

**UPDATE OF THE 1993 SNA – ISSUE No. 16  
ISSUE PAPER FOR THE MEETING OF THE AEG, JULY 2005**

**GOVERNMENT AND OTHER NON-MARKET PRODUCERS' OWNED ASSETS – COST OF  
USING CAPITAL**

**Introduction**

As part of the update of the 1993 SNA, the ISWGNA is conducting a global electronic consultation to determine the views of national statistical offices, central banks and other interested parties on the measurement of output of government and other non-market producers – issue 16.

When summing costs to make estimates of output for non-market producers, what should be used to reflect the cost of using non-financial assets:

- a) Consumption of fixed capital only, which is the current recommendation, or the full cost of capital services (approximately consumption of fixed capital plus a return to capital)?
- b) If the full cost of capital is chosen, should it apply to all non-financial assets owned by the non-market producer or just some of them?

Note: The SNA makes clear that production for own use should, if possible, be valued at market prices. Only if market prices are not available should the sum of costs be used as a fall back position. In specifying what these costs are, consumption of fixed capital is again mentioned, consistent with the valuation of non-market production. However, it is clear that a market price would include the opportunity cost of capital and so if the propositions above are supported then it would be logical to apply the same treatment to the measurement of all output that is not marketed when it is estimated as the sum of costs – whether undertaken by market or non-market producers. Hence, “consumption of fixed capital” would be replaced by something along the lines of “cost of capital services” in paragraph 6.85 of the SNA.

**Background**

The 1993 SNA recommends that the value of output of non-market goods and services produced by government units or non-profit institutions should be estimated on the basis of the total costs incurred in their production and that the cost of using non-financial assets should be measured as consumption of fixed capital (paragraph 6.91). The latter part of this recommendation (underlined) is one of the issues for consideration in the update of the 1993 SNA, namely *Government owned assets* (issue 16). The question is whether to replace the estimate of consumption of fixed capital for assets of general government and other non-market producers by an estimate of their capital services, which is roughly equal to consumption of fixed capital plus a return to capital. The current 1993 SNA, by convention, implies a zero net operating surplus for non-market producers and therefore no return to capital on their assets. If the change were made there would be a positive net operating surplus for non-market producers. Estimates of non-market production, and hence GDP, would be higher.

The Canberra II Group on the Measurement of Non-financial Assets was asked by the ISWGNA to undertake a review of the 1993 SNA recommendation. Subsequently, a paper, written by Anne Harrison, *Measuring the Contribution of Non-financial assets to Non-market Production* presented the

recommendations of the Canberra II Group to the meeting of the Advisory Expert Group in December 2004. The recommendations are as follows:

- a) A return to capital should be estimated for non-financial assets of non-market producers (principally but not exclusively those owned by government) whether they are
  - i) of the type used by employees in the course of their work (e.g. computers, vehicles),
  - ii) those which provide a service to the economy at large (e.g. roads),
  - iii) those which provide a service to the community at large (e.g. recreational facilities such as a city park);
- b) This return to capital should reflect the value of the asset; if the asset has an elevated value because it is rich in historical or cultural associations, the return to the asset will reflect this higher value;
- c) The capital services corresponding to these returns to capital should be used instead of consumption of fixed in calculating the value of output of non-market producers when this is estimated as the sum of costs incurred; and
- d) The definition of an asset needs to be clarified to ensure that assets which provide benefits to the economy or community as a whole and not just to the owner of an asset are included.

The Canberra II Group considered that all three classes (a(i), (ii) and (iii)) should be deemed to provide capital services and that estimates of these services should be used in place of consumption of fixed capital in the measurement of output of non-market production when it is estimated as the sum of costs incurred. (During the course of the AEG meeting it was noted that land should also be included in the third category.) However, the Group considered that the first priority was to include assets of type a(i); the second priority was to include assets of type a(ii); and the third priority was to include assets of type a(iii).

The AEG expressed strong support in principle for estimating the cost of capital services in the measurement of non-market output, and accepted the arguments put in favour of this approach. First, if the non-financial assets were not owned by the non-market producer but rented instead, then the rental would need to include a return to capital to the owner, and it should not matter to the measurement of its output whether the non-market producer owns the asset or not. Second, the opportunity cost to the non-market producer of owning the asset should include a return on capital. Despite agreeing in principle, members of the AEG expressed concerns about the rate of return to be chosen and the availability of capital stock data, (or the availability of data that could be used to derive estimates of capital stock).

In terms of the range of assets which could be covered, most AEG participants favoured including those assets in the generation of output similar to those used in market production (type a(i)). A smaller number favoured including roads and other infrastructure assets (type a(ii)). Progressively fewer favoured including assets such as city parks serving the community at large and land (type a(iii)).

Taking account of all these considerations, it was decided to take the following steps:

- a) A global consultation should be held involving national statistical offices and central banks to seek their views on both the conceptual and feasibility aspects.
- b) The ISWGNA will summarize the results and present them to the AEG for further deliberation.

- c) The feasibility of the proposal on the basis of case studies will be tested in Trinidad and Tobago and Costa Rica with the assistance of the US Bureau of Economic Analysis.

The remainder of this document concerns the first of these steps.

## **Measuring capital services**

### Conceptual issues

When an asset is used in market production, there is a return to capital implicit in the value of the operating surplus of that producer. Net operating surplus arises in large part because an asset generates services which exceed the depreciation of the asset (i.e. consumption of fixed capital), and if this excess does not at least equal the opportunity cost (the return to capital) of the value of the asset, then the asset is not cost-effective to the producer.

When an asset is used in non-market production, the 1993 SNA recommends that the input from the asset should be set equal to depreciation. This implies that two otherwise identical assets, one used in market production and one in non-market production, contribute differently to the economy, a proposition which is difficult to rationalise. Ignoring the return to capital on government assets reduces the productivity estimates of the economy which in turn may lead to an overestimate of the increase in productivity if the assets are privatised.

Government, as well as market producers, faces an opportunity cost for tying up resources in assets. Under the present SNA conventions, a government renting a building incurs greater costs than one which owns its own building. If the government moves from a building it owns to a rented building and then leases out the building it owns to a market producer, GDP will increase even though there has been no change in the number of buildings used in production in total.

The issues paper presented to the AEG meeting *Measuring the Contribution of Non-financial Assets to Non-market Production* did not attempt to describe how estimates of capital services should be derived. Instead, the paper referred the reader to another paper to be produced by the Canberra II Group which was unavailable at the time of the AEG meeting in December 2004. This paper *Cost of Capital Services in the National Accounts* by Paul Schreyer, Erwin Diewert and Anne Harrison is now available. This paper sets out a relatively straightforward approach to deriving estimates of capital services. It should be noted that some countries (US, Canada and Australia) are already using similar methods to derive estimates of capital services.

Section 5 of the paper (paragraphs 25-51) gives a succinct description of the theory underlying the estimation of the cost of capital services. It begins with the premise that the cost of owning a fixed asset (i.e. the user cost) will provide a good approximation of the value of the capital services it is expected to produce. In effect, the approach is one of trying to mimic what an enterprise that provides capital services to other enterprises would do in determining the price it should charge for those capital services in a competitive market.

Paragraphs 34 and 37 presents the two preferred formulae: (10) and (11). Formula 10 comprises four principal terms:

- i) a return to capital (i.e. the real interest rate ( $r^{*t}$ ) multiplied by the value of the asset ( $P_0^t$ ) at the beginning of period t)
- ii) less the anticipated real holding gains (losses) of owning an asset (i.e. the anticipated real asset inflation rate ( $i^{*t}$ ) multiplied by the value of the asset ( $P_0^t$ ))

- iii) *plus* depreciation (i.e. the depreciation rate ( $\delta_t$ ) multiplied by the value of the asset at the beginning of the period  $t$  ( $P_0^t$ ) (with an adjustment to take account of asset price inflation over the period  $(1 + i^{*t})$ )
- iv) *all multiplied by* a discount factor ( $(1+r^{*t})^{-1}$ ), which takes account of the fact that the three above costs are in the future.

*Note: this is a theoretical presentation of the formula with variables valued at the beginning of the period. In practice all variables should be valued at mid-period prices. This is explained in the annex to the paper by Schreyer, Diewert and Harrison.*

For most assets the second term will be zero, or close to zero, but for some assets the anticipated real holding gains/losses can be significant. For example, an owner of a computer would normally expect its price to fall in real terms over and above that due to depreciation (wear tear and foreseen obsolescence) given past experience of falling real prices. Hence, an enterprise providing computer services, or leasing out computers to other enterprises, would take account of the expected price fall in setting the prices it charged for those services.

For the common case where anticipated real holding gains/losses are negligible, formula (11), which excludes the second term, is recommended. When, as is usually the case, the real interest rate is small then a reasonable approximation is given by formula (12), which simply states that the user cost of capital is equal to depreciation and a return to capital, the first and third terms. This is the formula used to make rough estimates of the impact on GDP of replacing consumption of fixed capital with capital services in the measurement of government output for the US (1.8% in 2002) and Australia (1.5% in 2001-02) in the issues paper (paragraph 16).

#### Practical issues

Paragraph 60 in the annex (page 37) to the paper by Schreyer, Diewert and Harrison discusses an appropriate interest rate (or rate of return) for government and other non-market producers - it should reflect the cost of borrowing money. The obvious thing to do is to take a representative average of government bond rates of different maturation.

Paragraph 59 of the annex discusses how anticipated (ex-ante) interest rates and asset inflation rates can be derived from observed (ex-post) data. This boils down to extrapolating into the future what has been observed in the past. If there is no discernible long-term trend in real rates then an average of past observations can be used.

It is best to calculate capital services at as detailed a level as the data allow, and to group assets together that have similar depreciation and asset inflation rates. For example, it is best not to have computer equipment in the same group with assets that have long economic service lives and do not have declining real asset inflation rates.

The 1993 SNA currently requires countries to estimate consumption of fixed capital for those assets used by non-market producers, principally government. To do this accurately, information on the stock of government assets is required and a model to estimate the way in which the value of these declines over the life of the assets (a perpetual inventory model). If this information exists, then adding an estimate of the return to capital is straightforward and presents no new data demands beyond determining the appropriate rate of return. Although for some assets, such as computers, it is necessary to take account of anticipated real holding gains and losses.

Many countries have rudimentary or no information on the stock of assets used by government. This means such countries are unable to compile balance sheets for government and, if the lack of capital stock data extends to market producers also, no estimates of productivity will be possible. Deriving estimates of capital stock and other capital-related measures is part of the implementation of the SNA and should be a priority for countries wishing to undertake careful analysis of the reasons for growth in their economy and

to compare these with other countries. It should be noted that the recommendations of the update to the SNA will not be published before 2008 and implementation will inevitably follow with a further time lag.

It is worth noting that the calculation of depreciation, capital stocks and capital services can be undertaken in a fully integrated system, ensuring full consistency, as described in the paper by Schreyer et al. Any NSO considering developing capital-related estimates for the first time or considering redeveloping its existing system should seriously consider this approach.

In the absence of capital stock estimates, approximations of consumption of fixed capital or depreciation are made by some countries using more or less unsophisticated methods. If no alternative to this solution is possible, such methods could also be extended to the calculation of a return to capital.