Projecting future ecosystem service values for ecosystem asset valuation

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Introduction

Estimates of ecosystem assets in monetary terms are useful for making decisions about alternative uses of ecosystem assets since they provide a consistent basis for comparison. In addition, a decline in the value of ecosystem assets at aggregated scales may point to unsustainable ecosystem use (Technical Recommendations, Final draft, August 2017).

The SEEA EEA and the draft Technical Recommendations (TRs) set out some of the broad issues to be considered in compiling estimates of asset values. This paper is intended to supplement this advice by addressing some more detailed technical issues relating to the use of the Net Present Value (NPV) of ecosystem service flows to estimate the value of the asset. The ultimate objective is to reach agreement on some standard approaches to the assumptions needed in order to make such estimates. It is expected that the revised SEEA EEA will take on board much of the advice presented in the draft TRs and this paper therefore focuses on areas where a bit more clarity and structure would assist potential compilers.

As SEEA EEA 5.121 sets out, in order to calculate the NPV of a particular ecosystem service flow, it is necessary to make:

i) Assumptions about the life of the asset

ii) Best estimates of future or expected pattern of ecosystem service flows. In practice it is often necessary to make separate (but consistent) assumptions about future service flows in physical terms and about future unit prices (dealt with in the TRs para 7.25)

iii) A selection of an appropriate discount rate (not to be discussed in detail in this paper[3])

As different ecosystem assets supply different and sometimes competing baskets of services, one of the key requirements in projecting future ecosystem service flows is to ensure that the assumptions about asset life and the future supply and use of ecosystem services are consistent with each other. The two issues are closely connected and there are potentially different starting points.

Asset life and expected land use change

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[3] Paragraphs 7.28 to 7.31 of the draft TRs give a good introduction to the issues involved.

If managed sustainably, ecosystem assets can be expected to have an infinite life. In practice, however, we know that there will be some natural change in most ecosystems as a result of climate change, and that population growth and other anthropogenic pressures will lead to the loss or transformation of some ecosystem areas in every country. It is likely, for example, that the extent of urban ecosystem areas will continue to increase. These changes cannot take place without a corresponding loss of a different ecosystem asset. It is also likely that climate change will lead to land cover changes over the next 100 years or so[4].

It follows that in order to make estimates of asset life, it is first necessary to take a view on expected land cover change. Ideally this should be both temporally (in terms of the timing of such changes over the next 100 years) and spatially detailed. In practice the confidence with which one could apply such assumptions to individual parcels of land is extremely limited and the expectation is that such estimates should only be made at aggregate level. A default assumption might be that there will be no major land use or land cover changes in the future and indeed for some accounting areas (such as protected areas) this may be a reasonable assumption which can be applied at more spatially disaggregated levels.

There is a related issue concerning how to account for increases in the extent of certain ecosystem asset types which are expected to happen in the future. For example, if we expect some woodland to be converted to farmland, where should the NPV of future ecosystem flows from that farmland be reported in the asset account?

> **Issue 1: What advice should the SEEA give about taking population change, climate change or other drivers of land cover change into account in projecting asset lives? Is it possible to give more comprehensive advice which can be applied not just at aggregate level but also to the so-called bottom-up (spatially detailed) approach?**
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> **Issue 2: How should the NPV of ecosystem service flows from a land cover type or from an individual ecosystem asset which is expected to be grow or shrink in extent in future be reported in the asset account?**
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> **Issue 3: Is a default assumption of a 100 year asset life something that should be advocated in the revised SEEA EEA?**

Assumptions concerning the basket of ecosystem services

The next step is make a 'best estimate' of the future pattern of ecosystem services (TRs para 7.26), rather than simply assuming the current level of services continues indefinitely into the future. Much of the discussion in this context has focused on whether the current flow of services is unsustainable and

[4] In this paper we assume a 100 year life for illustrative purposes. It would account for 95% of the value of the asset over an infinite life at a discount rate of 3%, and 99% at a discount rate of 5%. Similar asset lives are routinely assumed for infrastructure assets in investment appraisals.

hence cannot be expected to be supplied at the same level into the future. This discussion is tied in with issues about the extent to which the ecosystem is currently degraded or expected under business-as-usual to become degraded. It is worth noting, however, that estimating the length of time that a certain service can be provided into the future[5] is not the same as determining the life of the asset, and that over a 100 year period there may well be temporary losses of certain services. For example, an area of woodland which is expected to be clear felled in 30 years' time will cease to provide anything much in the way of carbon sequestration services until it has been restocked and the saplings have matured. There may also be short term losses in biodiversity and recreational opportunities.

The SEEA EEA draft Technical Recommendations state that the future flow of services typically depends upon the condition of the ecosystem, the natural regeneration of the ecosystem and future uses of ecosystem services (TR para 7.10). In practice, as later paragraphs make clear, a wider range of considerations need to be taken into account in estimating how the future pattern of service flows will differ from the current pattern.

The first consideration is the degree to which expected changes in **demand for services**, such as population or income growth forecasts, can be incorporated into the projections. These forecasts are certainly relevant in determining for example how the supply of recreation and education services will change in future, and will also have an impact on the future supply and use of air filtration services.

Second, **future environmental (not ecosystem) conditions**, such as the expectation of climate change and expected changes in air pollutant concentrations as a result of technological change (TRs para 7.14), will have a strong influence on local temperature control and air filtration service values. Flood protection services will also be affected by expectations of the impact of climate change.

The third consideration is the extent to which official **forecasts of the volume of particular services** can be incorporated into the projections. For example, projections of future supply of timber are often available (at least at national level). In addition there may be official projections of the future levels of carbon sequestration which may or may not embody the same underlying assumptions.

Fourth, there may be official **estimates of future unit prices**. Examples include estimates of carbon prices, or damage costs per unit of pollutant. In many cases the prices may be assumed to be independent of the volume of supply, but this may not always be the case.

In the absence of official or consistent forecasts, the draft Technical Recommendations recommend that the assumption that the unit price (unit resource rent for certain provisioning services) stays constant over the life of the asset should only be applied as a default (para 7.25). Where past rents are volatile it is recommended that an average of recent periods (say 3-5 years) is used as the basis for estimating future flows) (para 7.26). However, the TRs say nothing about the case in which unit rents in real terms are showing a consistent upward trend. In this case, should the default assumption be to assume that

[5] For example, para 7.22 of the draft Technical Recommendations defines the expected asset life as the length of time that ecosystem services will be supplied into the future.

the latest estimate is constant throughout the asset life, or to project some further (but presumably limited short term) increases?

Issue 4: Would it be helpful for the revised SEEA EEA to set out formally a number of 'considerations' such as drivers of demand (e.g. population growth, income), environmental context (e.g. climate change, ambient air pollutant concentrations) and official supply forecasts (e.g. timber, carbon sequestration) which should where possible be taken into account in projecting the future basket of services?

Issue 5: Should a default assumption of constant unit price over the life of the asset be recommended where unit prices have shown consistent increases in real terms over the recent past?

Issue 6: To what extent can such assumptions reasonably be applied to individual ecosystem assets?