9. Some constructive criticisms of the Index of Sustainable Economic Welfare

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INTRODUCTION

The Index of Sustainable Economic Welfare (ISEW) was first calculated for the United States by Daly and Cobb (1989). It draws upon an earlier tradition of attempts to build a comprehensive indicator of economic welfare, beginning with Nordhaus and Tobin (1972). Since then it has been applied to a handful of other countries, including several in Western Europe as well as Australia, Chile and Thailand (see Table 9.1). As Table 9.1 shows, some practitioners have chosen to change its name. It has appeared as the Genuine Progress Indicator (GPI), the Sustainable Net Benefit Index (SNBI) and most recently as the Measure of Domestic Progress (MDP).[1] It would be fair to say that these linguistic turns reflect the degree of confidence different practitioners have placed in the ISEW's ability to measure welfare, sustainability and 'genuine' progress. Different practitioners have also made incremental but significant changes to the methodology for calculating some of the index's component parts. In general, no two studies are quite the same. We shall have much more to say on this point below.

Fundamentally, what the original proponents of the ISEW were trying to do was create a combined indicator of welfare and sustainability.[2] They understood welfare to be the satisfaction of human preferences, whereby the emphasis was placed on a comprehensive notion of preferences including much more than just income and consumer products. What they understood by sustainability is not as easy to explain. Almost certainly they supported the notion of *strong* sustainability, according to which at least a portion of a nation's natural capital resources (including sinks such as the atmosphere) must be preserved for all time. However, it is possible to show that by adding and subtracting different forms of capital in calculating the ISEW (see below), it is technically an expression of the notion of *weak* sustainability, according to which the task is only to preserve the

Table 9.1 ISEW and derivative studies in chronological order

Authors	Country	Name
Daly et al. (1989)	USA	ISEW
Cobb and Cobb (1994)	USA	ISEW
Diefenbacher (1994)	West Germany	ISEW
Jackson and Marks (1994)	UK	ISEW
Moffatt and Wilson (1994)	Scotland	ISEW
Rosenberg et al. (1995)	Netherlands	ISEW
Jackson and Stymne (1996)	Sweden	ISEW
Castañeda (1997)	Chile	ISEW
Jackson et al. (1997)	UK	ISEW
Stockhammer et al. (1997)	Austria	ISEW
Guenno and Tiezzi (1998)	Italy	ISEW
Hamilton (1999)	Australia	GPI
Lawn and Sanders (1999)	Australia	SNBI
Redefining Progress (ongoing, beginning in 1999)	USA	GPI
Clarke and Islam (2003)	Thailand	ISEW
Jackson (2004)	UK	MDP

total capital stock, not necessarily natural capital *per se* (see Neumayer, 1999a, 2003).

The ISEW has perhaps two prime motivations. The first is the obvious flaws that the traditional indicators of macroeconomic activity, gross domestic product (GDP) and gross national product (GNP), have in measuring welfare and sustainability. In Chapter 6, we made the point that, although GDP and GNP were not intended to be measures of welfare (see Neumayer, 1999a), in practice they have often been construed in that way. Secondly, proponents of the ISEW were confident that it would give expression to a notion commonly held by ecological economists: that continued growth of the economy would at some point in time cease to be sustained by the global ecosystem.

CONCEPTUAL ISSUES

What has until recently been missing from the ISEW literature has been a substantial theoretical foundation, something that has not escaped the notice of its detractors in the past (e.g. Atkinson, 1995; contributors in Cobb and Cobb, 1994; Neumayer, 1999a, 1999b). Lawn (2003) has gone some way towards filling this hole. He shows that the index gives a degree of expression to a concept of income and capital first developed by Fisher (1906) in which it is the services that give final consumers utility that count, not the products that yield the services.

Though different authors have calculated the ISEW in different ways, the core components of the index can be generalised follows:

$$
\begin{aligned}
\text{ISEW} = {} & \text{Personal consumption weighted by income inequality} \\
& + \text{domestic labour} \\
& + \text{non-defensive public expenditure} \\
& - \text{defensive private expenditure} \\
& - \text{difference between expenditure on consumer durables} \\
& \quad \text{and service flow from consumer durables} \\
& - \text{costs of environmental degradation} \\
& - \text{depreciation of natural resources} \\
& + \text{capital adjustments}
\end{aligned} \tag{9.1}
$$

The basic building block of the index is personal consumption expenditure, which is weighted with an index of income inequality in order to embrace the notion that extra money could be of greater marginal utility to the poor than to the rich. From here, it is easiest to understand the additions and deductions made in terms of Fisher's (1906) notion of flows of services. It follows that some service flows providing utility are not included in personal consumption expenditure and thus need to be added. These include non-defensive public expenditure on, for example, health, education and roads and an estimate of the value of domestic labour services from housework and parenting. One also adds growth in capital and net foreign lending/borrowing. This sits rather awkwardly with our explanation in terms of consumer welfare. In fact, these components are added, because the ISEW is concerned not only with welfare but also with sustainability. For instance, consumer expenditure financed by international debt is unlikely to be sustainable.

Other service flows are included in personal consumption expenditure but should not be, because they are not associated (directly) with consumer utility. Hence one deducts defensive private expenditures on such things as health, education, commuting and personal pollution control and the difference between expenditure on consumer durables and the flow of services they provide, which is estimated as the depreciated value of the total stock of consumer durables. Other deductions that have from time to time been made include the cost of national advertising[3] (Cobb and Cobb, 1994) and the costs of crime and family breakdown (Jackson, 2004). Other components are not included in personal consumption but need to be deducted, because they reduce the welfare of consumers either now or in the future.

These include, firstly, the costs of environmental degradation. This typically includes such things as air pollution, water pollution, ozone depletion and the long-term environmental damage resulting from climate change. Secondly, one deducts the depreciation of natural resources, including non-renewable mineral and fossil fuel resources, the loss of natural habitats such as wetlands and the loss of farmland.

In almost all ISEW and derivative studies undertaken thus far, a striking pattern has emerged. Until around the 1970s or early 1980s, the ISEW grows in line with GNP. However, around this time it apparently reaches a turning point and either levels off or in some cases falls. In reviewing the earlier empirical evidence, Max-Neef (1995) describes this trend as the 'threshold hypothesis'. In his own words, 'for every society there seems to be a period in which economic growth brings about an improvement in the quality of life, but only up to a point – the threshold point – beyond which, if there is more economic growth, quality of life may begin to deteriorate' (Max-Neef, 1995, p. 117). This does indeed appear to reinforce the suspicions of Daly and others.

Yet, it is worth asking whether the persistence of the threshold hypothesis is in fact a true reflection of welfare growth and decline, or whether this strong result is an artefact of some methodological flaws. In this chapter, we show that the existence of a threshold is virtually inevitable as soon as one makes some questionable assumptions regarding the growth of the costs of non-renewable resource depletion and long-term environmental damage. In addition, we offer some cautionary notes on the way in which private consumer expenditure is adjusted for income inequality and on which expenditures, if any, should properly be regarded as defensive. In summary, we take issue with the calculation of four components of the ISEW:

1. the valuation of the depletion of non-renewable resources;
2. the cumulative cost of long-term environmental damage;
3. the adjustment of private consumer expenditure for income inequality;
4. the deduction of defensive expenditures.

Elsewhere, critics of the ISEW have asked some very important conceptual questions. In particular, Neumayer (2004a, p. 4) argues that it is not possible to combine an indicator of current welfare with an indicator of sustainability, Indeed, 'what affects current well-being need not affect sustainability and vice versa.' For example, the depletion of non-renewable resources is a key determinant of sustainability, because the available stock of natural capital is diminished for future generations. On the other hand, it makes little difference to current welfare. We have already seen the problems that this causes the ISEW: the inclusion of capital adjustments do not seem to fit with the post hoc theoretical framework offered by Fisherian income. Since our remit is to focus on practical rather than conceptual problems, we will not persevere with this argument: suffice to say it is important and the interested reader is directed to Neumayer (2004a). For all that, the ISEW's focus on comprehensive current welfare is laudable. Indeed, the emerging sustainable consumption discourse gives the ISEW renewed salience, because, according to some, the task of making society consume more sustainably is in large part a question of separating out those things that we consume that make us 'happier' and those that don't or even make us less happy (see Levett, 2003).

DEPLETION OF NON-RENEWABLE RESOURCES

In Chapter 6, we pointed out that the way in which the depletion of non-renewable resources was valued had an important bearing on the magnitude of genuine saving rates and therefore, to some extent, on cross-national patterns through time. It turns out that the same is true of ISEW estimates. In this case, there are three points of debate. Firstly, there is the question of whether it should be the resources extracted within a nation's borders or the resources consumed there that are valued. Secondly, there is the question of whether to use replacement costs or resource rents to value each unit of resource depleted. Thirdly, if one elects to use resource rents, there is the question of whether one calculates total resource rents or user costs – the so-called El Serafy method. We deal with each of these questions in turn.

Resource Production or Resource Consumption?

ISEW studies have not been consistent in which of these they have used as the basis for valuing non-renewable resource depletion. All studies that use resource rents to value each unit of depletion value resource extraction rather than consumption. These are: Daly and Cobb (1989) for the United States; Diefenbacher (1994) for Germany; Guenno and Tiezzi (1998) for Italy; Lawn and Sanders (1999) for Australia; and Stockhammer et al. (1997) for Austria. On the other hand, those studies using replacement costs to value each unit of depletion have been divided between valuing extraction and consumption. Cobb and Cobb (1994) and Redefining Progress (1999) use resource extraction. In contrast, those using consumption are: Hamilton (1999) for Australia; Castañeda (1999) for Chile; Jackson and Marks (1994), Jackson et al. (1997) and Jackson (2004) for the UK; Jackson and Stymne (1996) for Sweden; Moffat and Wilson (1994) for Scotland; and Rosenberg et al. (1995) for the Netherlands.

Those studies applying the resource rent method to value each unit of depletion are correct to value resource extraction rather than consumption, because resource rents from extraction, not consumption, are an addition to the national accounts. To subtract the value of consumption instead would be subtracting something that was not there in the first place. However, the opposite is true for those studies applying the replacement cost method. The rationale behind the replacement cost method, which we will elaborate below, is that non-renewable resources will eventually run out and will have to be replaced, at some point in full, by renewable resources. On this basis it becomes irrelevant whether resources are sourced domestically or imported: it is the cost of replacing all the non-renewable resources consumed that matters. Therefore Cobb and Cobb (1994) and Redefining Progress (1999) are wrong to use resource extraction when they use the replacement cost method. But which method should one choose: the resource rent or the replacement cost method? We turn to this question now.

Resource Rents or Replacement Costs?

In Daly and Cobb's (1989) original ISEW for the United States, each unit of non-renewable resource extracted is valued using the resource rent method. With this method, non-renewable resource depletion is equal to the income that accrues from extracting and selling the resource stock. In fact, it can equal either all of the income that accrues or only a part of it, depending on whether one calculates total resource rents or user costs – the so-called 'El Serafy' method. We will discuss this issue below. There is an obvious and accepted rationale for using resource rents to value depletion. Since non-renewable resources are by definition irreversibly lost in the process of extraction, some if not all of the income accruing should be considered unsustainable.

When Cobb and Cobb (1994) recalculated the US ISEW five years later, they opted for the replacement cost method instead. This method constitutes a clean theoretical break from the resource rent method. Here, the value of non-renewable resource depletion should be derived from the cost of substituting all the non-renewable resources used with renewable resources (this explanation reinforces the point made above that it is resource *consumption* rather than production that is the appropriate subject of per-unit valuation with the replacement cost method). This follows from the assumption that non-renewable resources will eventually have to be fully substituted by renewable resources.

There are two chief difficulties with the replacement cost method. The first concerns the assumption that non-renewable resources will have to be fully substituted by renewable resources. Of course, in the long run this must be true. The problem is that in calculating the ISEW it is assumed all non-renewable resources consumed have to be replaced straightaway. There is no reason why this should be the case when, even now, there are large remaining reserves of many non-renewable resources. The assumption becomes even less tenable when we retrospectively calculate the ISEW as far back as the 1950s and 1960s: one ends up assuming that in, say 1950, all oil used in that year has to be fully replaced by renewables at once! In the present-day climate, renewable resources continue to offer in many cases a marginally expensive option compared to non-renewable resources and thus the profit-maximising consumer (intermediate industrial user or final consumer) will in most cases continue to opt for non-renewables. Why not wait until renewable resources are relatively cheap? They are unlikely to be so expensive in the future, which brings us to the second weakness of the replacement cost method.

In Cobb and Cobb (1994), the replacement cost of every barrel of oil equivalent was escalated by 3 per cent per annum throughout the entire 1950 to 1990 period and anchored around an assumed cost of $75 per barrel in 1988. All the other replacement cost-based studies to date (see above) have followed suit. Cobb and Cobb justify their escalator by pointing to the costs per foot of oil drilling in the 1970s, a period in which high prices made it economically viable to explore more marginal oil reserves. In this period, they report that drilling costs increased by 6 per cent per annum. One would expect to see extraction costs spiral as the resource becomes increasingly scarce, but Cobb and Cobb stretch the principle rather too far when they argue that the same will be true of renewable fuels, 'though not as dramatically' (Cobb and Cobb, 1994, p. 267). Therefore they arrive at an annual cost escalator of 3 per cent. The problem with extending their reasoning to renewable resources is that, as well as scarcity, the unit cost of renewable resources will be influenced by technology costs. In the long run, we will most likely have to rely on solar energy to replace the bulk of non-renewable energy used. In line with many new technologies, solar power is currently marginally expensive because the technology is in the early stages of development. Costs will fall in time as the technology improves (Lenssen and Flavin, 1996). Furthermore, the influx of solar energy currently exceeds total world energy demand by at least an order of magnitude (Norgaard, 1996). Ergo, it is not scarce. All in all, it may be more appropriate to assume falling annual replacement costs.

Escalating replacement costs in this way contributes to the threshold hypothesis. Neumayer (2000) showed that, as a consequence of the way in which non-renewable resource depletion is calculated using replacement costs, the deduction term will grow over time provided resource use does not fall by more than the 3 per cent factor used in escalating costs. Furthermore, it will grow at a rate faster than GNP if GNP growth is smaller than 3 per cent plus the growth rate of resource use. In other words, if resource use is non-decreasing, as indeed it tends to be, and GNP grows at less than 3 per cent, which is not uncommon either, then the escalated costs of non-renewable resource depletion will cause an increasing gap between GNP and the ISEW, *ceteris paribus*. Figure 9.1 makes this point clear. It shows the rate of growth of GNP versus the rate of growth of non-renewable resource depletion costs, escalated by 3 per cent per annum, for four ISEW country studies: the Netherlands, Sweden, the UK and the USA. In all four cases, the escalated replacement costs of non-renewable resource depletion are growing faster than GNP. Not only that, they constitute a significant proportion of all deductions made to arrive at ISEW estimates. Neumayer (1999a) calculates that it makes up 37 per cent of all deductions taken from the US ISEW in 1990, 31 per cent of those taken from the UK ISEW in 1996, 21 per cent of those taken from the Swedish ISEW in 1992 and 36 per cent of those taken from the Dutch ISEW in 1992. If, instead of escalating replacement costs by 3 per cent per annum, we assume them to be constant, Figure 9.1 illustrates that we no longer the see the marked divergence between non-renewable resource depletion costs and GNP growth. Indeed, in the UK and US indices, they actually grow more slowly than GNP. This casts some considerable doubt on the threshold hypothesis.

Total Resource Rents or User Costs According to the El Serafy Method?

If one opts to value non-renewable resource extraction using resource rents, as indeed we have argued one should, then there is some debate over whether it is better to calculate total resource rents or user costs. One can calculate the latter using the El Serafy method (El Serafy, 1989). This is a debate that we have already visited in Chapter 6 in the context of genuine saving. Of the ISEW studies that have used the resource rent method, Lawn and Sanders (1999) computed their SNBI for Australia with user costs, while all other studies have used total resource rents.

In Chapter 6, we explained the theory behind these different measures of resource rents and the practice of computing them. From a theoretical perspective, total resource rents assume that none of the income derived from extracting a non-renewable resource is sustainable. On the other hand, the El Serafy method in effect partitions the income stream generated into an unsustainable part: the user cost, and a sustainable part: Hicksian income. So there is some lower income generated by non-renewable resource extraction that can indeed be sustained into the future. This makes a degree of sense, because some of the proceeds of extraction can be invested in other forms of capital – fixed and human – that might at least partly substitute

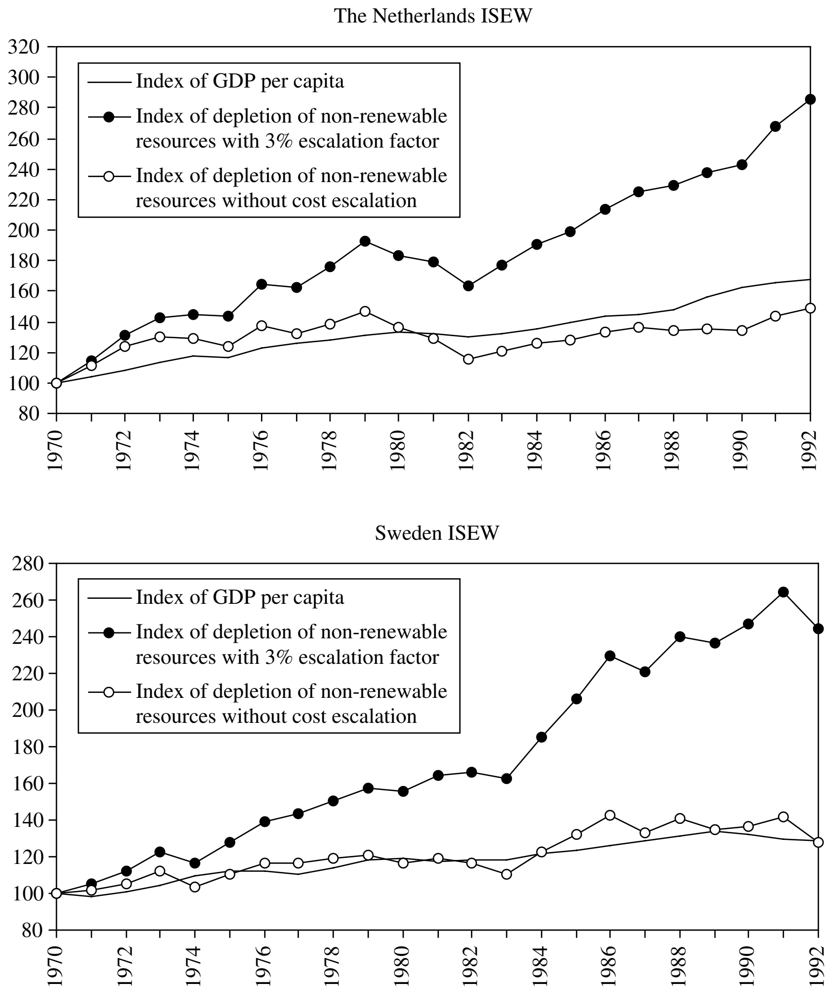
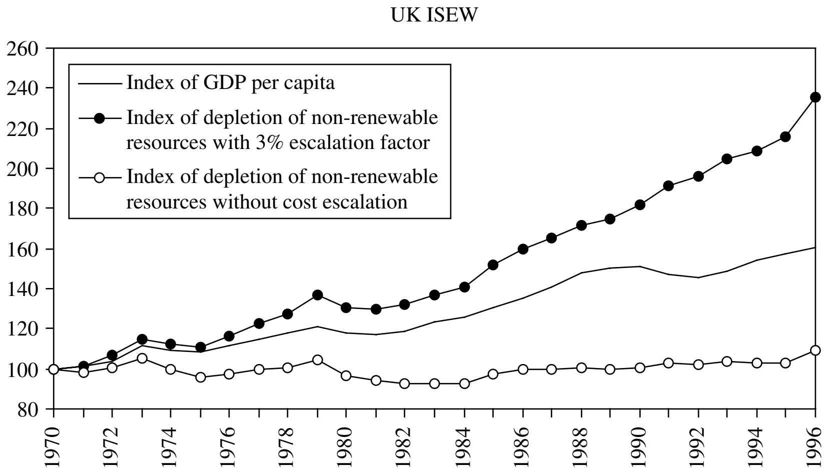


Figure 9.1 GDP/GNP per capita and the value of non-renewable resource depletion with and without escalating replacement costs. Examples from the Netherlands, Sweden, the UK and the USA

for the depleted natural capital stock. There can also be shortcomings with the computation of total resource rents in practice. Most importantly, the total resource rent method depends on the assumption of inter-temporally efficient markets that naturally lead to optimal prices. There is no reason to presume resource pricing is optimal though, not least because of the



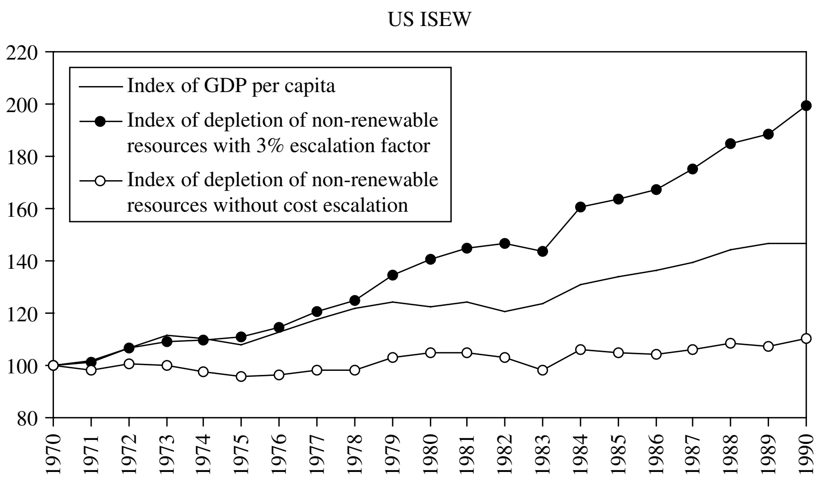


Figure 9.1 (continued)

external costs of extraction. The El Serafy method does not depend on the optimality assumption.

In addition, although total resource rents should in theory be computed as price minus the marginal cost of extraction multiplied by the volume of the resource that is extracted, it is generally necessary to substitute average costs for marginal costs. To the extent that marginal costs are increasing (thus squeezing profits) whereas average costs are not, average costs will tend to overestimate resource depletion. That said, when the discount rate and the number of remaining years of the resource stock are both low, the two methods will produce converging estimates (see Chapter 6) and, where total resource rents do not seem unreasonably high, one can look at them as a particularly conservative estimate, in the sense that, being larger than user costs, they will tend to place more emphasis on non-renewable resource depletion.

The Cumulative Cost of Long-term Environmental Damage

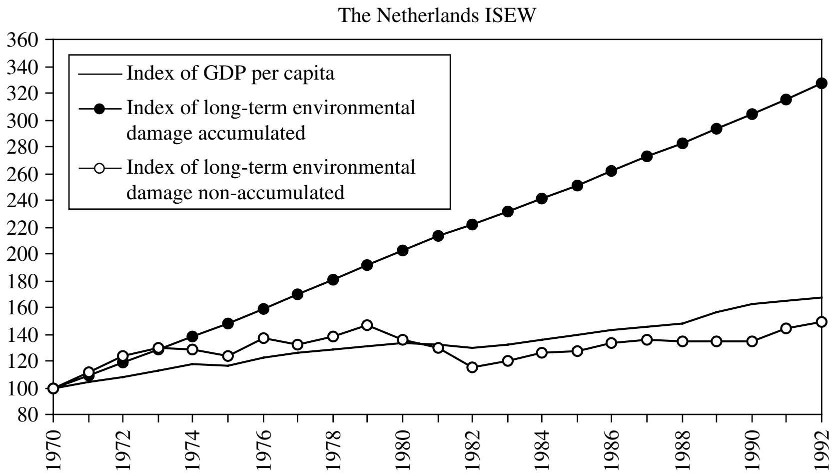
In Daly and Cobb's (1989) original ISEW study, the cost of long-term environmental damage is the cost of climate change. Cobb and Cobb (1994) include ozone depletion in their revised US study, following Eisner's observation in the same volume that not all long-term environmental damage is caused by energy use. In terms of the cost of climate change, Daly and Cobb (1989) value each unit of energy consumed (each barrel of oil equivalent) in a given year at US$0.50 in 1972 dollars. This includes both fossil fuels and nuclear energy, based on the assumption that the social cost of decommissioning spent fuel rods and reactors is about the same as the social cost of climate change (Cobb and Cobb, 1994).[4] Critically, the cost of energy consumption in a given year is actually deducted from the ISEW in all subsequent years: it is cumulative. Therefore in a given year one must deduct the value of environmental damage caused by energy consumption in all previous years too.

Cobb and Cobb (1994) explained the logic behind the method. They imagined that a tax of US$0.50 had been levied on all non-renewable energy consumed during the measurement period. This was set aside to accumulate in a non interest-bearing account in order to provide a fund to compensate future generations for the damage caused by climate change. This does not specifically explain why they let the costs accumulate, but it seems as if they extended their reasoning on wetland and farmland loss, where costs were also accumulated. The costs of wetland and farmland loss are accumulated, because the services provided by a wetland are lost not only in the year in which the wetland is destroyed, but in every subsequent year too. Alternatively, they may have reasoned that the proceeds of a non-accumulated tax would not have provided compensation to future generations for emissions prior to the introduction of the tax. Cobb and Cobb (1994) value the cost of ozone depletion in a very similar way, being US$15 per unit production of CFC-11 and CFC-12 in 1972 prices, accumulated year-on-year after the year of production.

Cobb and Cobb (1994) conceded that they set the unit cost of energy consumption at US$0.50 arbitrarily. In Jackson et al.'s (1997) ISEW and Jackson's (2004) MDP, both for the UK, and Stockhammer et al.'s (1997) ISEW for Austria, each tonne of greenhouse gas emissions is valued at its marginal social cost. Jackson et al. (1997) and Jackson (2004) derive their unit cost estimate from Fankhauser (1995), which is generally considered to be a consensus estimate. The marginal social cost of a tonne of greenhouse gas emissions is the total discounted value of all future damage arising from that tonne of emissions. But instead of deducting the marginal social cost of a given year's emissions for that year only, both studies allow the costs to accumulate over time by making deductions in all following years.

Whichever theoretical underpinning one chooses – and the notion of marginal social cost is more rigorous – allowing the costs of long-term environmental damage to accumulate is problematic (Atkinson, 1995; Neumayer, 2000). In valuing each tonne of greenhouse gas emissions at its marginal social cost, the future cost of a tonne of emissions is already included in terms of its discounted value over all time. Letting the costs accumulate annually amounts to multiple counting. Hamilton (1999) recognises this problem and does not accumulate costs in his GPI computations for Australia. On the other hand, Cobb and Cobb (1994) are explicitly accumulating *undiscounted* costs. To recap, they do so apparently because they are valuing the annual loss in climate services resulting from greenhouse gas emissions. But it is not possible to simply extend the notion of lost services from the wetland scenario to that of climate change, because we have barely begun to feel the impacts of climate change. Up until now, the lost services associated with greenhouse gas emissions have been negligible. Furthermore, it is very difficult to establish, let alone come close to quantifying, the relationship between greenhouse gas emissions arising from energy consumption and the loss of elements of a habitable climate. Indeed, climate change is a fundamentally complex process. On a practical note, Cobb and Cobb imagined that tax proceeds in any year are set aside to compensate future generations. This is fine, but according to the logic of accumulation one needs to make the same deposit in the following year, the year after that and so on, and must find from somewhere the revenue to cover all previous years' emissions. This is surely not what they had in mind.

Choosing to accumulate the cost of long-term environmental damage turns out to be a 'big' decision in terms of calculating the ISEW in the same way as escalating the costs of non-renewable resource depletion is. In the US ISEW the cumulative cost of climate change constitutes 33 per cent of all deductions made in 1990. In the UK ISEW the cumulative cost of climate change and ozone depletion amounts to 32 per cent of all deductions made in 1996 and in Sweden it amounts to 23 per cent of all deductions made in 1992. Figure 9.2 demonstrates that such estimates of long-term environmental damage contribute a great deal to the threshold hypothesis. The similarities with the case of non-renewable resource depletion are once again striking. The rate of growth of the accumulated costs



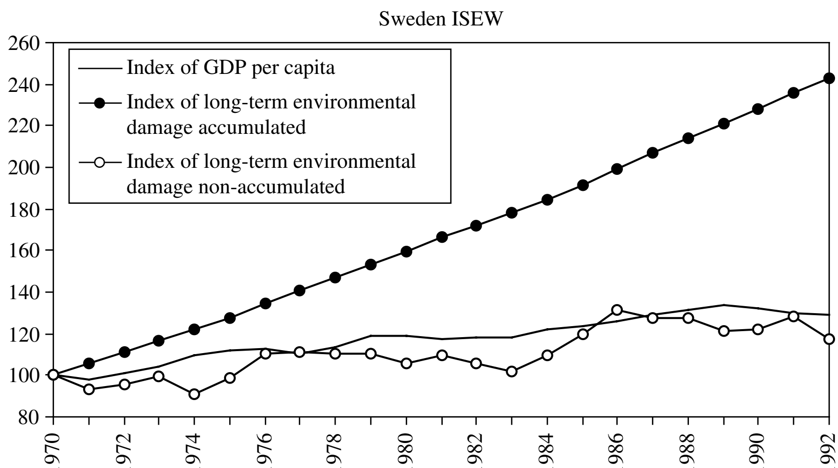
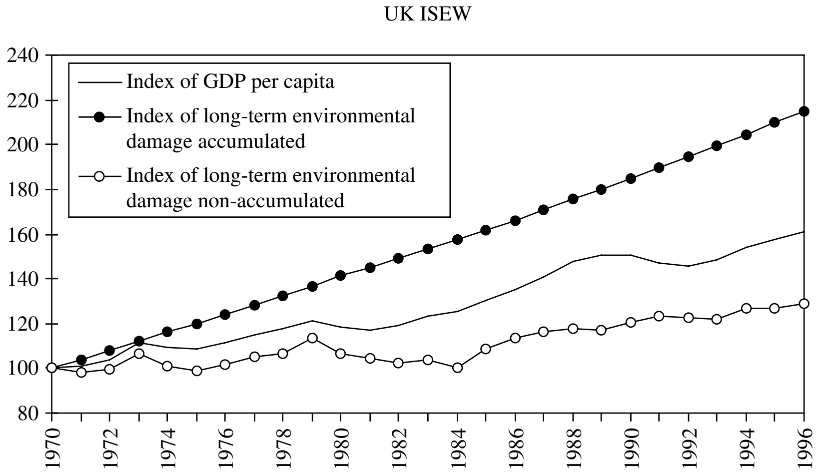


Figure 9.2 GDP/GNP per capita and the value of long-term environmental damage with and without accumulation costs. Examples from the Netherlands, Sweden, the UK and the USA

of climate change outstrips that of GDP/GNP in all four countries, with the gap widening year by year. *Ceteris paribus*, this will magnify any genuine threshold effect that might possibly exist.

If the costs of climate change are not accumulated, then Figure 9.2 shows that this divergence is no longer apparent. In the Netherlands and Sweden, the rate of growth of long-term environmental damage is about the same as



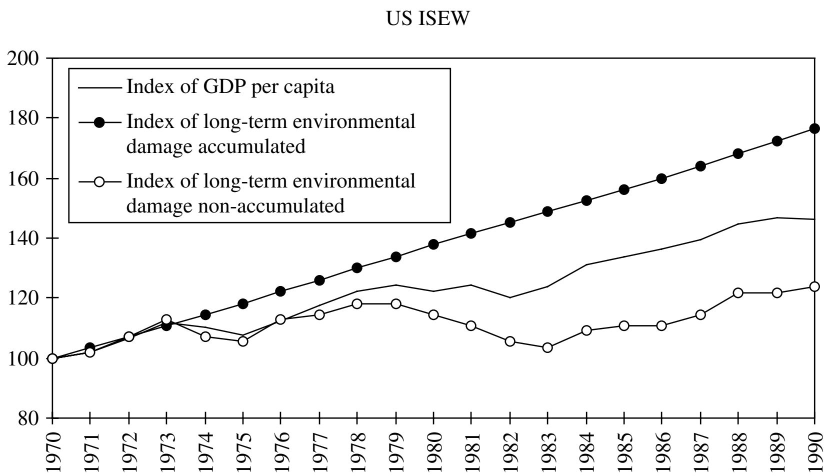


Figure 9.2 (continued)

GDP/GNP throughout the measurement period and, in particular, is lower than GDP/GNP for most of the 1980s and early 1990s. In the UK and the USA, the growth rate of long-term environmental damage is in fact lower than that of GDP/GNP for the whole period, and the difference between the two trends widens year on year, such that long-term environmental damage is virtually an ever decreasing proportion of gross production.

Even if the marginal social cost of greenhouse gas emissions is not accumulated, it is still appropriate to allow costs to increase from one year to the next, as the marginal social cost of each tonne of emissions is a positive function of the accumulated stock of carbon in the atmosphere. The more carbon dioxide there is in the atmosphere, the greater is the social damage cost of each additional tonne pumped in. In fact, Jackson et al. (1997) follow this idea for the UK by making the assumption that the marginal social cost of a tonne of emissions is increasing in proportion to cumulative carbon emissions from the year 1900 up to its 1990 value of GBP11.40 per tonne. However, if this was to contribute to the threshold hypothesis, we would expect to see the non-accumulated costs of long-term environmental damage in the UK ISEW grow faster than GDP. As we have seen from Figure 9.2, the opposite is in fact the case. Once again, we find reason to doubt the threshold hypothesis.

Adjusting Private Consumer Expenditure for Income Inequality

As we have presented it, the first step in calculating an ISEW is to multiply consumer spending by a measure of income inequality such that the greater is the inequality in income in a given country, the lower is the index value and the more the product term is scaled down. The motivating assumption behind this adjustment is that an 'additional [say] thousand dollars in income adds more to the welfare of a poor family than it does to a rich family' (Cobb and Cobb, 1994, p. 31). There are differences between ISEW studies in the method they use to adjust consumer spending. One reason for this is that available data on income inequality vary from country to country. We focus on the difference between Jackson et al.'s (1997) ISEW and Jackson's (2004) MDP for the UK and the rest of the studies.

Most ISEW studies use an index of income inequality to adjust consumer spending and generally they use the Gini coefficient or a derivative. On the other hand, Jackson et al. (1997) and Jackson (2004) use the so-called Atkinson index:

$$\text{Atkinson index} = 1 - \exp[\textstyle\sum (Y_i/\bar{Y})^{1(1-\varepsilon)} f_i]^{1(1-\varepsilon)} \qquad (9.2)$$

where Y_i = the mean income of all individuals in the ith income group (out of a total of n groups); $\bar{Y}$ = mean income for the whole population; f_i = the proportion of the population with incomes in the ith group; and ε = a parameter estimating the weight attached by society to income inequality that must be chosen by the researcher.[5]

Importantly, ε can be either positive, which implies society is averse to an unequal distribution of income (with larger values implying greater aversion), zero, which implies society is indifferent, or in principle at least negative, which implies society has a positive preference for income inequality.

The advantage of the Atkinson index lies in ε: it forces the researcher to be explicit in his/her assumption about how averse society is to income inequality. A thousand dollars may indeed be worth more in welfare terms to the poor than it is to the rich, but, even if this is the case (and some would disagree), by how much? Therefore we can either make an assumption about society's aversion to income inequality, or we can resort to empirical estimates from attitudinal surveys on the level of well-being associated with different income levels. Pearce and Ulph (1995) estimate ε lies between 0.7 and 1.5, with a best estimate of around 0.8. This is the value used by Jackson et al.

If one uses the Gini coefficient, then the first step is normally to select a year as the base year and index all other years relative to this. Then unadjusted consumer spending is divided by this index and multiplied by 100. This is problematic, because the approach has no clear welfare-theoretic interpretation. In other words, it does not make explicit its assumption as to how averse society is to income inequality. Instead, it makes a rough and ready adjustment to consumer spending that is at best relative to the base year of the index in any case (Jackson et al., 1997).

Even if one does choose to adjust consumer spending with the Atkinson index, which we recommend, one needs to take care in interpreting the resulting ISEW. In particular, one needs to exercise caution in interpreting ISEW results in absolute terms. Indexing consumer spending makes the ISEW an index, and as such one can either restrict oneself to interpreting changes in the ISEW over time, or one must explicitly state what the base year was chosen in indexing income inequality.

Deduction of Defensive Expenditures

Leipert provides a useful definition of defensive expenditures: 'expenditures . . . made to eliminate, mitigate, neutralize, or anticipate and avoid damages and deterioration that industrial society's process of growth has caused to living, working, and environmental conditions' (Leipert, 1989, p. 28). Put another way, if, in Fisher's (1906) terms, we want to measure the psychic income consumers gain when they enjoy the services provided by commodities, then defensive expenditures should embrace what we spend on insulating ourselves from the 'psychic outgo' of the economic process (Lawn, 2003, p. 111). The question of what, if any, defensive expenditures to deduct in calculating the ISEW is in fact a subset of a debate in national accounting that has been 'live' for as long as national accounting itself: whether all commodities currently produced are a source of final satisfaction to consumers or whether they might properly be regarded as 'intermediate inputs regrettably required to produce other useful goods' (England, 1998, p. 3).

But the major problem with deducting defensive expenditures is where to draw the line. One might agree that consumer spending on commuting to work is not so much psychic income as psychic outgo (though by no means everyone would choose to live next to their workplace even if they did have the choice), but some ISEW estimates have gone as far as considering spending on health and education defensive. In Cobb and Cobb's (1994) US GPI, for instance, they effectively deduct half of all public and private spending on health and education on the grounds that it is defensive. Vis-à-vis education, they deduct spending on primary and secondary education as 'people attend school because others are in school and the failure to attend would mean falling behind in the competition for diplomas or degrees that confer higher incomes on their recipients' (Cobb and Cobb, 1994, p. 54). Similarly, they rather arbitrarily deduct half of all spending on health, because they assume that this half is simply spent in order to compensate people for 'growing health risks due to urbanization and industrialization' (Cobb and Cobb, 1994, p. 55). But if this is the case one can classify most spending as defensive. Neumayer (2004b, p. 154) asks, 'why should food and drinking expenditures not count as defensive expenditures against hunger and thirst?' Even if one accepts Daly and Cobb's defence that they only deduct defensive expenditures beyond the baseline environmental conditions, one could still argue that some portion of all spending is forced by undesirable modes of modern living. As the Commission of the European Communities et al. has argued (1993, p. 1), 'pushed to its logical conclusion, scarcely any consumption improves welfare in this line of argument'.

Certainly in the case of education, Cobb and Cobb are at odds with most economists, who would suggest that education expenditures (even at primary and secondary levels) are productive and welfare-improving. With regard to their health expenditure deductions, they would presumably concede the choice of deducting half of all spending is arbitrary. We would advise greater caution in classifying expenditure as defensive.

CONCLUSION

In this chapter, we have sought to make some constructive criticisms of the ISEW methodology. We encourage practitioners in the field to question certain assumptions that may give a false impression of the threshold in the growth of sustainable welfare. In doing so, we acknowledge that some recent studies, especially Hamilton's (1999) GPI for Australia, are themselves doing so and improving their accounts as a result. We do not exclude the existence of thresholds altogether. We have simply demonstrated that two key deductions made in calculating the ISEW – the cost of non-renewable resource depletion and the cost of long-term environmental damage – are highly influential in creating the threshold, but are much less important given what we consider to be more reasonable assumptions.

In summary, we recommend the following to ISEW practitioners. Firstly, in valuing non-renewable resource depletion, those who choose to apply the resource rent method should base their calculations on national extraction, while those who choose to use replacement costs need to use estimates of national consumption. We also recommend that those using resource rents consider the implications of calculating user costs according to El Serafy rather than total resource rents. Most importantly, we caution against using a 3 per cent cost escalation factor in calculating replacement costs: there does not seem to be a reasonable theoretical basis for escalating replacement costs and its effect on the cost of non-renewable resource depletion over time is manifest. Given some frequently observed trends in resource use and GDP/GNP growth, we have shown that it is inevitable that the ISEW will diverge from GDP/GNP, *ceteris paribus*. Second, practitioners should not, in our view, let the costs of climate change and ozone depletion accumulate yearly. Again, we see no reasonable theoretical basis for doing so and the effect this has on the cost of long-term environmental damage is very large indeed. Third, in adjusting consumer expenditure for income inequality, we recommend using the Atkinson index rather than a more crude method of adjustment based on Gini coefficients. Doing so ensures one adopts a transparent position on just how much more utility extra consumption gives the poor compared to the rich. Fourth, and finally, we urge caution in classifying expenditures as defensive. It is always rather difficult to argue a form of expenditure is fully defensive, and some, such as education, do not seem to accord with the notion at all.

NOTES

1. Osberg and Sharp (2002a, 2002b) have also produced the Index of Economic Well-Being, which they compute for a selection of OECD countries. This is similar in its aims to the ISEW, but makes a much less comprehensive set of adjustments for environmental degradation and none at all for resource depletion (Neumayer, 2004a).
2. It is worth noting that not all ISEW practitioners believe that increases in the ISEW truly indicate increasing sustainability and progress (Jackson, 2004; Lawn, 2003).
3. Cobb and Cobb's contestable rationale is that national advertising does not offer information of value but instead 'tends to be aimed at creating demand for products and brand name loyalty through the use of images that have little to do with the actual product' (Cobb and Cobb, 1994, p. 55).
4. Cobb and Cobb (1994, p. 73) provide no evidence to support this assumption. In their view, '[t]he cost of keeping radioactive elements with long half-lives out of the environment for thousands of years is anybody's guess.'

5. Atkinson (1983) suggested that ε can be thought of as the amount of income that could be transferred from a rich person to a poor person such that the net benefit of doing so remains positive. In other words, the gain enjoyed by the poor person is greater than the loss felt by the rich person plus transfer costs.

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