTIMALITY VERSUS SUSTAINABILITY

We have argued above that (a) distributional considerations can – and invariably are – included in the economist's concept of 'welfare'; (b) this applies also to the inter-generational distribution of income and welfare; and (c) one way of doing this (though not necessarily the only way) is by appropriate choice of the discount rate used to estimate the present value of welfare that society should seek to maximise. In view of this there does not appear to be any independent role left for 'sustainability' as a separate objective of policy, independent of maximisation of the present value of welfare. For if future generations have lower incomes as a result of any particular environmental policy this will show up – other things being equal – in a lower present value of income over whatever time period our views on inter-generational justice regard as relevant. We might also want to allow for the fact that marginal units of consumption probably add more to welfare at lower levels of consumption than at higher levels.

Nor does there seem to be any special role left to play for the particular possibility that future levels of welfare may include some decline. And this is related to the second important feature of the Pearce definition of sustainability quoted above, which is that wellbeing must never decline, 'or, not more than

temporarily'.[25] Apart from the qualification about a temporary decline this is in line with most recent definitions of sustainable development. It is anyway implicit in any definition of sustainability that requires that any substitution of man-made capital for natural capital can only be justified if it makes an equal contribution to welfare. As John Pezzey rightly says in his survey of the various definitions used, most of them '...understand sustainability to mean sustaining an improvement (or at least maintenance) in the quality of life, rather than just sustaining the existence of life'. He goes on to adopt a 'standard definition of sustainable development' according to which welfare per head of population must never decline (as in the latest Pearce definition mentioned above, but without the 'temporary' qualification this had included).[26]

One is always free, of course, to define welfare however one wishes. But it would be very curious to insist on defining it to *include* all sorts of environmental, distributional, social, and other considerations, but to *exclude* changes in the level of welfare (as distinct from the level itself). Indeed, it seems self-contradictory to do so. If a decline in welfare did not affect welfare, why bother about it? And if it does affect welfare, why cannot it be included in the concept of welfare that one is trying to maximise? As indicated above, one might want to adopt a concept of welfare maximisation that left no room for incommensurate objectives, such as integrity, or freedom. In that case, it would be sensible to talk about maximising welfare subject to some constraint on these other incommensurate objectives. But there seems no reason to treat *changes* in welfare levels in this way.

Furthermore, not only does it seem illogical to exclude a decline in welfare from the concept of welfare that optimal policy should seek to maximise, it is not clear why some special moral significance should be attached to *declines* in the level of welfare. It is no doubt true that a very rich man may suffer some extra loss of welfare if he has had a bad year on the stock exchange and has had to sell his yacht. He would not miss the yacht so much if he had never had it before. But we cannot be expected to be very sorry for him. After all, how did he become rich if not as a result of a lot of *increases* in income in earlier years which, if we are to be consistent, should be given an additional value, on top of their effect in bringing him to a higher level. Anyway, it may well be that he will lose less welfare from having to give up the yacht – which may have been a nuisance and entailed all sorts of responsibilities – than the joy he experienced when he first got his new toy.

On the other hand, it may be argued that this does not apply to different generations. For if some particular generation experiences a decline in its welfare one cannot assume that it was the same generation that enjoyed the previous increases. Nevertheless, if future generations experience a dip in welfare in any period, we cannot be expected to be very sorry for them *irrespective of their welfare levels*. And even if we are there seems to be no justification for switching to a development path that yields a lower present value of welfare in order to

avoid the temporary decline. For that would imply inflicting on some other generation a loss of welfare greater than the one that was incurred by some particular generation *solely because of the temporary decline*. And it is far from obvious that there is any moral justification for shielding future generations from any decline in income or welfare irrespective of whatever sacrifice of welfare this might inflict on other generations.

In other words, if we are to attach a separate value to *changes* in welfare, they need not be only negative. We should also include the increases in welfare – the rise that preceded the fall. Indeed, if the hypothecated temporary decline in welfare that is to be avoided at all costs is from a higher level of welfare than the one we enjoy now, the preceding generations must have experienced more increases in welfare than declines in welfare. On balance, therefore, the future generations that enjoyed the increases in welfare should be credited with even more welfare than the simple present value exercise would have permitted. As well as being credited with more welfare for reaching higher levels, they would be credited with even more welfare because they reached the higher levels in the only possible way, namely by experiencing more increases than declines!

Thus, the exclusion of *changes* in welfare – as distinct from the level of welfare – from the concept of welfare the present value of which society should seek to maximise, is open to two objections. First, it appears to be simply logically self-contradictory. At the same time, if one is consistent one should take account of positive as well as negative changes in welfare, so that it is far from obvious how the incorporation of changes in welfare in the concept of welfare that society should maximise would affect its value. One might add a third objection, namely, why should negative changes in welfare be singled out for special treatment anyway?

Of course, if the decline in living standards of future generations continued to the point that human life on this planet was no longer possible, the simple optimisation rule comes up against another tricky question. This is whether it makes sense to talk about the loss of welfare caused by the extinction of the human race. As Thomas Nagel points out, 'none of us existed before we were born (or conceived), but few regard that as a misfortune'.[27] Would the non-existence of the human race constitute a negative item in the overall total of welfare? Perhaps the welfare of such wild-life that remained might be much higher?

6. SHOULD 'SUSTAINABILITY' BE A CONSTRAINT?

The preceding discussion should make it obvious – if it were not already so – that not only should we stick to welfare maximisation, rather than sustainability, as an over-riding objective of policy, but that sustainability cannot even be regarded as a logical constraint on welfare maximisation. Mimicry of the economist's use

of the concept of a constraint is the latest twist in the evolution of the concept of sustainable development. It represents a further step in the retreat, under fire, by those environmentalists who have presented the 'sustainable development' concept as a great breakthrough in our thinking on the subject. First they retreat from strong sustainability to weak sustainability, and then from weak sustainability as an objective of policy to weak sustainability as just a constraint. The idea now is that welfare should be maximised but subject to the constraint that the path of development being followed be sustainable. However, this appears to represent a mis-interpretation of the concept of a 'constraint'.

Economic theory is dominated by the notion of how to make optimal choices when faced with constraints of one kind or another. For example, it is full of the analysis of how firms may seek to maximise profits *subject to constraints*, such as the prices they can charge for the goods they sell or the wages they need pay employees, and so on. Or households are treated as maximising utility *subject to constraints* in terms of their incomes and the prices of goods they buy, and so on. If, for example, the firm could relax the wage constraint and pay employees lower wages it could make higher profits. If a household could relax its income constraint by earning more, or by borrowing, it could increase welfare. In many other contexts, too, it might be analytically convenient to seek to maximise some objective, such as total economic welfare, subject to some constraint in terms of the other objectives, such as freedom, or justice.

But it is obvious that only if there is a conflict between the 'constraint' and what it is that one is trying to maximise does it make sense to use the term 'constraint'. For a constraint is something that, if relaxed, enables one to obtain more of whatever it is one is trying to maximise. Where there is no conflict, however, there is no scope for a 'constraint'.

Sustainable development could only constitute a constraint on welfare maximisation, therefore, if it conflicted with it. It is, of course, possible to define sustainable development in such a way that it does conflict with welfare maximisation over the time period in question. 'Strong sustainability', for example, would do so. For it is quite likely that the attempt to preserve all existing species and other environmental facilities would lead to a reduction in welfare as commonly defined. But, as we have seen, 'strong' sustainability has been more or less abandoned on account of its moral inacceptability. And the capital stock component of 'weak' sustainability obviously cannot conflict with welfare maximisation since the criterion of whether a substitution of man-made for natural capital is acceptable is whether it makes an adequate contribution to welfare.

For sustainability to constitute a constraint on welfare maximisation, therefore, some other source of conflict between sustainability and welfare maximisation has to be found. We have discussed at some length one that has been given much prominence, namely distributional considerations, particularly the inter-generational distribution of welfare. We have shown that whilst it is, of course, open to anybody to define welfare in such as way as to take no account

of distributional considerations it would violate a long tradition in economics to the effect that income distribution was an integral part of welfare and that inter-temporal distribution can be handled through the appropriate choice of the discount rate. We have also argued that the notion that declines in welfare – particularly temporary declines – should be given special consideration and constitute constraints on welfare maximisation is also open to serious objections.

The advocates of sustainable development as a constraint, therefore, face a dilemma. Either they stick to 'strong' sustainability, which is logical, but requires subscribing to a morally repugnant and totally impracticable objective, or they switch to some welfare-based concept of sustainability, in which case they are advocating a concept that appears to be redundant and unable to qualify as a logical constraint on welfare maximisation.

7. SUSTAINABILITY AND THE MEASUREMENT OF NATIONAL INCOME

As pointed out above, most environmentalists mix up, in their own concept of sustainable development, the technical characteristics of a development path with its moral superiority. It is perhaps because of this confusion that they also mis-interpret perfectly legitimate technical definitions that some economists have proposed, such the definition of maintaining capital intact, or the conditions to be satisfied IF it is required to ensure constant levels of consumption per head, as carrying with them ethical force that their originators would not necessarily attach to them at all.

For example, a famous definition of income by the late Sir John Hicks, a Nobel Laureate in Economics, is that national income is the output of a nation's economy *after maintaining capital intact* – i.e. after allowing for the amount of capital used up in the course of producing the output in question. Obviously, if the capital that is gradually 'used up' in the course of time through wear and tear and so on is not replaced then, in the longer run, output will begin to decline and it will not be possible to maintain income levels. But this Hicksian definition of income, with its emphasis on the need to maintain capital intact in order to maintain income levels, is a purely technical definition of net income and has no moral connotation whatsoever.

More recently, other economists, notably Hartwick, Weitzman, and Solow, have shown precisely how to extend the concept of net national income and maintaining capital intact to encompass the depletion of natural capital through the extraction of minerals, and precisely how much investment is required in order to compensate for using up natural capital and to maintain constant levels of consumption per head.[28] But these technical definitions of income and of sustainable consumption paths are frequently quoted by environmentalists as if they imply some moral obligation never to consume more than income so defined and hence to always maintain capital intact and to follow a sustainable

growth path as so defined. But the authors of these definitions usually had no intention of suggesting that they were also laying down the law as to what is morally imperative

For example, in a much quoted article on 'Intergenerational Equity and Exhaustible Resources' Nobel Laureate Robert M. Solow states that he is merely exploring the consequences of a straightforward application of the famous second principle of justice associated with the political philosopher, John Rawls, to the problem of optimal capital accumulation spanning several generations.[29] He states that 'It will turn out to have both advantages and disadvantages as an ethical principle in this context' (page 30). He goes on to show that in the normal situations '...the max-min [i.e.the Rawlsian] criterion does not function very well as a principle of intergenerational equity.... It calls ... for zero net saving with stationary technology, and for negative net saving with advancing technology.' This is hardly a ringing endorsement of the principle of never allowing consumption per head to be lower in any time period than in any other time period. But it does not prevent many environmentalists from writing that Solow has demonstrated the desirability of the principle of maintaining a constant level of consumption per head. [30] Most of them must be just quoting each other without bothering to read Solow in the original.

Thus the fact that eminent economists have helped provide a precise basis for estimating how much investment a society would need to make, under certain highly simplified conditions, in order to compensate for any reduction in the stock of natural capital and to maintain 'sustainable development' (defined as no fall in welfare levels), after taking due account of damage to the environment, does not imply that this represents some ethical injunction. This not only implies nothing at all about the optimality of sustainable growth paths, it does not even imply that making such estimates is worthwhile in practice.

Even the depreciation of man-made capital is not possible to estimate with much accuracy. For it does not correspond to any actual market transactions. The flow of goods and services entering into gross national product (GNP) – such as the food consumed, the machine tools built, the services provided to consumers, and so on – are almost all the subject of two-way market transactions involving a buyer and a seller. By contrast, the depletion of the capital stock is not, as a rule, the subject of any transactions between buyers and sellers. True, firms will show estimates of depreciation in their accounts, but, for many reasons that lie outside the scope of this paper, nobody in the trade would rely on these as being objective and accurate estimates of any conceptually valid true measure of capital consumption.[31] But at least the assets in question did go through the market at one time in their life, and in some cases it may be possible to use second-hand prices to estimate the value of capital goods that have been discarded.

By contrast most environmental assets never did pass through the market place at all. In almost all cases there are no market observations of the value to be attached to clean air or water or beautiful landscape. It is true that newly

extracted supplies of minerals do pass through the market, but the known reserves are only the reserves that have been found worth while identifying given prices at any point of time. As I explained in detail about twenty years ago, insofar as demand may exceed supply for any length of time this will lead to a rise in price which, in turn, invariably sets in motion many feedback mechanisms to restore the balance between supply and demand. These include increases in exploration and discovery of new reserves, improvements in extraction and refinement techniques, but also economies and substitution in the use of the materials in question.[32] Also, there are obvious difficulties in using prices of minerals at any point of time as guide to the prices that they will fetch for the next few centuries, so that it is impossible to put any reasonable values on these resources.

8. CONCLUSIONS

What we have seen so far then is that:–

(i) 'sustainability' should be interpreted purely as a technical characteristic of any project, programme or development path, not as implying any moral injunction or over-riding criterion of choice;

(ii) the 'optimal' choice for society is to maximise the present value of welfare over whatever time period is regarded as relevant given one's views on inter-generational justice. This can make allowance for distributional considerations, including inter-temporal distribution, by attaching weights to the welfare accruing to different generations in any estimate of the present value of social welfare, as, for example, by appropriate choice of the discount rate;

(iii) since, anyway, most environmentalists have now dropped 'strong' sustainability and now define the 'sustainability' condition in terms of how much contribution different components of the total capital stock contribute to welfare, insofar as society seeks to maximise welfare the sustainability condition becomes redundant and cannot even be treated as a 'constraint'.

None of the above conclusions means that we are not left with serious environmental problems when attempting to decide what is an *optimal* policy. As I have always maintained the world is faced with real environmental problems. Economists have been well aware of the fact that, left to itself, the environment will not be managed in a socially optimal manner. There are too many market imperfections. The most important is probably the absence of well-defined property rights. But in many cases – particularly with global environmental issues, such as the preservation of biodiversity or the prevention of excessive production of greenhouse gases – it is not easy to see what economic incentives can be devised

and implemented internationally in order to secure socially optimal co-operative action. These are serious issues, many of them requiring extensive scientific research and economic research into, for example, the economic evaluation of environmental assets, or the costs of pollution reduction, or the relative efficacy of alternative schemes to achieve socially optimal levels of environmental protection.

Serious research into these and related environmental problems is being carried out in various institutions all over the world.[33] It is unfortunate that too much time and effort is also being devoted to developing the implications of the sustainable development concept, including innumerable commissions and committees set up to report on it and innumerable research programmes designed to measure it.[34] Outside a few devloping countries heavily dependent on limited supplies of some minerals or other primary product, the measurement of some wider concept of 'sustainable GNP' is a waste of time and effort and such estimates as have been made for developed countries are virtually worthless.

NOTES

[1] Emeritus Fellow of Balliol College, Oxford. I wish to express my particular gratitude to John Pezzey who has helped me remedy some serious deficiencies in an earlier draft of this paper, as well as to an anonymous referee for several constructive comments. Needless to say I alone am responsible for all remaining defects.

[2] Dasgupta and Mäler 1994.

[3] The legal status of Agenda 21 is far from clear although it was later enshrined in a resolution of the Second Committee of the General Assembly of the UN (at its 51st meeting on the 16th December 1992). But this only urged governments and international bodies to take the action necessary to follow up the agreements reached in Rio, and there is no question of countries that do not take much notice of it being brought before the International Court of Justice! After all, most countries in the world are constantly in breach of various more binding commitments into which they have entered concerning human rights without ever being pursued in the courts or penalised in any way.

[4] See, for example, Pearce Markandya and Barbier 1989, p. 1; Solow 1991; Pezzey 1992a, p. 1.

[5] Brooks 1992, p.30.

[6] See criticism along these lines by Dasgupta and Mäler (1990, p. 106), in which they take specific issue with a definition of SD by D. Pearce, Barbier and Markandya, which required no decline in the natural capital stock. This condition differs significantly from one proposed by the same authors but with their names in a different order, namely in Pearce, Markandya and Barbier 1989, p. 3. It is interesting that changing the order of the authors changes their views on the definition of SD.

[7] Even at a technical level, whether some project or development programme is sustainable or not depends on numerous assumptions – e.g. concerning availability of inputs, of foreign loans, and so on.

[8] Little and Mirrlees 1990, p. 365.

[9] World Commission on Environment and Development, 1987.

[10] An excellent recent survey is contained in Appendix 1 of Pezzey 1992a.
[11] See Pezzey 1992a and Pezzey 1992b.
[12] Pearce 1993, p. 48.
[13] On page 48 of Pearce et al. 1989, this maintenance of the stock of natural capital seems to be the concept of sustainable development to which the authors subscribe, though wider concepts are also given their due.
[14] We abstract here from the question of whether, at the margin, she derives as much welfare from a unit of consumption as from a unit of income devoted to investment.
[15] This example does not depend at all on any assumptions about the individual's rate of time preference.
[16] Pigou 1932, p. 89. The link between economic welfare and distribution is very forcibly expressed in, for example, de V. Graaff 1957, p. 92. Nowadays, of course, refinements to the theory enable one to combine changes in distribution with changes in real income in such a way as to weaken the force of Pigou's proviso concerning the importance of not reducing total real income.
[17] See, in particular, Little and Mirrlees 1974.
[18] See Beckerman 1978, chapter 4, 'The adjustment of growth rates for changes in income distribution'. In this study I adjusted the growth rates of nine OECD countries to take account of income distribution changes.
[19] Some of the difficulties surrounding the problem of our obligations to future generations are discussed in Pasek 1992.
[20] As proposed by Dasgupta and Heal 1979, p. 262.
[21] One interesting attempt to relate alternative ethical views concerning inter-generational justice is in d'Arge, Schultze and Brookshire 1982.
[22] See, for example, a formal exposition of this type of egalitarianism in Broome 1991, pp. 178-80.
[23] See, for example, Partridge 1981. One distinguished philosopher who has made extensive criticisms along these lines is Derek Parfit, as in Parfit 1984, Appendix F.
[24] We might, however, use a slightly lower discount rate to allow for the reduced risk of one's not surviving long enough to see the fruits of one's savings. I have attempted a fuller exposition of the discounting argument in Beckerman 1993.
[25] And how temporary is the temporary decline in welfare that is permitted under the Pearce definition? If one cannot specify this precisely the condition is totally non-operational. By this I do not mean to suggest that one should give a precise number of years. What is required is a specification of the precise criteria by which one can determine whether any particular 'temporary' decline in welfare is optimal. Economists define the optimum output of any commodity as that output at which the marginal social cost of producing it equals the marginal social benefit. This definition does not tell us exactly how much of each commodity should be produced in terms of kilograms or gallons or any other units. But it gives a precise and operational definition. By contrast definitions of sustainable development that include vague qualifications about the acceptability of 'temporary' declines in social welfare, devoid of any criteria for deciding how temporary is temporary, are totally non-operational.
[26] Pezzey 1992a, p. 11.
[27] Nagel 1979, p. 3.
[28] A relatively recent paper by R.M. Solow (1986) contains also the key references to contributions made by Hartwick, Weitzman, Dixit, and others.
[29] Solow 1974, p. 30. More specifically, here, and elsewhere, Solow demonstrates that

with growing population and technical progress, constant consumption per head may not be desirable. Elsewhere, he also explicitly states that 'there are social goals other than sustainability' (Solow 1992, p. 20).

[30] See, for example, the generally excellent article by Mick Common and Charles Perrings (1992) where they write (p. 10) that 'Economists have always had to work hard to find a rationalization for the principle of constant consumption. In this instance, the rationalization was provided by Solow, who used the egalitarian arguments of Rawls (1971) to propose a "Rawlsian" maximin approach to the intertemporal distribution of consumption.'

[31] Various other methods have been used to attempt to measure capital stocks and their depreciation, such as the use of fire insurance surveys. Or estimates have been made of the typical length of life of specific types of building or machinery or capital equipment and so on. But nobody would pretend that such estimates provide more than rough orders of magnitude at best.

[32] I explained the theory and backed it up with the facts in my book *In Defence of Economic Growth*, chapter 8, 'Resources for Growth' (1974). For more recent data see, also, Beckerman 1992, Annex 2.

[33] The Environment Directorate of the OECD, and the World Bank, frequently produce authoritative studies of economic valuation of environmental costs and benefits, including, for example, Munasinghe 1993; Pezzey 1992a; and Peskin and Lutz 1990. See also Barde and Pearce 1991, and the papers included in Part II of Costanza 1991.

[34] These are among the tasks of the Convention on Biodiversity signed by over 150 countries at the 1992 UN Conference on Environment and Development at Rio de Janeiro.

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