



## **Dialogue platform "Provisioning and sustainable use of wood"**

### **Workshop report**

#### **Economic evaluation of forest ecosystem services**

HEG Geneva (Geneva School of Business Administration), 29 January 2016

Event staged by: HEG Geneva / University of Neuchâtel

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**A stakeholder event marked the conclusion of the timber market research project led jointly by Milad Zarin-Nejadan (University of Neuchâtel) and Andrea Baranzini (HEG Geneva) as part of NRP 66. More than 60 interested parties from Switzerland and neighbouring countries made the trip to Carouge on 29 January 2016, where they looked at methods for evaluating the diverse non-monetary services that the forest provides for society.**

Ecosystems provide a whole range of services that are vital to the welfare of society: as well as supplying timber as a construction material or for use in energy generation, the forest also protects infrastructure from avalanches and landslides, filters our water, and provides an attractive space for recreational activities. While such services are broadly recognised and made use of, they are frequently ignored during decision-making, which can mean that their quality is impaired or that they are lost altogether. The workshop on the "Economic valuation of forest ecosystem services" initiated by Andrea Baranzini and Nicolas Borzykowski from HEG Geneva dealt with the various methods used for the economic evaluation of forest functions, and with the resulting findings, as well as with the impact on forestry and resources policy in industrialised countries.

## Evaluating and comparing forest ecosystem services

One study, conducted in two mountain valleys in the Autonomous Province of Trento (northern Italy), began by differentiating between provisioning services – such as the provision of wood, mushrooms, berries and game –, regulating services, such as carbon sequestration and protection against avalanches and landslides, and cultural services, such as recreation, provided by the forest. Tiina Häyhä (Stockholm Resilience Centre) applied different biophysical and economic evaluation methods for each of these three service types. Using the market value method, she was able to determine that, with regard to provisioning services, the supply of timber, accounting for EUR 218 per hectare per year, is by far the most economically significant provisioning service. The value of the hydrogeological protection service was calculated using the replacement cost method. The method is based on the investments that would be needed if technical facilities were required to take over the services provided by the forest. The annual costs of replacing the natural protection with technical substitute (e.g., palisades or snow fences) would result in EUR 13 million per year. In terms of the wide range of ecosystem services provided by the forest, the regulating services, in particular protection against hydrogeological risks, proved to be the most important, while the provision of timber emerged as the second most important service. The study also revealed some trade-offs between different ecosystem services: For example, a trade-off was found between timber production and hydrogeological protection as well as between timber production and recreation. An appropriate intensity of use must therefore be found so that the different services can be utilised optimally and on a long-term basis. The study showed that a major part of the ecosystem services is non-marketed. The study highlighted the importance of a solid biophysical assessment of ecosystem services before their valuation and suggested spatially explicit approaches to identify and visualize priority areas for different services. Finally, the study concluded that the ecosystem services concept has a potential to support the communication of the multiple benefits the forest ecosystem provides.

The protection against slippage provided by the forest is also the main focus of the study carried out by Roland Olschewski (Swiss Federal Institute for Forest, Snow and Landscape Research; WSL). Olschewski also applied the replacement cost method in order to determine which costs the Andermatt population would be willing to bear in order to protect a particular neighbourhood from avalanches. The scenario investigated assumes that a forest that has been destroyed by windthrow has to be replaced. In addition, the local population was surveyed with regard to its willingness to pay for various technical alternatives such as nets or wooden or steel barriers, all against the background of the potential damage that would be caused by a large-scale avalanche (a once-in-300-years event). The various technical options differ in terms of cost (calculated as a one-off payment per household) and effectiveness, as well as in terms of how long they would last. The calculations confirmed that the willingness to pay for individual measures correlated relatively accurately with the costs for the preventive measures with which the simulated damage could be avoided. In any event, the willingness to pay extended far enough to finance wooden stems and grills. In contrast, (more costly) installations such as steel bridges were often viewed by those surveyed as being over the top. The study shows that it is possible to compare costs and benefits of the protection services of forests and to derive decision-making tools that help to determine the efficient level of such services.

A French study, conducted by Serge Garcia (Laboratoire d'Économie Forestière, National Institute for Agricultural Research INRA, and AgroParisTech, Nancy) focuses on the eco-

logical service provided by the forest in the capacity of a water protection/purification. Land use has a significant impact on water quality. The nitrate and pesticide readings from water in the soils in areas where wheat is cultivated are up to twenty times higher than in forest areas. This would appear to suggest that the treatment of drinking water is cheaper if the water is drawn from forest-rich areas. An initial approximation confirms that, in the most extreme case, drinking water from the departments of France that have the most forest can be more than EUR 22 per hectare and per year cheaper than drinking water in other districts with agriculture. The findings were refined using the example of the Vosges department of France and spatial econometric methods. As well as land usage, further factors such as geographical features of the catchment area, population density, type of management (private or public utility) etc. were incorporated into the model. The study confirmed the major benefit of forestry with regard to drinking water supply: depending on the model used and depending on the other type of land usage used for comparison purposes, one hectare of forest reduces the costs of drinking water treatment by between approximately EUR 100 and almost EUR 140 per year.

Hunting as a recreational activity was the main focus of the forest services study conducted by Justice Mensah and Katarina Elofsson (Department of Economics, Swedish University of Agricultural Sciences, Uppsala). Bushcraft is held in high esteem in Scandinavia, and is a long-standing family tradition for many people. The fact that hunting is so important means that it must be efficiently regulated, not least to ensure its long-term viability. This raises the question of the value that should be attached to the different game species that are hunted, and how to set the price for hunting licences. One of the study's findings was that there is a negative correlation between level of income and willingness to pay. The obvious conclusion is that hunting is particularly popular in rural areas where average incomes are relatively low. This pushes up demand for hunting licences in these areas, with prices increasing accordingly. Ultimately, the type of game being hunted also has a major impact on the price of the licence.

### **How the public views the forest**

In Switzerland, the *2020 Forestry Policy* sets out the framework for sustainable forestry at national level. Its aim is to harmonise forestry policy across all of the cantons, as well as to improve timber harvests and to guarantee multifunctionality. Programme agreements are to be put in place with the Swiss cantons setting up protected areas (10% forest reserve by 2030, pursuant to agreements with the cantons). The study carried out by Nicolas Borzykowski, Andrea Baranzini and David Maradan (HEG Geneva) as part of the project "Understanding the market of raw wood: Supply and demand aspects" in NRP 66 tackles the question of how much the general public are prepared to pay for a 10% increase in the forest reserve. The trade-offs are well known. While protected areas have an important role to play in maintaining biodiversity, the loss of other types of land usage (timber production, recreational activities) is associated with opportunity costs. The study looked into the preference for the creation of forest reserves. Telephone interviews were conducted, with a broad dataset that was representative of the Swiss population. The study used the contingent valuation method, assuming a level of willingness to pay for particular goods and services. As expected, the willingness to pay for expanding protected areas of forest declines as the amount of the proposed charge increases. However, higher-income households agree to higher payments to only a very limited extent. On average, Swiss households would be willing to pay between CHF 400 and CHF 470 per year for the creation of new forest reserves. Overall, this means that the value of newly created forest

reserves would amount to CHF 26,000 per hectare per year, which justifies the investment provided for in the reserve programme set out in the 2020 Forestry Policy. During the discussion, there was clear criticism levelled at the contradiction between the Federal government's planned extension of forests and its goal of making greater use of timber. It also became clear that the extent to which those surveyed are informed about the problem may influence their willingness to pay.

The economic assessment of those surveyed also plays a central role in the study conducted by Stefano Carattini, Nicolas Borzykowski and Andrea Baranzini (HEG Geneva). Their analysis aimed to evaluate levels of acceptance for reforestation programmes in Switzerland and abroad as a means of cutting greenhouse gas emissions. Economists point out that trading in emission certificates can effectively cut the costs of reducing greenhouse gas emissions and/or compensating for such emissions. After all, in terms of environmental benefits, it makes no difference where emissions are being reduced, while the costs of avoidance measures can vary greatly from one country to another. In practice, however, what happens is that reforestation in distant countries meets with poor levels of acceptance in Switzerland and it is difficult to implement any spending commitments in the form of an effective policy. This raises the question of what sort of arguments could be used to reduce opposition to greenhouse gas compensation measures abroad. An experiment involving students from Geneva looked at levels of willingness to invest money in a reforestation programme in Nicaragua. The participants were provided with information on efficiency (expressed as carbon store per costs per tree), the credibility of the project and the other services resulting from the reforestation (such as promotion of biodiversity or prevention of natural disasters). The efficiency argument proved to be the most persuasive, generating an increase of up to 10% in donations to foreign reforestation projects. In contrast, the provision of information on a project's credibility contributed to a 2% increase in financial contributions. This highlights the following: supplementary information about the effectiveness of climate protection measures makes these measures more acceptable.

Two projects focus on the appeal of the forest, both using the travel costs method. According to Stefan von Grünigen (Econcept), this approach has the advantage that there is no need to rely on verbal information from those surveyed. Rather, people's actual actions and their actual preferences are surveyed. Based on data from the second public survey *Waldmonitoring soziokulturell (WaMos 2)*, various forms of the travel costs method were used to estimate the recreational value of the Swiss forest at between CHF 290 and CHF 589. The decisive factors proved to be the distance between a person's home and the forest, the existence of a replacement area, the socio-economic background of the person surveyed and the provision of infrastructure in a forest (e.g. benches). Unlike most applications of the travel costs method, which are more or less concerned with "natural" forests, Adan Martínez-Cruz (ETH Zurich) and Jaime Sainz (Centro de Investigación Económica, Mexico City) looked at a forest close to the city, which is very important to the millions of people living in Mexico City and contributes a great deal to their wellbeing. Although the forest in question is located in the periurban belt of the capital city, the travel costs method is still valid as the traffic jams on Mexico's streets make the journey a great deal more difficult. A variation of the approach was used that enables a distinction to be made between different groups of forest visitors (in particular, differentiated according to the activity carried out in the forest and on the basis of socio-demographic profiles). On this basis, the average consumer surplus (willingness to pay and/or forest value including travel costs) was calculated as USD 29 per person. This means that the USD 30 per hectare

ture being invested by the government as part of its protection programme will pay off if just one visit to the forest is made per year. In fact, the visitors are likely to make an average of eight trips. Based on these results, it would make sense to launch similar protection programmes for other recreational areas on the outskirts of Mexico City.

### **Evaluation of forest services taking account of socio-demographic characteristics**

An analysis project led by Jonas Ngouhouo Poufoun (Laboratoire d'Economie Forestière, National Institute for Agricultural Research INRA, and AgroParisTech, Nancy) looks at the ecological, economic and social value of the forest elephant in Central African protection areas for the local communities. The study investigated the contribution that households would be prepared to pay to avoid the total loss of the forest elephants. The findings confirmed that people's view of the problem was crucially influenced by socio-demographic factors: traditional communities are particularly positively disposed towards the protection programme or are more likely to get involved. The figures from the study prove that just the social value of the forest elephants is more than 1.5 times as high as the level of state funding to protect them.

The fact that the household socio-economic profile influences preferences for the forest is confirmed by Laetitia Tuffery (Université d'Evry-Val-d'Essonne). Tuffery investigated the extent to which the accessibility and the recreational quality of all of the forests in the Seine-et-Marne department (Paris region) influenced property prices, which served as an indicator of willingness to pay for the purposes of the study. The empirical connection of different data proves that a forest environment including cycle path or walking trail particularly increases the value of a property. Protected areas, on the other hand, have a negative impact on house prices. The study also revealed that younger and least affluent households are the least inclined to pay for protected forest reserves.

### **The forest from the perspective of administrators and decision-makers**

The public statistics, presented by Franz Murbach from the Swiss Federal Statistical Office (FSO), show that a good 30% of the area of Switzerland is covered with forest. Of this, 70% is publicly owned, with the rest owned privately. The entire value added chain for Swiss wood guarantees some 54,000 full-time jobs and generates 0.7% of Swiss gross value added. The FSO harmonises its surveys, drawing from 20 different sources, with international analysis for the sake of comparability. The FSO surveys depict the diversity of wood products and forestry services, and also show the development of the past decades, with natural events such as the storms Vivian (1991) and Lothar (1999) contributing to the peaks in output recorded by the Swiss timber industry.

The event drew to a close with Beat Burgenmeier (University of Geneva), Patrik Fouvy (Natural Spaces Department, Canton of Geneva), Patrick Schmutz (Energie Durable SA) and Matthias Kläy (Federal Office for the Environment, Forest Services & Forest Tending Section) taking part in a roundtable discussion led by radio journalist Thierry Fischer. While the importance of figures in the public arguments for maintaining forests was not disputed by any of those present, doubts were raised as to whether this actually made sense given the large stocks of timber. In addition, major reservations were voiced with regard to expressing non-monetary services in financial amounts, as this was not in keeping with the actual value of something non-material and could promote speculation. The question arose in this regard as to whether the heterogeneous nature of forest ownership

in Switzerland meant that different evaluations were needed (for the forest as a public and as a private good). However, this very speculation, some of the experts felt, could also be a means of making the use of timber attractive again in Switzerland and of moving into profit. The participants in the discussion were unanimous in the view that ways must be found of communicating the services that the forest has to offer and the challenges of sustainably managing forests as widely as possible. In this regard, it would make sense to step up the process of exchange between researchers and political decision-makers with responsibility for forestry at national and cantonal level, particularly but not exclusively in relation to urban forestry.