CONTINGENT VALUATION AS A TOOL FOR ENVIRONMENTAL ECONOMIC ACCOUNTING: CASE OF ESTONIA

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Abstract

The article deals with the possibilities of including non-market ecosystem services into official statistics. Current statistical standard and the GDP calculated on the basis of it do not take into account the value of ecosystem services and therefore the contribution of ecosystems. In recent years (2020–2021) has taken place the revision of System of Environmental-Economic Accounting– Experimental Ecosystem Accounting (UN SEEA EA), aimed at developing a standard for statistics on ecosystem services. Statistics Estonia also participates in this process, using as an input to the experimental statistics of ecosystem services (among other data) the results of the contingent valuation study conducted by the author on the monetary value of ecosystem services of Estonian forests, wetlands and urban areas. The total annual willingness to pay for forest ecosystem services is about 23.9 million euros, for wetland services 12.3 million euros and for urban areas 17.3 million euros. The most important services considered by the respondents were regulatory services. Also, the relative importance of individual services by respondents were examined separately. It turned out that people value ecosystem services aimed at the physical-chemical quality of the environment more than the increase in welfare resulting from personal contact with ecosystems.

Keywords: environmental economics, ecosystem services, contingent valuation, ecosystem accounting, urban ecosystems

JEL classification number: Q5; Q51; Q56; Q57

Introduction

Environmental economics has been involved in the monetary valuation of natural values, or in a more modern way, ecosystem services, for decades. If the main question for the exchange (market) outputs of ecosystem supply services (such as agricultural production) is how and to what extent the price of production is transferred to the value of the ecosystem, then, in order to find out the monetary equivalent of the value of non-market services (most regulatory and cultural services), specific environmental economics methods have to be applied, such as travel costs, contingent valuation, hedonic prices, etc. There are many theoretical arguments (eg Champ, P. A. et al, 2003; Bockstael, N. E. and McConnell, K. E., 2010) as well as practical guidelines (eg Abelson, P., 1996) for application such methods. Much has also been said about environmental accounting (eg Hecht, J. E., 2005), but the problem is that accounting does not consider the non-market values of the environment, which include also ecosystem services.

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The main disadvantage of the current accounting standard and the GDP calculated on the basis of it is that they do not take into account the contribution of ecosystems. Given that the size and growth of GDP is a priority for many voters when assessing the economy as well as governance, the quality of the environment and ecosystem services are outside accounting based economy because they often do not involve real financial turnover. There are many regions in the world where ecosystem health has been ignored, natural ecosystems are declining and the government's attitude is far from sustainable. The paradox for those countries is that the rapid decline of natural ecosystems do not reflect negatively in GDP.

At the same time, the international community has agreed on ambitious strategies (e.g., Sustainable Development Goals (https://www.un.org) and European Green Deal (https://ec.europa.eu) to stop the deterioration of the planet's environment. In order to achieve ambitious goals, significant changes are needed in the entire economic system and also in economic accounting. The concept of green accounting is nothing new, but the practical application of its principles in accounting and statistics has stalled. To improve the situation, an initiative has been launched at UN level and The System of Environmental Economic Accounting (SEEA) has been set up, which organizes and presents statistics on the environment and its relationship with the economy. The Estonian Statistical Office is also involved in this process, contributing to the development of an international standard for statistics on ecosystem services (Statistics Estonia. Grant Agreement 881542 2019-EE-ECOSYSTEMS. Methodological report. Development of the ecosystem accounts), the report is available (https://www.stat.ee/sites/default/files/2021-07/D1.1%20Final%20methodological%20 report.pdf). This grant was not intended to carry out original research, but the results of previous research could be used. This article publishes the author's research results on the assessment of the monetary value of ecosystem services, which Statistics Estonia has used to develop the standard for ecosystem services statistics. A more detailed overview of how statistics use the monetary equivalent of non-market values can be found in the report mentioned above.

The first chapter of this article briefly introduces the institutional framework for the development of a statistical standard that would allow future accounting for ecosystem services. The second chapter analyzes the difficulties arising in integrating non-market values into accounting and statistics. The third chapter presents the author's research results in the economic evaluation of ecosystem services of Estonian forests, wetlands and urban areas.

1. Institutional framework of ecosystem accounting

The System of Environmental Economic Accounting (SEEA) organizes and presents statistics on the environment and its relationship with the economy. The SEEA is a statistical system that brings together economic and environmental information into a common framework to measure the condition of the environment, the contribution of the environment to the economy and the impact of the economy on the environment. The SEEA contains an internationally agreed set of standard concepts, definitions, classifications, accounting rules and tables to produce internationally comparable statistics (https://seea.un.org).

The SEEA EA is one of the new standards in development in System of Environmental Economic Accounting. (System of Environmental- Economic Accounting—Ecosystem Accounting: Final Draft. https://unstats.un.org/unsd/statcom/52nd-session/documents/BG-3f-SEEA-EA_Final_draft-E.pdf)

The SEEA Ecosystem Accounting (UN SEEA EA) constitutes an integrated and comprehensive statistical framework for organizing data about habitats and landscapes, measuring the ecosystem services, tracking changes in ecosystem assets, and linking this information to economic and other human activity.

The United Nations Statistical Commission adopted the SEEA Ecosystem Accounting at its 52nd session in March 2021. This adoption follows a comprehensive and inclusive process of detailed testing, consultation and revision. Today, ecosystem accounts have already been used to inform policy development in more than 34 countries.

(SEEA-EA) built on five core accounts. These accounts are compiled using spatially explicit data and information about the functions of ecosystem assets and the ecosystem services they produce. The five ecosystem accounts are:

1. ECOSYSTEM EXTENT accounts record the total area of each ecosystem, classified by type within a specified area (ecosystem accounting area). Ecosystem extent accounts are measured over time in ecosystem accounting areas (e.g., nation, province, river basin, protected area, etc.) by ecosystem type, thus illustrating the changes in extent from one ecosystem type to another over the accounting period.

2. ECOSYSTEM CONDITION accounts record the condition of ecosystem assets in terms of selected characteristics at specific points in time. Over time, they record the changes to their condition and provide valuable information on the health of ecosystems.

3. & 4. ECOSYSTEM SERVICES flow accounts (physical and monetary) record the supply of ecosystem services by ecosystem assets and the use of those services by economic units, including households.

5. MONETARY ECOSYSTEM ASSET accounts record information on stocks and changes in stocks (additions and reductions) of ecosystem assets. This includes accounting for ecosystem degradation and enhancement.

The SEEA EA also supports ‘thematic accounting’, which organizes data around specific policy-relevant environmental themes, such as biodiversity, climate change, oceans and urban areas. Other important thematic accounts would include accounting for protected areas, wetlands and forests.

A key aspect of ecosystem accounting is that it allows the contributions of ecosystems to society to be expressed in monetary terms so those contributions to society’s well-being can be more easily compared to other goods and services we are more familiar with. Monetary estimates can provide information for decision-makers, for example for economic policy planning, cost-benefit analysis, and for raising awareness of the relative importance of nature to society. Ecosystem service values are derived by using a range of economic valuation techniques. (https://seea.un.org)

The SEEA EA framework allows to answer important, overarching questions on the relationship between the economy, society, and the environment and how we measure well-being and social progress. For example:

- What is the contribution of ecosystems and their services to the economy, social wellbeing, jobs and livelihoods?
- How is the condition, health and integrity of ecosystems and biodiversity changing over time and where are the main areas of degradation and enhancement?
- How can natural resources and ecosystems be best managed to ensure continued services and benefits such as energy, food supply, water supply, flood control, carbon storage and recreational opportunities?
- How should conservation efforts be targeted?
- What opportunities exist for the development of innovative incentive-based programs to conserve nature such as payment for ecosystem services?
- What do estimates of a nation's wealth and economic potential look like once the state of its environment is considered? (https://seea.un.org)

Answering these questions requires that we know how much ecosystem services cost, or in other words, what is their monetary equivalent. Statistics Estonia participates in a global initiative aimed at establishing a standard for statistical accounting of ecosystem services. 2018–2021 have been the years of the revision of System of Environmental-Economic Accounting– Experimental Ecosystem Accounting (UN SEEA EA), Statistics Estonia contributed to the revision in relevant areas of ecosystem accounts. Statistics Estonia has contributed to the revision of UN SEEA EA mainly by:

- testing various methods for monetary valuation of services,
- testing IUCN typology crosswalk,
- trying to develop urban ecosystem thematic account, including trying to define urban area. (https://seea.un.org)

The project was in line with the general objective of environmental economic accounts to build the bridge between the information about ecosystems and the services they provide with the information already available in national accounts. An attempt to organize the information about ecosystem 14 services in the way information is organized in national accounts and contributed to the integration of economic and environmental information has been done. The project also used the author's original contingent valuation studies on the monetary value of forest, wetland and urban area ecosystem services.

2. Difficulties in the accounting and statistics of ecosystem services

Statistics (and the actual turnover based accounting) and environmental economics use "different languages" to describe the relationship between the environment and the economic system, although at least ideally and in the context of sustainable development have a common goal: to describe as accurately as possible stocks. So far, environmental economics and economic accounting have followed quite different paths.

While in the 1960s environmental economics began to explore the possibilities of monetary valuation of non-market (ie non-direct turnover based) natural values, accounting and statistics based on (including GDP statistics based) have until recently been based on real turnover described by accounting. Undoubtedly, with this approach, many ecosystem services will be excluded from official statistics. Not only are non-market values of nature affected by the trouble of being not accounted for by economic accounting, but economic accounting and, consequently, statistics *are* also having difficulty in describing non-market values of human capital.

The branch of environmental economics dealing with nature values, and in particular its applications, has focused mainly on social cost-benefit analysis to generate input to the analyses and also on the monetary assessment of environmental damage. The logic of economic accounting has not been taken into account at all in the development of environmental economics methods. Thus, for example, environmental economics can attribute the market value of all hay from grassland-to-grassland ecosystem and the market value of wood to the forest ecosystem when talking about so-called exchange values. However, the accounting and statistics put the monetary value of hay on the value of agriculture and timber on the forestry (forest industry) line, leaving nothing to the ecosystem. Methodologically, the same happens with the values obtained using revealed preferences. For example, in the travel cost method, which is widely used in environmental economics, the total value found (ie the total financial cost of reaching the site) is attributed to the natural object, claiming that it is the monetary equivalent of a natural object (e.g. such as a waterfall). The value found in this way is also used as an input to a social cost-benefit analysis when it comes to, for example, granting or not granting a permit for the special use of water for the production of hydropower. However, the accounting take a completely different view of travel costs, which are probably described in the transport sector line.

There is also a big difference how environmental economics and accounting approach in the direct measurement of natural values with CVM, which measures the monetary equivalent of natural values through welfare change. As this is not based on real turnover, accounting have completely ignored the resulting increase in welfare, ie it is not reflected in any way, it is not described in any accounting line.

As can be seen from the above, the objectives of environmental economics and accounting have so far been different: the former measures the ability of natural assets (ecosystem services) to increase individual well-being and its monetary equivalent (for non-market values), the latter describes actual turnover (cash flows). These two approaches conflict in developing practically applicable systems for ecosystem services statistics.

The problems that arise when statistics want to start accounting for ecosystem services and assets using environmental economics methods stem from the different objectives of environmental economics and accounting. Environmental economics measures (or tries to measure) how much one or another nature value affects (increases) an individual's well-being. It does not make a fundamental difference whether the service consists of the so-called exchange value at the market price or is non-market by nature. It is important to make different values comparable, ie one-dimensional, in order to compare different resource use scenarios in social cost-benefit analysis! And select the most beneficial for society. What matters is the impact of the service (positive) influence on welfare, not whether it is a market or a non-market service, only the methods used are different, i.e., the willingness to pay for the benefit is determined in different ways. So for example, in some cases the market price (e.g. hay and potatoes), in some cases the cost is indirectly related to the service under valuation (for example, the travel cost method), in some cases where there is no real turnover at all, the use of a simulated market scenario (CVM) is appropriate. However, all these methods measure an individual's actual or hypothetical willingness to pay for a benefit and are therefore monetary equivalent of the value of ecosystem service. Thus, from the point of view of environmental economics, the nature of value is the ability of something to affect positively the welfare of individuals and is measured by the willingness of individuals to pay, whether it is based on real or hypothetical turnover.

However, accounting (and the statistics based on it) have so far dealt with real turnover, described it in a certain way, and the monetary equivalent of the value of ecosystem services found using environmental economics has been not taken over. The problem is that the turnover on the basis of which environmental economics assigns value to services is already described by the accounts in "other lines". This is also the reason why the accounting cannot automatically attribute the market value of all agricultural production to the field ecosystem and all the travel costs of hiking trail users to the ecosystems along the hiking trail. This money is (at least partially) already described on other accounting lines.

In conclusion, it is very difficult to keep economic accounts and produce statistics on ecosystem services without changing the established canons of accounting and statistics and opposing the individual welfare-based approach accepted in environmental economics. This requires major paradigm shifts in areas with a long tradition, such as national statistics and GDP accounting. It is, of course, difficult and time-consuming to bring about change in these large systems, but it is essential to meet the targets of sustainable development.

3. The Contingent valuation study (CVM)

The contingent valuation methodology was first applied in 1963 when Davis sought to assess the value of wildlife among hunters and tourists. In the mid-1970s, the method of conditional valuation began to spread rapidly. Since then, this method has become increasingly popular and is widespread in many countries. In recent decades the method has been widely used to find the monetary equivalent of non-market nature values, e.g. (Bandara, R. and Tisdell, C., 2003; Holmes et al. 2004).

The theory of environmental economics considers contingent valuation method (CVM) to be very reliable in determining the monetary equivalent of the value of non-market goods and services. The method is also universal, practically suitable for determining the financial equivalent of very different types of non-market goods, but it has been used most to evaluate the non-market environmental goods (including ecosystem services). Despite its widespread use in research of academic nature, a major disadvantage of the method is the need for costly special research each time the method is applied. The methodology of conditional valuation is exhaustively discussed by Mitchell and Carson (Mitchell, R., Carson, R.T, 1999; Carson, R.T., 2011). In Estonia, the CVM method has so far been applied, for example, to find the monetary equivalent of non-market nature values of the Jägala waterfall (Ehrlich, Ü., Reimann, M. 2010), the Estonian coast in natural state (Reimann, M, Ehrlich, Ü. 2012) and Lake Harku (Nõmmann, T., Ehrlich, Ü., Pädam, S. 2020).

Contingent valuation methodology as an opportunity to assess the monetary equivalent of non-market values based on welfare economics theory. According to the principles of welfare economics, everything that has a positive effect on people's welfare has value. It also valid for ecosystem services, which can be classified according to the nature of expression into supply services, regulatory services and cultural services.

However, such a classification is not a good basis for choosing a method of economic evaluation of values. It is important for the choice of the economic assessment method whether or not the ecosystem service product is directly tradable on the market. If the product of the service is a direct market good, the service has a market value and the monetary equivalent of the corresponding ecosystem service can also be assessed on the basis of the market price method.

If the value created by the service is not directly tradable in the market, the corresponding value is a non-market value. Non-market values can be divided into two groups depending on whether or not their use associates with a real financial turnover. If there is a real financial cost of using the service (revealed preference), the revealed preference method (such as the travel cost method) is used.

If no real financial costs are made, people (respondents) are asked to directly assess how much the increase in well-being provided by the service to the individual is financially worthwhile. As a result of a sufficient sample survey, a financial equivalent is found for the service under investigation. The method is called contingent valuation and is very widespread in the world for monetary valuation of non-market values. The advantage of the method is the possibility to directly measure how much the researched value affects the welfare of individuals.

The disadvantage of this method is that the monetary value of the service obtained by the contingent valuation method has no connection with the actual (i.e. „accountable“) turnover. Therefore, it is difficult to place the financial result of the service thus obtained in the existing system of accounting and statistics, which is why the corresponding values are also called non-SNA values.

3.1. Methodology

The identification of willingness to pay shall be carried out in the form of a questionnaire or interview and should include the following elements:
1) the scenario and description of the hypothetical or actual activity or program to be evaluated;
2) a mechanism that would highlight the value attributed by the respondents to the observed object or scenario (willingness to pay question);

3) information on the social and economic characteristics, values and preferences of the respondents. (Carson, R.T. 2011)
The aim was to evaluate the ecosystem services of three ecosystems: forest, wetland and urban. In order to evaluate the non-market values of services of these ecosystems, 3 independent CVM studies were performed, one for each ecosystem. The sample sizes used for the CVM studies, share of positive payment decisions and total willingness to pay are shown in the table 1. The sample structure was representative of the Estonian adult population. Willingness to pay is discussed in more detail in the relevant ecosystem subsections.

Table 1. Sample sizes of CVM studies.

Ecosystem	Number of responses to be considered	The share positive payment decisions, %	Total willingness to pay, million EUR/year
Forest	660	90	23.9
Bog	400	89	12.3
Urban	720	91	17.3

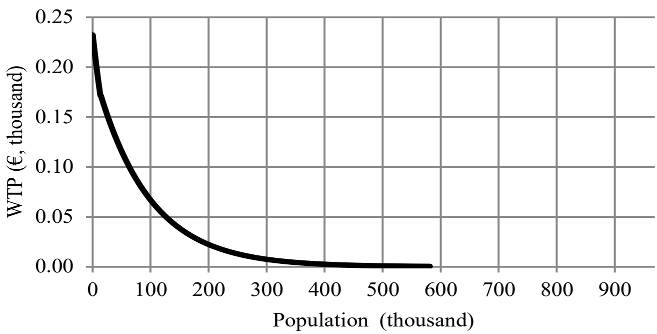
The questionnaires used in the study were designed according to the requirements for CVM surveys. The questionnaires included a simulated market scenario, a willingness to pay identification question and questions on the respondent's sociometric data.

The basic data on total willingness to pay for all three CVM studies were three surveys of the willingness to pay of a representative sample of the Estonian working-age population. Based on this, the total demand functions for the respective ecosystem services was determined and the demand curves was constructed.

To construct the demand curve, the best approximation was found (which is also the general form of the total demand function):

$$WTP = \alpha e^{-\beta x}$$

where WTP is the amount of willingness to pay, x is the number of people who would be willing to pay at least that amount, and α and β are the parameters to be assessed. The demand curve constructed on the basis of the total demand function is presented for all three studies similarly to the illustrative figure below.



The total demand of the Estonian working age population for ecosystem services is mathematically proportional to the area under the demand curve in the figure. The total demand is found by integrating the demand curve according to the formula:

$$CS = \int_{x_1}^{x_2} WTP(x)dx = \int_{x_1}^{x_2} \alpha e^{-\beta x} dx = -\frac{\alpha}{\beta}(e^{-\beta x_2} - e^{-\beta x_1}) \cong \frac{\alpha}{\beta} \quad ,$$

where x_1 is 0 and $x_2$is the number of people with a positive willingness to pay.

While CVM study typically explores the monetary equivalent of a single non-market value (e.g., an existence value of one biological species), the aim in the present study was to explore multiple non-market services in one ecosystem in a single CVM survey. It would probably have been methodologically more correct to carry out CVM study for each non-market ecosystem service separately, but given the labor-intensive nature of such an approach (especially the sample size requirements), this was beyond possibilities.

In order to assess several non-market services of one ecosystem in one CVM survey, respondents were asked to rank the given ecosystem services according to their subjective importance in addition to their declaration of willingness to pay. Based on the preferences received, the declared willingness to pay for ecosystem services was divided between the individual services on the list.

3.2. Relative importance and WTP for forest ecosystem services

The relative importance of forest ecosystem services according to the respondents and the corresponding WTP are presented in Table 2. In the survey of non-market values of the forest ecosystem, 660 questionnaires met the requirements. According to the survey, the total willingness to pay of the Estonian adult population for forest ecosystem services was 23.9 million euros per year. The high percentage of respondents with a positive willingness to pay (90%) is worth noting.

Table 2. Relative importance and WTP for forest ecosystem services

Forest ecosystem service	Relative impor-tance	% total value	WTP (thous. EUR)
Photosynthesis (oxygen production)	1.	13.96	3329.753
Air and water purification	2.	13.71	3271.079
Climate regulation	3.	11.83	2820.943
Habitat supply for biological species	4.	11.64	2777.562
Preserving soil fertility	5.	9.23	2200.465
Ensuring landscape diversity	6.	7.56	1803.242
Enabling pollination and honey collection	7.	7.45	1777.344
Provision of genetic resources and medicinal plants	8.	7.13	1700.029
Provision of berries, mushrooms and other bog products	9.	6.07	1447.123

Providing opportunities for environmental education	10.	5.97	1422.783
Providing recreation and leisure opportunities	11.	5.46	1301.678
TOTAL		**100**	**23852.0**

When ranking ecosystem services on the basis of subjective importance, respondents preferred *Photosynthesis (oxygen production)* (13.96% of the total value, WTP 3.3 million euros). The service *Air and water purification* achieved almost the same result (13.71% of the total value). These two services were followed by *Climate regulation* (11.83% of the total value) and *Habitat supply for biological species* (11.64% of the total value). This sequence clearly shows that, in the case of forests, people consider global environmental regulation services to be paramount. The last three services in the ranking include *Provision of berries*, *mushrooms and other bog products* (6.07% of the total value), and cultural services *Providing opportunities for environmental education* and *Providing recreation and leisure opportunities* (5.97% and 5.46% of the total value respectively).

It is surprising that the service that people are expected to be most exposed to in the forest (*Providing recreation and leisure opportunities*) is at the bottom of the list. It can be concluded that people's subjective welfare is positively influenced more by global life-support services than by direct contact with the forest ecosystem having recreation.

3.3. Relative importance and WTP for wetland ecosystem services

The relative importance of forest ecosystem services according to the respondents and the corresponding WTP are presented in Table 3. The survey is based on 400 questionnaires and the sample structure was representative of the Estonian adult population. Similar to the forest survey, the percentage of positive respondents (89%) was very high.

Table 3. Relative importance and WTP for wetland ecosystem services

Wetland ecosystem service	Relative Impor-tance	% of total value	WTP (thous. EUR)
Maintaining clean water resources	1.	13.57	1665.599
Air and water purification	2.	13.29	1631.006
Habitat supply for biological species	3.	12.90	1583.501
Carbon sequestration	4.	11.30	1387.636
Photosynthesis (oxygen production)	5.	10.71	1315.327
Ensuring landscape diversity	6.	9.42	1156.111
Provision of genetic resources and medicinal plants	7.	7.50	921.072
Provisioning of berries, mushrooms and other bog products	8.	7.28	894.267
Providing opportunities for environmental education	9.	7.18	881.258
Providing recreation and leisure opportunities	10.	6.85	840.725
TOTAL		**100**	**12276.500**

It can be said that the general pattern of wetland ecosystem services ranked by subjective preferences is similar to forest ecosystem services. In the first place is the service *Maintaining clean water resources* (13.57% of the total value, WTP 3.3 million euros). In second place is *Air and water purification* (13,29% of the total value) and in the third place *Habitat supply for biological species* (12,90). They are followed by services related to global climate regulation *Carbon sequestration* (11,30%) and *Photosynthesis* (10,71%). The last two places are cultural services, *Providing opportunities for environmental education* (7,18% of the total value) and *Providing recreation and leisure opportunities* (6.85%).

In summary, the preferences for wetland ecosystem services are very similar to those for forest ecosystem services. Of the ecosystem services provided by wetlands, people also subjectively regard services related to the quality of the environment as the most important and cultural services as the least important. The relative differences between the highest rated and lowest rated services are also similar to the forest ecosystem services. The main difference between forests and wetlands is the overall willingness to pay for ecosystem services, which is almost twice as high for forests as for wetlands, at 23.9 and 12.3 million euros per year, respectively.

3.4. Relative importance and WTP for urban ecosystem services

When conducting the urban area CVM study, it had to be taken into account that the basis for classifying the urban ecosystem is quite different from the other ecosystems studied (forest and wetland). The urban area consists of many different ecosystems such as large parks, small parks in the middle of the city, urban forests, tree alleys, private courtyards, etc. (a more complete list is given in the table 4).

The presence of different ecosystems in the urban area made it difficult to compile the CVM questionnaire and to interpret the results later. The aim of the study was to find monetary equivalent for different services of different urban ecosystems the separately. To achieve this, respondents were asked to rank (according to subjective importance) different urban ecosystems in addition to urban ecosystem services (see table 4). By dividing the total willingness to pay between ecosystems and ecosystem services (both ranked according to subjective preferences), it was possible to find monetary equivalent to all services of all studied urban ecosystems.

The survey is based on 720 questionnaires and the sample structure was representative of the Estonian adult population. Similar to the forest survey, the percentage of positive respondents (91%) was very high as in the case of forest and wetland ecosystem services.

Of the urban ecosystems ranked on the basis of subjective preferences (table 4), large parks are unrivaled (23.3% of total value, WTP 4 million euros). In second place are small parks (17.3%, WTP 3 million euros) and in third place urban forests (15.9%). The last places in the list are relatively smaller urban green areas Lawn *strips and flower pots by the sidewalks* (10.5%) and *Lawn strips by the roadrand between lanes* (10.0%). The ranking of privately-owned gardens is very similar to them (also 10.5%). The result urban ecosystem ranking shows that people appreciate in urban ecosystems higher larger green areas in public use.

Table 4. Relative importance of urban ecosystems and and the corresponding WTP

Urban Ecosystem	Importance	% total value	WTP (thous. EUR)
Big parks (e.g. Kadriorg, Glehni park)	1.	23.3	4028.3
Small parks in the City centre (e.g. Tammsaare park, Hirvepark)	2.	17.3	2985.9
Forests within the city borders (e.g. Nõmme forest, Stroomi forest)	3.	15.9	2747.6
Tall landscaping (trees, alleys) by the road	4.	12.6	2176.5
Privately owned gardens (e.g. Nõmme, Meriválja)	5.	10.5	1815.3
Lawn strips and flower pots by the sidewalks	6.	10.5	1810.3
Lawn strips by the road and between lanes (e.g. Sõpruse av.)	7.	10.0	1723.9
TOTAL		**100.0**	**17287.75**

The relative preferences of urban ecosystem services and the corresponding WTP are presented in Table 5. People value urban ecosystem services the most *City air purification* (14.9% of the total value, WTP 2.6 million euros). This is followed by *Photosynthesis* (11.9%) and *Providing recreation and leisure opportunities* (10.9%). The third place of this cultural service is the main difference compared to forest and wetland ecosystems, where this recreational service was penultimate. This clearly shows that people value urban and natural ecosystem services differently.

Table 5. Relative importance of services urban ecosystems and the corresponding WTP

Urban area ecosystem service	Importance	% (of inverse value)	WTP (thous. EUR)
City air purification	1.	14.9	2579.0
Photosynthesis (oxygen production)	2.	11.1	1924.8
Providing recreation and leisure opportunities	3.	10.9	1884.9
Traffic noise reduction	4.	10.3	1773.5
Habitat supply for biological species (e.g. birds)	5.	10.2	1766.1
Ensuring the diversity of urban space	6.	9.7	1673.1
Urban microclimate regulation and carbon sequestration	7.	9.7	1674.5
Offering aesthetic pleasure (flower buds, alleys)	8.	8.1	1401.7
Providing shade for people (e.g. from wind and sun)	9.	7.9	1360.7
Providing opportunities for environmental education	10.	7.2	1249.4
TOTAL		**100**	**17287.75**

Although the monetary equivalent of the highest rated ecosystem service of the highest rated urban ecosystem differs more than four times from the lowest rated ecosystem service on lowest rated ecosystem, however, it can be argued that the differences between urban ecosystem services are not as large as might have been expected. This shows that people's preferences vary quite a bit, one prefers lawns, the other large parks and the third flower buds. But all these ecosystems are important for the urban green space.

Conclusion

The incompatibility of the financial equivalent of ecosystem services and economic accounting has long been one of the main obstacles to the effective introduction of green accounting. The inability of official statistics to reflect the monetary equivalent of ecosystem services is also a reason why the value of ecosystem services is not included in national GDPs.

In particular, taking into account the identified financial equivalent of non-market ecosystem services in statistics is objectively complicated, as accounting and statistics standard has been so far engaged dealing with real financial turnover. This situation is a serious obstacle to the actual implementation of the principle of sustainable development. An initiative The System of Environmental Economic Accounting (SEEA) has been brought to life to create an international standard for ecosystem services statistics. SEEA organizes and presents statistics on the environment and its relationship with the economy. Statistics Estonia also participates in the in the review and development of the standard and principles ecosystem services statistics. For this purpose, are also used the results obtained assessing the monetary value of Estonian forest, wetland and urban ecosystem services using the contingent valuation method.

Three contingent valuation studies found out that the total willingness to pay for forest ecosystem services is about 23.9 million euros per year, for wetland services 12.3 million euros and for urban areas 17.3 million euros. All three studies were asked to rank respective ecosystem services under study according to their importance. The total willingness to pay for the services of the respective ecosystem was distributed according to the importance indicated by the respondents. The most important services considered by the respondents were regulatory services, photosynthesis in the case of forests, water purification services in the case of wetlands and air purification in the city. Somewhat surprisingly, cultural services such as "providing recreation and leisure opportunities" and "providing opportunities for environmental education" were among the least important. Only in the urban area study was the cultural service in third place after air purification and photosynthesis.

With this in mind it can be concluded that people value ecosystem services aimed at the physico-chemical quality of the environment more than the increase in welfare resulting from personal contact with ecosystems. Such a general attitude creates good preconditions for the implementation of the European Green Deal in Estonia.

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