## Limitations to economic valuation

During the past three decades, the economic valuation approaches have improved considerably, however some limitations still exist. These limitations can be summarised as follows:

Interdependence of ecosystems and their services. This includes both the interdependence within an ecosystem (i.e. various components of an ecosystem interact to provide a certain service) and interdependence between ecosystems (i.e. various ecosystems may interact to provide a certain service). For valuation, this means that the economic value of any one service may depend on its relationship with other services, and therefore an assessment of the value of one service may not easily take into account how other services are being affected.

Marginality. The economic valuation is meaningful when considering small, marginal changes in the provision of ecosystem services.

Double counting. Some ecosystem services are not complementary, the provision of one is precluded by others (trade-offs). Therefore, to prevent double-counting, the full range of complementary and competitive services must be distinguished before any aggregation of values is completed.

Spatial issues. Ecosystem functions and their capacity to supply services to a particular human population are often best evaluated across their full geographical extent, which may not fit well with the spatial scale of valuation context. The valuation should take into account the complete population affected, whose values may be affected by the changes in ecosystem services supply. To estimate appropriate values, it is necessary to understand whether an ecosystem service is local, regional, national or global.

Temporal issues. Impacts on ecosystems and their services may extend well beyond a standard time period of a given policy (project) appraisal. It is therefore important to account for any temporal distribution of costs and benefits. This is normally done by discounting, using an appropriate discount rate, which converts all costs and benefits to present values so that they can be compared. However, the choice of the discount rate usually requires additional assumptions. In the Green Book (2003) the British Treasury guidelines recommend using different (declining) discount rates over the longer term. The reason for this is that uncertainty increases as we look further into the future. The choice of discount rate can make a very significant difference in terms of the final outcomes of any cost-benefit analysis. The timeframes over which costs and benefits are considered should depend on the duration over which the costs and benefits will be realised.

Environmental limits. The services that ecosystems provide depend not only on the scale and function of the ecosystem but also, crucially, on its conditions and biodiversity levels. As the state of an ecosystem deteriorates, the services it provides are deemed to diminish. Sometimes, this may be a gradual process, but in other circumstances a threshold may be reached. Beyond this threshold, an irreversible change in the ecosystem may occur (e.g. total collapse), resulting in permanent loss of services.

An economic valuation study typically estimates values only for a marginal change in a service or ecosystem condition at a few points along the demand curve. Applying these marginal values to non-marginal changes in ecosystems is therefore not appropriate.

Dealing with uncertainty. There is considerable uncertainty surrounding both the knowledge regarding functional aspects of ecosystems and valuation of ecosystem services. Even among specialist scientific communities, there is no consensus on certain aspects, for example, what services are provided by different ecosystems, how these may change over time and how changes in ecosystems may affect the quantity and quality of the services they provide. This is further complicated by the fact that ecosystems may not respond to change in a linear fashion; there may be thresholds beyond which an ecosystem responds in a previously unknown manner.

Under such circumstances, consideration needs to be given to the uncertain future losses or gains that might be associated with potential change. One option for accounting for uncertainty is to conduct a sensitivity analysis by identifying areas of uncertainty and testing how sensitive the evaluation outcomes are to changes in values or assumptions used in valuing ecosystem services.

Data transfer and knowledge gap. The quality and availability of valuation data could be improved by exploiting knowledge from valuation studies from other locations. However, data transfer from other studies is challenging. Issues are related to the need for good quality studies of similar situations, their social and environmental context, to changing characteristics in different time periods and the inability to deal with the valuation of novel impacts.

Thus, an effort on collecting existing studies and/or improving open access to existing databases of valuation studies with specific focus on European conditions should be made. This would enable to recognize what type of studies and/or data is available. An example is a database on Forest Ecosystem Service Valuation Studies in France and in the German-speaking countries[1]. The database is a first step towards facilitating the access to studies about forest externalities for researchers all over the world. Another example is Woodland Valuation Tool[2] that enables those involved in forestry management to search for, and cross-reference methods and scenarios associated with different trees and woodland to test out their potential benefits and pitfalls at the planning stage.

There are also other databases such as EVRI or Envalue, however, they contain rather general information about valuation studies and do not cover methodological details and/or are not generally accessible, which is not sufficient for data transfer.

The following points and caveats are important to note in case of using valuation approaches:

- Methods and their results are based on theoretical background, purpose of valuation, socioeconomic conditions, and data availability.
- The role of valuation is to show the contribution of ecosystem services to the wellbeing of people, to increase awareness of existing benefits as well as creating sense of ownership and commitment among stakeholders. However, valuations themselves do not determine whether a service should go to market (let alone the questions of who should pay and how much he or she should pay); for that, negotiations between providers and beneficiaries are often necessary.
- One of the main limitations of economic valuation is that the resulting estimates are often highly context dependent, being sensitive to both the methods selected and assumptions used. For example, some methods mainly focus on marketed services, but omit non-market values. In addition, the selected ecosystem service, valuation period and discount rate have profound effects on the estimates.
- Values estimated in different contexts should not be compared directly. One of the limitations of valuation methods is that, in general, they do not allow direct comparison of economic values estimated in different studies, or the use of the estimated values to express the relative economic importance of different forest goods and services. These limitations result from differences in valuation objectives, methods applied, data accuracy, considered target populations, value units, etc.
- There are no generally accepted procedural rules for monetary valuation of forest ecosystem services which would allow for a simple “cookbook approach”. However,

[1] The data base is downloadable under https://www.thuenen.de/en/wf/figures-facts/environmental-valuation/data-base-forest-services/

[2] https://forestry.gov.scot/sustainable-forestry/economic-research/non-market-values

there are good technical guidance (e.g. guidance developed by DEFRA[3], COST Action E45 EUROFOREX[4]), which can help to decide how to implement valuation and how to deliver such values, including the vital step of identifying the beneficiaries of FES and, therefore, potential demand for them.

- Valuation is one of the element of a more complex decision making process. However, it can broaden the perspective and information base for a better informed policy making.
- From the view of implementation of FES for policy support and consulting, successful valuation approaches and results should particularly consider rational relationships between economic, ecological and social aspects of FES provision.

Various practical barriers are reported for broader consideration regarding approaches and results of monetary valuation of services in policy decisions. They:

(i) cultural barriers – considering economic approaches for solving environmental problems is generally seen with some reservations in several European countries. Hence there is less of experience with economic valuation of environmental services in these countries (apparently there are fewer economic valuations of FES for example in the German speaking countries than in the UK or in Scandinavia);

(ii) methodological barriers – no generally accepted procedural rules amidst methodological complexities of valuation; and

(iii) political barriers – it can be much easier to communicate political decisions based on "real money" than on what some see as intangible and nebulous values based on the consumer surplus concept

[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69192/pb12852-eco-valuing-071205.pdf

[4] http://www.efi.int/portal/projects/cost e45.