

Unnatural Capital Accounting

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1. One Instrument: Two Purposes

Accounting is not a topic that immediately sends the hearts of nations throbbing. But there is one case where it should and that is where it concerns the survival and prosperity of humanity. No less an issue is at stake in relation to natural capital accounting.

Accounting for our natural capital (our environment and ecosystems) is a topic that has risen to prominence over the last few years. It has become the subject of national and international initiatives and, as part of the Rio+20 Earth Summit, the UK is leading the way in promising to embed natural capital in its national accounts by 2020. The enthusiasm, determination and good intentions are all there – and both national and international bodies are steaming ahead to implement natural capital accounts. The only question is whether they are all charging in the right direction or about to topple over.

The reason for being concerned on this score is that in trying to devise a system of natural capital accounting at a national and international level, two different concepts are being conflated. First there are national accounts and how these might be adapted to reflect natural capital. Second, there is what is termed comprehensive or inclusive wealth accounting in which broader measures of national well-being and wealth are sought. Both are important yardsticks but they are distinct and an attempt to combine them into

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one is mistaken. It is equivalent to trying to adapt good budgetary housekeeping to reflect the total state of well-being or happiness of the members of the family.²

Sections 2 and 3 describe how national natural capital accounting and inclusive wealth accounting both serve valid but different purposes requiring different tools of measurement which together offer particularly valuable techniques for guiding policy. Section 4 discusses how the tools of natural capital accounting can be adapted to corporations and take a form that differs from existing systems of environmental profit and loss reporting.

While measurement is critical to identifying what is required to place the economy on a sustainable basis, it does not in itself automatically translate into policy. Section 5 considers what is required for corporations to transition from measurement to sustainable policies and for natural capital accounting to become an integral part of their decision taking. As section 6 concludes, appreciating the distinction between inclusive wealth and natural capital accounting is critical to this and the derivation of appropriate tools for guiding the adoption of sustainable policies by nations and corporations.³

2. National Accounting

National accounting is concerned with measuring the economic activity of a nation. The criticism that is correctly levelled against existing approaches to this is that they fail to account for all the factors that are employed in the production of goods and services, in particular the consumption of our natural capital. As such national accounts represent an

² The System of Environmental-Economic Accounting (SEEA), a joint initiative between the European Commission, the Food and Agriculture Organization, the International Monetary Fund, the Organization for Economic Co-operation and Development, the United Nations and the World Bank is establishing a common framework for the adoption of natural capital national accounting by national authorities around the world. In its central framework document of 2012, the SEEA states that “where market prices do not exist, the estimation of values requires the use of assumptions and models. Overall, these models have proved to be sound tools for the development of meaningful valuations for produced assets. At the same time, there are complexities in the application of these models that compilers and users should be aware of before applying the models in practice.” (#5.97) It then goes on to describe two approaches: “written down replacement cost” and “the net present value approach” which should be adopted for the valuation of natural capital where market prices are not available.

³ The article is written in a non-technical way for a general audience of readers.

overstatement of the net value of production, income and consumption to the extent that non-market natural capital resources which have been consumed are not properly accounted for. It is as if the landlord of a property records his rental income without acknowledging the deterioration in the properties he manages and thereby misperceives both his true wealth and disposable income.

The proper way to account for this in the context of natural capital is exactly the same as in regard to any form of capital, namely on a capital consumption basis: to what extent has the productive potential of the capital been diminished and how much needs to be expended to restore it to its previous productive potential? Put very simply if you earn 100 and have to spend 20 on restoring the fabric of your properties, your income is 80 and not 100. Likewise if national income is 100 and the cost of restoring natural capital to its condition at the start of the period in question is 20 then net national income is 80 not 100 as currently reported.

What should be measured?

There are some complications that arise in relation to natural capital but in many respects they make accounting for natural capital easier not harder. The first consideration is the fundamental characteristic of natural capital itself, namely that it in large part (though not exclusively) derives from nature. Many, if not most, forms of natural capital have been touched by the hand of man but nevertheless what distinguishes natural capital from its material counterparts is that it also largely comprises nature. Where that nature is living it gives natural capital a unique and important feature in relation to its material counterparts – its ability to sustain itself. To the extent that this remains a feature of at least some forms of natural capital where depletion is slower than renewal, it substantially diminishes the measurement task at hand because it means that not all forms of natural capital have to be incorporated in the measurement exercise.

The enduring nature of some aspects of natural capital, such as the world's mountains and the prospect that sun will continue to rise tomorrow, mean that, in contrast to inclusive wealth, from the perspective of capital consumption there are many elements of

natural capital for which we do not have to account. Our consumption of the rays of the sun does not impinge directly on its ability to continue to emit them and the enjoyment that we derive from the existence of mountains does not affect their enduring presence, though we can do more to influence the course of the latter than the former. So we do not have to determine a measure of capital consumption of these non-depleting assets for national accounting purposes while we should incorporate the benefits that we derive from them in inclusive wealth measures.

This then suggests an answer to the question of what elements of natural capital should be incorporated in national accounts, namely those components which we are failing to sustain and in particular those that are at risk of potentially serious or catastrophic collapse. However inexact a science the creation of a register of natural capital at risk may be and whatever complications may in practice arise in constructing it, attention should be focused on those elements of natural capital that are most at risk of deterioration.

How should it be measured?

Having determined what should be measured from, for example a register of assets at risk, the second question is how it should be measured? Within an accounting framework, the answer that is given in the context of material capital is the minimum cost of maintaining the services that the capital yields. There are several interpretations that can be placed on this. The most stringent is that the natural capital is literally restored by the end of the period in question to its previous state at the start of the period. This provides no room for substitution of one form of capital for another or the offset of deterioration of natural capital in one location by investment elsewhere (for example in nature reserves in place of natural habitats).

No substitution sounds like an unduly restrictive and extreme requirement but the justification for it stems from the underlying rationale for using sustainability as the basis of capital maintenance. We would normally regard questions of whether one form of service is equivalent to another to be a matter about which the owners or the affected

communities might be asked to express a view. The role of the auditor of the accounts is then to determine whether in their judgement the provision correctly reflects the owners' and communities' assessment of equivalent services. However, in the case of natural capital, the relevant parties, namely future generations, are not in a position to express a preference. So the only way in which they can be granted a voice is by preserving the natural capital in the state in which it currently exists and leaving them to determine how they will derive benefits from the natural capital in its current form in the future.

The importance of this is reinforced by the fact that the purposes to which we believe that natural capital can be best put today may be quite different from those of future generations. There is an option value of deferring decisions about the deployment of natural capital to future generations. For example, forests may at one time have been most valued for the fuel that they could provide, whereas today their recreational and carbon sequestration benefits may be more highly prized. Furthermore, the complexities of understanding the nature of ecosystems and the environment suggest that we err in the direction of caution, imposing restrictive rather than lax rules on the no substitution requirement.

A less restrictive approach is to consider categories of similar forms of capital which in aggregate should be conserved but within which there is potential for substitution. So for example, the total stock of a particular species might be critical to its survival while its prevalence in a certain location is not. Or access to recreational land within a specified radius of an urban conurbation may be important while its situation in an existing locality is not. In other words, there may be some potential for offsetting loss of one form of natural capital with another.

The guiding principle of accounting for material capital is that it should be valued at the lower of the cost of replacement and its economic value (defined as the present value of the benefits derived from the services of the material capital). So some assets should not be valued at the cost of maintaining them because that cost cannot be justified in relation to the value that is attached to maintaining the services derived from the capital

(measured in ways that will be described in the next section). In that case, there is no benefit to be had from investing in the capital and it should be allowed to deteriorate, with the loss recorded on the income statement being the value of forgone services rather than the maintenance charge.

For the reasons described above, particular care should be taken in coming to such a conclusion in the case of natural capital because the affected party, namely future generations, is not in a position to express a view about the value of preservation and may perceive quite different uses to which the natural capital can be put from current generations. The determination of true economic valuations is particularly difficult in these circumstances. Nevertheless, there may be some types of natural capital (e.g. a disease infected swamp) from which we may derive some benefits but not sufficient to justify retention in their current form, in which case depreciation should be in terms of the value of services forgone rather than the cost of sustaining the capital.

The practicality of the approach

For the purposes of deriving income, expenditure and output statements of national accounts the minimum cost of sustaining those elements of natural capital which are deemed to be at risk has to be determined. That is the equivalent of the 20 that needs to be spent on maintaining our properties and reduces our gross rental income of 100 to a net income of 80.

On the balance sheet there is an entry not of the value of the assets but their cost of replacement or restoration. The balance sheet entry in natural capital accounts is an estimate of the cost of maintaining the asset over the predicted life of the asset if it is not sustained. So for example, woodland that is predicted to last for 100 years and requires a cost of maintenance per annum of £1 million would have a balance sheet entry of £100 million. This is the amount of loss that could be avoided if we desisted from exploiting

the woodland.⁴ To the extent that we do consume the woodland then each year the asset depreciates by £1 million unless this amount is actually expended in preserving it.

As an alternative to annual replacement, it may be possible to restore the natural capital to a level at which it can regenerate itself a rate which is at least as great as its utilization. Once a critical threshold of restoration has been reached then provided that consumption remains below the rate of regeneration, natural capital can restore itself without the need for repeated maintenance. In effect, restoration of natural capital to critical quality thresholds is an investment that substitutes for the need to continue replacement in the future.

An advantage of this approach to the inclusion of natural capital in national accounting is that, except where natural capital should not be sustained, it does not require estimates of subjective evaluations of present values of future benefits with their associated problems of determining appropriate rates of discounting future benefits.⁵ Capital maintenance is concerned with the cost this year of conserving natural capital for next year in the state that it was last year and as such it is more readily measurable than valuations based on uncertain and often indeterminate future benefits. However, while a cost approach avoids the complexities of valuing benefits, the problems associated with its implementation should not be underestimated. Identifying minimum expenditures required to prevent degradation is frequently complex and involves subjective comparisons of, for example, avoidance as against repair. In particular, establishing levels of threshold investment above which natural capital is capable of sustaining itself is prone to substantial margins of error.

Summary of natural capital accounting

In summary the process of producing natural capital national accounts is as follows:

⁴ Note that the depreciation provision is a summation of future costs (in today's prices) not a present value. It does not therefore involve discounting.

⁵ Once restoration or replacement costs of natural capital have been determined then society's views can be sought on whether they are justified by the associated benefits.

- 1 Create a register of assets that are at risk of deterioration. Those that are nearing critical threshold points at which there are serious risks of catastrophic and irreversible collapse should be particularly prioritized. However, there are other forms of natural capital for which accounts should be created even though their condition is not judged to be critical.
- 2 Estimate the minimum cost of sustaining these assets on a like-for-like basis.
- 3 Where the value of the asset to future as well as current generations is deemed to be less than the cost of sustaining it then it may be allowed to deteriorate and income statements will show the annual reduction in the present value of the asset. Alternatively, some form of offset by which compensation elsewhere is made on an equivalent but not like-for-like basis is chosen.
- 4 Where the asset is not simply allowed to deteriorate then an estimate is made of the predicted life of the asset if it is not sustained.
- 5 The annual cost of sustaining the asset is determined and cumulated over the life of the asset to establish its book entry.
- 6 Income statements record the annual depreciation of the asset, i.e. the minimum amount that needs to be spent to sustain the asset.
- 7 Balance sheets record the cost of sustaining the asset over its life.

The contrasting treatment of non-depletables, non-renewables, ecosystems and species under the above can be used to illustrate its application. *Non-depletables* (such as sunlight) will not satisfy 1 so will not be considered further. All forms of *non-renewables* that are being extracted are at risk of being exhausted but some more than others. Costs of sustaining non-renewables are in general prohibitive and so depreciation reflects the reduction in the present value resulting from extraction. The net value is therefore just the cost of extraction with the loss in value of the remaining resource precisely offsetting the revenue of what is extracted.

Those *ecosystems* which are closest to a critical threshold will be the focus of attention under 2. The costs of preservation of ecosystems and moderating the activities which are causing their degradation will be estimated. If this cost is felt to be justified in terms of

the benefits of their preservation then the cost will be subtracted from national income. An estimate of the potential life of the ecosystem without preservation is made and then the annual cost of sustaining the system over its life is cumulated to provide a balance sheet entry of the liability.

Species that are most at risk of extinction will be identified under 1. The cost of taking remedial action to protect these species and avoid activities that are adversely affecting their survival will be made. Those species to which society attaches most value, possibly as in the case of fish stock because it is part of the food chain, will be the ones where the cost is most likely to be thought justified. Where the species is not felt to be worth preserving an estimate of the resulting loss in value will be subtracted from national income. Where the species is protected then the cost of so doing will be estimated and cumulated over its estimated remaining life (in the absence of protection) for inclusion on national accounting balance sheets.

3. Inclusive Wealth Accounting

Inclusive wealth accounting is trying to answer a very different set of questions from the national accounts, namely the value of all forms of capital – human, intellectual, material, natural and social capital – that contribute to our well-being and prosperity. This is the equivalent of a register of the assets that we as individuals possess which together make for our overall sense of well-being – our families, friends, home, job, security of employment, health etc.

Identifying all such components of the world's capital is critically important in determining, for example, how significant human capital is in relation to material capital and social capital is in relation to private capital. It is important in establishing how capital is distributed across different parts of the world and different groups in society. It is significant in evaluating how different forms of capital have changed over time and how for example our stock of social capital today compares with what it was ten or fifty

years ago. It therefore provides a comprehensive picture of our long-term wellbeing and its evolution over time.

In relation to natural capital, valuation is important in establishing the benefits that we derive from it and the extent to which our prosperity has been enhanced by it. It is needed to evaluate how significant natural capital is in relation to other forms of capital and the extent to which different parts of the world are endowed with greater and lesser amounts of natural capital. We require valuations to determine how the benefits of natural capital are changing over time and where the most serious declines are taking place.

Inclusive wealth and investment

The valuation of natural capital is also important in providing indications of where there should be more or less investment in its preservation and enhancement. While cost-benefit analyses of natural capital should be undertaken at the margin of increments to natural capital, comparisons of the average or total value of natural capital with its cost as recorded in national accounts provides *prima facie* evidence of where investment should be concentrated.⁶ So for example, where there is little or no cost of sustaining natural capital because it effectively reproduces itself then there may be greater potential for employing it without risk of degrading it. Detailed cost-benefit analyses involving marginal valuations are required to establish whether this is indeed the case. However, they face particular challenges in evaluating natural capital investments which average valuations may go some way to address.⁷

⁶ The relation between the two can be illustrated as follows. Suppose that the value of some form of natural capital is V and the cost of sustaining it over its life is C . Suppose that there is a potential to enhance the natural capital at a cost of I which would increase its value to V' and the cost of sustaining it (because, for example, of greater utilization) to C' . Then the incremental social benefit is $(V'-V) - (C'-C) - I$. With linear technologies (constant returns to scale), $(V'-V)/(C'-C) = V/C$ and I small in relation $(C'-C)$ then the incremental social benefit is proportional to $V-C$.

⁷ If under the constant returns to scale assumption in the previous footnote I is small in relation to $(C'-C)$, then average valuations will provide better resource allocation indicators than marginal cost-benefit analyses which fail to take adequate account of incremental costs of sustainability $(C'-C)$ and just compute $(V'-V) - I$.

Complexity

The complexity of valuations of natural capital should not, however, be understated. First, while as noted above it is not necessary to include many forms of natural capital in national accounts, this is not true of inclusive wealth. By their very nature they need to be comprehensive and in principle should, for example, include the benefits of sunlight and mountain views.⁸ Second, while national accounts require estimates of costs, wealth measures are present values of future benefits. Subjective assessments of the benefits which individuals derive from natural capital need to be made. For some forms of natural capital, in particular natural resources, market prices may be available but for many others they are not. Ecosystems and the environment cannot in general be valued on the basis of market prices. Other approaches need to be taken and many have been suggested, including production functions, revealed preferences (including hedonic prices) and stated preferences.

Third, even if implied prices can be derived where actual ones are not available then future as well as current assessments need to be made and these have to be brought back to a present value using discount rates. There are many components of this including pure time preference, catastrophe risk and discounting for growth with discount rates in some cases declining over time in response to uncertainty. All of these are controversial and subject to considerable margins of uncertainty.

Fourth, there are serious problems of double counting in imputing values to natural capital since much of it is already capitalized in existing valuations, particularly of land. So for example, the benefits that coastal areas provide in the form of inland flood protection will be reflected in higher values of adjacent land and a corresponding greater rental income derived from that land. Conversely, the costs of urban air pollution will be incorporated in lower values of affected property prices. Finally, and most significantly of all, the consumption of natural capital comes at the expense of future generations who,

⁸ Similar questions of materiality to those discussed in relation to national accounts might be thought to apply here. If so, this is a matter of practical expediency rather than fundamental principle. As a matter of principle, there should be no depreciation provision in national accounts for non-depleting natural capital but there should be a valuation, however small, in inclusive wealth

as has been mentioned, cannot express their preferences and for whom the benefits and particular purposes to which natural capital is put might be very different from what they are today.⁹

In contrast to national natural capital accounting where the range of assets that need to be measured is restricted, measurement is relatively straightforward, discounting is not required and the interests of future generations can be correctly incorporated by using sustainability as a benchmark, inclusive wealth is ambitious, subjective, requires uncertain discounting and involves complex assessments of the interests of our descendants. That is not to diminish the significance of inclusive wealth analyses. It is an essential complement to national accounting in determining the composition and trend in our wealth and well-being but a failure to distinguish the two risks undermining and discrediting both by making national accounting subject to criticisms from which it should be immune.¹⁰

4. Corporate Natural Capital Accounting

The suggested form of national natural capital accounting in section 2 is in line with conventional approaches that are taken to business accounting. Valuations in company accounts are made at the lower of cost (historic or replacement cost) and economic value,

⁹ If changes to natural capital today are costly to reverse in the future then cost-benefit analyses that omit effects of closing down options available to future generations overstate (V'-V) in the previous footnotes. One way to address this, drawing on the strong no substitution definition of sustainability described in Section 2 is to require that provision be made for restoration of natural capital at the end of the life of the investment I to its condition prior to the investment. Costs of restoration, C, then relate to all material activities, including investments designed to enhance natural capital.

¹⁰ The emphasis placed here on replacement and restoration costs differs from that generally advocated in the economics literature on sustainability, for example in Heal, G. and Kriström, B. (2005), Chapter 22 "National Income and the Environment", in Vincent, J. and Maler, K-G., *Handbook of Environmental Economics*, Volume 3, 1147–1217 and Arrow, K., Dasgupta, P., Goulder L., Mumford, K. and Oleson, K. (2012), "Sustainability and the Measurement of Wealth", *Environment and Development Economics*, 17, 317-353. The difference stems from the low level of substitutability between different forms of natural capital assumed here and the consequential need for preservation. . Restoration costs are more closely associated with earlier work on environmental accounting, see for example Hueting, R. (1992), "Correcting National Income for Environmental Losses: A Practical Solution for a Theoretical Dilemma." in Krabbe J. and Heijman, W. (eds) *National Income and Nature: Externalities, Growth and Steady State*, Vol. 5, Springer, 23-47.

and depreciation is reported on a cost or economic value basis in profit and loss statements.

Distinctions between national and corporate accounting

But this analogy between national and company accounting hides some important distinctions. At a national level it was suggested in section 2 that all natural capital that is at risk of deterioration should be reported. In company accounts, firstly only those assets over which firms have a legal property claim will be included on the asset side of their balance sheet and only the legal liabilities associated with use of natural capital will be recorded on the liability side. Where the company owns natural capital, for example access to a water source or woodland from which it can derive commercial value, then it will be recorded as an asset on the firm's balance sheet. Where a company uses a resource for which it is charged, for example a source of energy, then this will be a cost in its income statement. Elsewhere, if a company uses or enhances natural capital that it does not own or is not priced, e.g. the water supply or clean air, then it will not be reported in income or balance sheet statements.

Second, the basis on which the asset or liability is valued will reflect its economic value to the firm not its benefit or cost to society. So for example, a mineral resource will be valued on the basis of the economic value derived from sale of the resource and will not account for depletion of the resource. Socially the sale of a mineral resource is of zero value with the cost of depletion mirroring the value of the sale. There is incremental value to the extent that extraction makes accessible a resource that was previously inaccessible but the actual consumption of a finite resource comes at the expense of the ability of future generations to do so.

There are therefore two requirements for proper corporate accounting for natural capital. First, either the consumption of natural capital has to be fully priced to reflect the social cost of its utilization or the ownership of natural capital has to be associated with the creation of a legal liability. So, for example, possession of a natural habitat on land should create a liability for the corporate owner of the land. Second, the principle on

which the liability should be valued is one of sustainability so that a capital maintenance charge is created which is equal to the minimum cost of replacing the asset on a like-for-like basis. Thus in the case of the natural habitat, the landowner will be responsible for its preservation and accounting for the cost of so doing.¹¹ These two principles ensure analogous treatment of corporate and national natural capital accounting.

Contrast with environmental profit and loss reporting

This differs from current approaches to environmental profit and loss reporting that attempt to identify the impact of firms on the environment through their supply chain. The latter is more inclusive in evaluating a firm's entire supply chain and therefore extends beyond the boundary of the firm to incorporate the impact on the environment of the firm's suppliers as well the firm itself. The drawback of this is that it risks double counting in so far as suppliers as well as purchasers account for their environmental impact.

Environmental profit and loss reporting is less inclusive in so far as it does not derive balance sheets for the property liabilities of companies. So if the property of a company incorporates an area of biodiversity then environmental profit and loss reporting only establishes a charge to the extent that a firm's activities impact on it, whereas corporate natural capital accounting requires a firm to make provision for the cost of sustaining it irrespective of what is done to it. For example under corporate natural capital accounting, landowners will be responsible for the maintenance of biodiversity on their land irrespective of whether their activities impact on it. Once the notion of a liability for sustainability associated with the ownership of natural capital is accepted then principles of corporate accounting extend naturally to include natural capital.

¹¹ Liabilities could be retrospective as well as prospective in requiring recovery to a date prior to the start of the current accounting period. There may be a political imperative to do this at the national level to avoid the accusation that developing and emerging countries will prospectively bear the costs of preservation of natural capital which developed countries have never incurred. There is no obvious correct starting date for such retrospective assessments of nations but determination of the full cumulative impact of companies on natural capital does have a natural start date, namely the year of their incorporation.

5. From Measurement to Implementation

What corporate accounting cannot do on its own is to internalize the social benefits of enhancement of natural capital where this is not reflected in market prices. If inclusive wealth and cost benefit analyses suggest that there is a benefit to enhancement or expansion of natural capital then corporations will only respond in undertaking the necessary investment if there is a perceived commercial benefit from so doing. This requires that there be either markets in the relevant natural capital services (in, for example, pricing for usage of leisure parks or natural habitats) or subsidies and tax concessions associated with the enhancement of natural capital. The prices, tax concessions and subsidies then give rise to commercially valuable investments which will be included on the asset side of companies' balance sheets.

Application to utilities and other parts of the economy

One sector in which an association between prices and corporate accounting most naturally arises is the utilities where the prices that companies are allowed to charge are subject to limitations determined by economic regulation. Environmental obligations imposed on utilities create liabilities which require corresponding relaxations in price caps for companies to be able to earn their required rates of return on capital. There are two ways in which this can be achieved. First, prices can be attributed to the specific environmental services that utilities deliver and compensation paid in relation to those services. Second, the asset base on which allowed returns are computed can be augmented by companies' investments in natural capital. In both cases, utilities derive economic benefits which are reflected in their asset valuations.

Similar results can be achieved in other parts of the economy by attributing prices to the delivery of natural capital services or allowing companies to earn returns on their natural capital through tax concessions and subsidies. So for example, there could be a natural capital asset base, equivalent to the regulatory asset base used in economic regulation of UK utilities, to determine the size of tax concessions that should be granted to those

components of natural capital investment which are not sufficiently rewarded by market prices.

Alternatively, if requirements to account for sustaining natural capital are extended to obligations to undertake restoration then markets in restoration will emerge that both promote economic activity and the preservation of natural capital. So for example, if there is an obligation to restore a natural habitat then companies will enter to offer these services. Likewise, if there is a carbon neutral obligation on companies then markets in carbon sequestration will develop at a price reflecting its lowest cost of extraction. The extension of regulation to include preservation of natural capital therefore promotes the emergence of new markets to deliver it.

In practice, a mixture of regulation and taxes will be required, with regulation being preferred where critical thresholds are approached or crossed that otherwise necessitate the levying of complex and imprecise tax rates to compensate for the pronounced non-linearities that exist around such thresholds. Elsewhere, taxes may provide less distortionary incentives than regulation. The combination of market prices, regulation and taxes convert natural capital accounting and inclusive wealth from interesting into essential tools of corporate management for resource allocation, investment appraisal and performance measurement purposes.

6. Conclusion

At one level the current wave of activity in natural capital accounting is to be welcomed. It comes after decades of discussion about the inadequacies of national accounting in recognizing the impact of productive activity on the environment. An immense amount of progress has been made recently on this score but this progress also poses serious threats.

The threat comes from confusion about the purpose of the exercise. There are two distinct objectives. The first is to extend national accounting to incorporate

environmental considerations. The second is to create a more inclusive measure of national and global wealth. Both of these are important goals which warrant careful attention but they are distinct and involve quite different methodologies. To conflate them, as many approaches currently do, is to risk undermining both.

In particular, natural capital accounting at both the national and corporate level is comparatively straightforward. It is a relatively simple extension of existing accounting methods employing evaluations of costs with which national and company accountants are very familiar. While it is not without its own significant problems of measurement, it does not require elaborate valuation techniques. The scale of the exercise is contained and the nature of the question that the accounts are seeking to answer is quite well specified. In contrast, inclusive wealth measures seek to address ambitious and wide ranging questions about the scale and scope of the forms of capital that affect our well-being. They require elaborate valuation techniques and subjective assessments of costs and benefits. They involve the derivation of controversial rates of discounting, require complex intergenerational comparisons to be made and risk double counting costs and benefits that are reflected in other, in particular land, valuations.

The fundamental difference between the two approaches is not, however, one of practicality. It is one of principle arising from the fact that they answer different questions. Let us return to the example of you earning 100 but having to set aside 20 to repair the fabric of your property over its life of, say, 10 years to have the 200 required to replace it. If instead there is an alternative investment available to you that also yields 100 but only costs 100 then you could set aside 10 over the 10 years and still be able to maintain your income in the future. Your permanent net income is then 90 not 80 and, while your existing property will become derelict, you will acquire a new one of equivalent value at lower cost of replacement. According to the wealth measure it is the protection of the income or consumption streams that matters. According to natural capital accounting, it is the preservation of the natural capital itself that is required.

Natural capital accounting as defined here in terms of capital maintenance for both national and corporate accounts answers the fundamental question of how much needs to be expended to preserve the existing stock of natural capital and how much have we as a nation or a shareholder earned net of the cost of sustaining our stock of natural capital. Inclusive wealth tells us about the benefits that we derive from our natural capital and, in combination with natural capital accounts, the potential benefits of investing in and expanding the stock of natural capital. Both are important questions, neither sufficient on their own and each distinct from the other. But both will remain peripheral until there is a political imperative to sustain and enhance natural capital and to incentivize companies to do so through regulation and taxation.