ECONOMIC VALUATION OF ECOSYSTEMS AND THEIR SERVICES FOR PILOT IMPLEMENTATION AREAS IN SAULKRASTI AND JAUNĶEMERI

Table of contents

ECONOMIC VALUATION OF ECOSYSTEMS AND THEIR SERVICES FOR PILOT IMPLEMENTATION AREAS IN SAULKRASTI AND JAUNĶEMERI

CHAPTER I: ECONOMIC VALUATION OF ECOSYSTEM SERVICES FOR THE PILOT IMPLEMENTATION AREA OF JAUNĶEMERI BASED ON THE PRIMARY DATA

1. Economic valuation of ecosystem services for the pilot implementation area of Jaunķemeri based on the primary data
    1.1. Provisioning services: Fibres and other materials from plants, algae and animals for direct use or processing. Medicinal herbs, yield
    1.2. Cultural services: Experiential or intellectual use of plants, animals and land-/seascapes in different environmental settings Bird watching
    1.3. Cultural services: Physical use of land-/seascapes in different environmental settings. active and passive recreation
    1.4. Cultural services: Educational activities through ecosystems. Environmental education possibilities

1.5. Cultural services: Cultural heritage associated with ecosystems. Cultural heritage interaction possibilities

1.6. Cultural services: Aesthetic interactions. Visual identity of the cultural scenery

2. Economic impact range of ecosystem services

2.1. Provisioning services: Fibres and other materials from plants, algae and animals for direct use or processing. Medicinal herbs, yield

2.2. Cultural services: Experiential or intellectual use of plants, animals and land-/seascapes in different environmental settings Bird watching

2.3. Cultural services: Physical use of land-/seascapes in different environmental settings. active and passive recreation

2.4. Cultural services: Educational activities through ecosystems. Environmental education possibilities

2.5. Cultural services: Cultural heritage associated with ecosystems. Cultural heritage interaction possibilities

2.6. Cultural services: Aesthetic interactions. Visual identity of the cultural scenery

CHAPTER II: ECONOMIC VALUATION OF ECOSYSTEM SERVICES FOR THE PILOT IMPLEMENTATION AREA OF SAULKRASTI BASED ON THE PRIMARY DATA

1. Economic valuation of ecosystem services for the pilot implementation area of Saulkrasti based on the primary data

Provisioning services: Fibres and other materials from plants, algae and animals for direct use or processing. Medicinal herbs, yield

1.2. Cultural services: Experiential or intellectual use of plants, animals and land-/seascapes in different environmental settings Bird watching

1.3. Cultural services: Physical use of land-/seascapes in different environmental settings. active and passive recreation

1.4. Cultural services: Educational activities through ecosystems. Environmental education possibilities

1.5. Cultural services: Cultural heritage associated with ecosystems. Cultural heritage interaction possibilities

1.6. Cultural services: Aesthetic interactions. Visual identity of the cultural scenery

2. Economic impact range of ecosystem services

2.1. Provisioning services: Fibres and other materials from plants, algae and animals for direct use or processing. Medicinal herbs, yield

2.2. Cultural services: Experiential or intellectual use of plants, animals and land-/seascapes in different environmental settings Bird watching

2.3. Cultural services: Physical use of land-/seascapes in different environmental settings. active and passive recreation

2.4. Cultural services: Educational activities through ecosystems. Environmental education possibilities

2.5. Cultural services: Cultural heritage associated with ecosystems. Cultural heritage interaction possibilities

2.6. Cultural services: Aesthetic interactions. Visual identity of the cultural scenery

CHAPTER III: ECONOMIC VALUATION OF ECOSYSTEM SERVICES FOR THE PILOT IMPLEMENTATION AREA OF JAUNĶEMERI BASED ON THE SECONDARY DATA

1. Economic valuation of ecosystem services for the pilot implementation area of jaunķemeri based on the secondary data

1.1. Provisioning services: Wild plants, mushrooms, algae and their outputs

1.2. Provisioning services: Fibres and other materials from plants, algae and animals for direct use or processing

1.3. Provisioning services: Plant-based resources

1.4. Regulating services: Filtration/sequestration/storage/ accumulation by ecosystems

1.5. Regulating services: Noise reduction

1.6. Regulating services: Erosion control

1.7. Regulating services: Buffering and attenuation of mass flows

1.8. Regulating services: Hydrological cycle and water flow maintenance

1.9. Regulating services: Flood protection

1.10. Regulating services: Storm protection

1.11. Regulating services: Pollination and seed dispersal

1.12. Regulating services: Decomposition and fixing processes

1.13. Regulating services: Maintenance of chemicalphisical and biologycal conditions

1.14. Regulating services: Global climate regulation by reduction of greenhouse gas concentrations

1.15. Cultural services: Experiential or intellectual use of plants, animals and land-/seascapes in different environmental settings

1.16. Cultural services: Physical use of land-/seascapes in different environmental settings.

1.17. Cultural services: Educational activities through ecosystems

1.18. Cultural services: Cultural heritage associated with ecosystems.

1.19. Cultural services: Aesthetic interactions

CHAPTER IV: ECONOMIC VALUATION OF ECOSYSTEM SERVICES FOR THE PILOT IMPLEMENTATION AREA OF SAULKRASTI BASED ON THE SECONDARY DATA

1. Economic valuation of ecosystem services for the pilot implementation area of Saulkrasti based on the secondary data

1.1 Provisioning services: Wild plants, mushrooms, algae and their outputs

1.2 Provisioning services: Wild fish (river)

1.3 Provisioning services: Potentially obtainable growing forest stock volume and Medicinal herbs, yield

1.4 Provisioning services: Potentially obtainable biomass stock volume for energy use

1.5 Regulating services: Filtration/sequestration/storage/ accumulation by ecosystems

1.6 Regulating services: Dilution of pollution in freshwater system

1.7 Regulating services: Noise reduction

1.8 Regulating services: Erosion control

1.9 Regulating services: Buffering and attenuation of mass flows

1.10 Regulating services: Hydrological cycle and water flow maintenance

1.11 Regulating services: Flood protection

1.12 Regulating services: Storm protection

1.13 Regulating services: Pollination and seed dispersal

1.14 Regulating services: Decomposition and fixing processes

1.15 Regulating services: Maintenance of water chemical quality, including biogenic conditions

1.16 Regulating services: Maintenance of chemicalphisical and biologycal conditions

1.17 Regulating services: Global climate regulation by reduction of greenhouse gas concentrations

1.18. Cultural services: Experiential or intellectual use of plants, animals and land-/seascapes in different environmental settings

1.19. Cultural services: Physical use of land-/seascapes in different environmental settings.

1.20. Cultural services: Educational activities through ecosystems

1.21. Cultural services: Cultural heritage associated with ecosystems.

1.22. Cultural services: Aesthetic interactions

CHAPTER V: COMPARATIVE VALUATION OF ECOSYSTEM SERVICES BY ANALYSING THE DATA IN THE CONTEXT OF SOCIO-ECONOMIC/WELFARE FACTORS

1. Sociological data analysis

1.1. Socio-Demographic indicators

2. Usage of ecosystem services

2.1. Cultural services: Experiential or intellectual use of plants, animals and land-/seascapes in different environmental settings Bird watching

2.2. Cultural services: Physical use of land-/seascapes in different environmental settings. active and passive recreation

2.2.1. Cultural services: Physical use of land-/seascapes in different environmental settings. active and passive recreation. Meta analysis

2.3. Cultural services: Educational activities through ecosystems. Environmental education possibilities

2.4. Cultural services: Cultural heritage associated with ecosystems. Cultural heritage interaction possibilities

2.5. Cultural services: Aesthetic interactions. Visual identity of the cultural scener

2.6. Provisioning services: Fibres and other materials from plants, algae and animals for direct use or processing. Medicinal herbs, yield

3. Consumed resources for ecosystem services

4. Foreign visitors

Summary

The objectives of the economic valuation of ecosystem services (ES) within the LIFE Project "Assessment of ecosystems and their services for nature biodiversity conservation and management" No LIFE13 ENV/LV/000839 (hereinafter - Project) is as follows:
- to carry out economic valuation for the ES in order to obtain monetary data for the further assessments;
- to compare the values of the ecosystem services against the various social factors identified as influenced by or influencing the values of the ES
- to use the obtained data for the assessment of the development scenarios for Saulkrasti and Jaunķemeri Pilot Implementation Areas (PIA).

The economic valuation of ES has been carried out based both on primary and secondary data. The economic valuation of ES based on the primary data is described in Chapter I *"Economic valuation of ecosystem services for the Pilot Implementation Area of Jaunķemeri based on the primary data" and* Chapter II *"Economic valuation of ecosystem services for the Pilot Implementation Area of Saulkrasti based on the primary data"*. From the data obtained it can be concluded that the cultural services and a provisioning service for gathering of *Medicinal herbs* of Saulkrasti PIA in particular have the highest monetary value.

The resulting data can be explained by analysing it in the context with socio-economic data, gathered within the surveying process. The economic valuation of ES by using the Travel Cost method is based on concrete costs related to the expenses required for traveling to the particular territory, unearned income, time spent, frequency of the use of ES and other variables.

Analysing the information from the social surveys, described in the Chapter V *"Comparative valuation of ecosystem services by analysing the data in the context of socio-economic/welfare factors"*, it has been concluded that the visitors of Jaunķemeri PIA use the available ES less often. More precisely, a major part of the visitors of Saulkrasti PIA use the provided ES on a daily basis, as opposed to the Jaunķemeri PIA, where such visitors are significantly lesser, therefore the use value of the ES is decreased.

The Chapter III *"Economic valuation of ecosystem services for the Pilot Implementation Area of Jaunķemeri based on the secondary data"* and Chapter IV *"Economic valuation of ecosystem services for the Pilot Implementation Area of Saulkrasti based on the secondary data"* contain a detailed description of economic valuation of ES based on the secondary data.

Similar values were obtained from valuation of cultural services in both PIA. For instance, valuation of the services *Physical use of land-/seascapes in different environmental settings*, *Educational activities through ecosystems* and *Cultural heritage associated with the ecosystems* in both areas has delivered identical results.

Comparison of the primary and secondary data obtained during the valuation of ES has been performed in order to assess the application of different methods. Comparison of the ES as such has not been carried out, as that requires use of the same valuation approaches. In particular, such mutual comparison of ES can be carried out either based only on primary or only on secondary data.

Data obtained by using different valuation methods vary greatly. For instance, because the primary data represents information about a beneficiary of a specific service, while secondary data reflects the current market situation (Direct Market Pricing method), as well as provides information on the estimated service value based on the values obtained within other studies (Benefits Transfer method). At the same time it can be hypothetically assumed that the primary data, obtained by surveying the actual users of the ES, reflects the economic values of those ES more objectively.

Limitations of the research

Monetary valuation of the ES is also a *relative assessment*, namely, it is possible to compare the monetary values of the services A and B and determine, which of the services has more value, but it is impossible to assert the exact cost of the service as a monetary value, as that greatly depends on the assumptions within the particular study and limitations of the research during the process of valuation of ES.

The methodological conclusion as a result of the Project activities is related to the different usability of the methods and mutual comparison of results. In particular, cross-evaluation of the data of economic evaluation of ES that has been obtained based on application of different methods is not entirely correct, as the economic values of ES are not analogical to the privatisation and possibility to offer them for trade in the private market.

KOPSAVILKUMS

Ekosistēmu pakalpojumu (EP) ekonomiskās novērtēšanas **mērķis** projekta LIFE "Ekosistēmu un to sniegto pakalpojumu novērtējuma pieejas pielietojums dabas daudzveidības aizsardzībā un pārvaldībā" Nr.LIFE13 ENV/LV/000839 (turpmāk - Projekts) ietvaros ir šāds:

- veikt EP ekonomisko novērtēšanu, lai apzinātu to monetārās vērtības;
- salīdzināt EP vērtības saistībā ar dažādiem sociālajiem un labklājības faktoriem, kurus ietekmē vai kuri ietekmē EP vērtības;
- izmantot iegūtās vērtības, lai novērtētu Saulkrastu un Jaunķemeru piloteritoriju attīstības scenārijus.

EP ekonomiskā novērtēšana veikta izmantojot gan primāros, gan sekundāros datus. EP ekonomiskais novērtējums, izmantojot primāros datus, aprakstīts I sadaļā *Ekosistēmu pakalpojumu ekonomiskais novērtējums Jaunķemeru piloteritorijai, izmantojot primāros datus* un II sadaļā *Ekosistēmu pakalpojumu ekonomiskais novērtējums Saulkrastu piloteritorijai, izmantojot primāros datus*. No iegūtajiem datiem var secināt, ka lielākā monetārā vērtība ir kultūras pakalpojumiem un apgādes pakalpojumam *Ārstniecības augu ievākšana* tieši Saulkrastu piloteritorijā.

Iegūtos datus iespējams skaidrot, analizējot tos kontekstā ar sociāli ekonomiskajiem datiem, kas iegūti anketēšanas rezultātā. EP ekonomiskā novērtēšana, izmantojot ceļojuma izmaksu metodi, balstās uz konkrētām izmaksām, kas saistītas ar nokļūšanu līdz teritorijai, negūtajiem ienākumiem, pavadīto laiku, EP izmantošanas biežumu un citiem mainīgajiem.

Analizējot informāciju no sociālajām aptaujām, kas aprakstīta V sadaļā *Ekosistēmu pakalpojumu salīdzinošā vērtēšana, analizējot tos kontekstā ar sociālajiem/labklājības faktoriem*, secināts, ka Jaunķemeru piloteritorijas apmeklētāji salīdzinoši retāk izmanto pieejamos EP. Proti, liela daļa Saulkrastu piloteritorijas apmeklētāju gandrīz katru dienu izmanto ekosistēmu sniegtos pakalpojumus, turpretī Jaunķemeru piloteritorijā šādu apmeklētāju ir ievērojami mazāk, līdz ar to arī EP izmantošanas vērtība samazinās.

III sadaļā *Ekosistēmu pakalpojumu ekonomiskais novērtējums Jaunķemeru piloteritorijai, izmantojot sekundāros datus* un IV sadaļā *Ekosistēmu pakalpojumu ekonomiskais novērtējums Saulkrastu piloteritorijai, izmantojot sekundāros datus* detāli aprakstīta EP ekonomiskā novērtēšana, izmantojot sekundāros datus.

Līdzīgi novērtētie EP abās piloteritorijās ir kultūras pakalpojumi. Piemēram, fiziska ainavas baudīšana dažādos vides apstākļos, izglītojoša darbība, izmantojot EP un kultūras mantojums, kas saistīts ar ekosistēmu abās piloteritorijās ir novērtēts identiski.

EP novērtēšanā iegūto primāro un sekundāro datu salīdzināšana veikta, lai novērtētu dažādu metožu pielietojamību. Pašu pakalpojumu salīdzināšana netiek veikta, jo tā ir jāveic, izmantojot vienādas novērtēšanas metodes. Proti, EP savstarpējo salīdzināšanu var veikt balstoties vai nu tikai uz sekundārajiem vai tikai uz primārajiem datiem.

Dati, kas iegūti izmantojot dažādas vērtēšanas metodes ievērojami atšķiras, jo, piemēram, primārie dati atspoguļo informāciju par konkrētā pakalpojuma guvēju, turpretī sekundārie dati atspoguļo esošā tirgus situāciju (tirgus cenu metodes gadījumā), kā arī sniedz

informāciju par aptuveno pakalpojuma vērtību, pamatojoties uz vērtībām, kas iegūtas citos pētījumos (ieguvumu pārneses metodes gadījumā). Tajā pašā laikā, hipotētiski var pieņemt, ka primārie dati, kas iegūti aptaujājot faktiskos EP izmantotājus, atspoguļo objektīvāku EP ekonomisko vērtību.

Pētījuma ierobežojumi

EP monetārā novērtēšana ir *relatīva novērtēšana*, proti, var salīdzināt pakalpojumu A un B monetāras vērtības un noteikt, kāds pakalpojums vērtīgāks, taču apgalvot, cik tieši maksā pakalpojums naudas izteiksmē nav korekti, jo tas ir atkarīgs no pētījuma pieņēmumiem un ierobežojumiem EP novērtēšanas laikā.

Projekta ietvaros veiktais metodoloģiskais secinājums saistīts ar metožu dažādo pielietojamību un savstarpējo rezultātu salīdzināšanu. Proti, EP ekonomiskās novērtēšanas datus, kas iegūti, izmantojot dažādas metodes, savstarpēji salīdzināt nav korekti, jo EP ekonomiskās vērtības nav analogs privatizācijai un iespējai piedāvāt tos tirdzniecībai privātā tirgū.

INTRODUCTION

The objective of the economic valuation of ecosystem services (ES) within the LIFE Project "Assessment of ecosystems and their services for nature biodiversity conservation and management" No LIFE13 ENV/LV/000839 (hereinafter - Project) is as follows:

- to carry out economic valuation for the ES in order to obtain monetary data for the further assessments;
- to compare the values of the ecosystem services against the various social factors identified as influenced by or influencing the values of the ES
- to use the obtained data for the assessment of the development scenarios for Saulkrasti and Jaunķemeri Pilot Implementation Areas (PIA).

In order to reach the set objective, the following **tasks** have been defined in the Project Proposal**:**
- to apply various methodologies for the assessment of each ecosystem and ecosystems services in order to verify and validate the results;
- to collect the data regarding the results of previous similar, scientifically approved international researches;
- to carry out social survey for obtaining non-existing data for economic evaluations of ecosystems and their services;
- to validate the obtained monetary values for the ecosystem services basing on the results of social survey;
- to carry out comparative analysis of the ecosystem service values against the identified social an welfare factors;
- to perform the economic assessment of the current ecosystem service values in the PIAs of Saulkrasti and Jaunķemeri.

This report summarises the main results and methods of the economic valuation of ES carried out within the Project in the specific PIA of Saulkrasti and Jaunķemeri.

The economic evaluation of ES has been carried out basing on external service contracts. The Association of Persons – "Direct Impact and "Ardenis" Ltd." (No of contract BK2015-12/01, December 30th, 2015) has performed the economic evaluation of ES within the framework of the contract. The Association "Misiņa bibliotēkas Atbalsta biedrība" *("Association for the support of Misiņa library"*) (No of contract BK2016-08/02, August 4th, 2016) has performed the sociological survey within the framework of the contract.

This chapter - *The economic valuation of ecosystems and their services in the Pilot Implementation Areas of Saulkrasti and Jaunķemeri* – has been elaborated as a summarising chapter, comprising information on:
- economic valuation of ES;
- PIAs of the Project;
- methods of economic valuation of ES used within the Project;
- economic valuation of ES based on the primary data;
- economic valuation of ES based on the secondary data.

This Chapter comprises a summary of economic valuation of ES (based on the primary and secondary data). More detailed information on performed data calculations is presented in the following chapters:

- Chapter I: *Economic valuation of ecosystem services for the Pilot Implementation Area of Jaunķemeri based on the primary data*;

- Chapter II: *Economic valuation of ecosystem services for the Pilot Implementation Area of Saulkrasti based on the primary data*;

- Chapter III: *Economic valuation of ecosystem services for the Pilot Implementation Area of Jaunķemeri based on the secondary data*;

- Chapter IV: *Economic valuation of ecosystem services for the Pilot Implementation Area of Saulkrasti based on the secondary data*;

- Chapter V: *Comparative valuation of ecosystem services by analysing the data in the context of socio-economic/welfare factors*.

1. ECONOMIC VALUATION OF ECOSYSTEM SERVICES AND METHODS APPLIED

Total Economic Value (TEV) of ecosystem services is the sum of different economic values (Figure 1.1), both those that have direct and indirect use value, and those that have non-use value. Non-use value is based on possible use of benefits by our or future generations. It includes existence value, altruistic value and bequest value.[1]
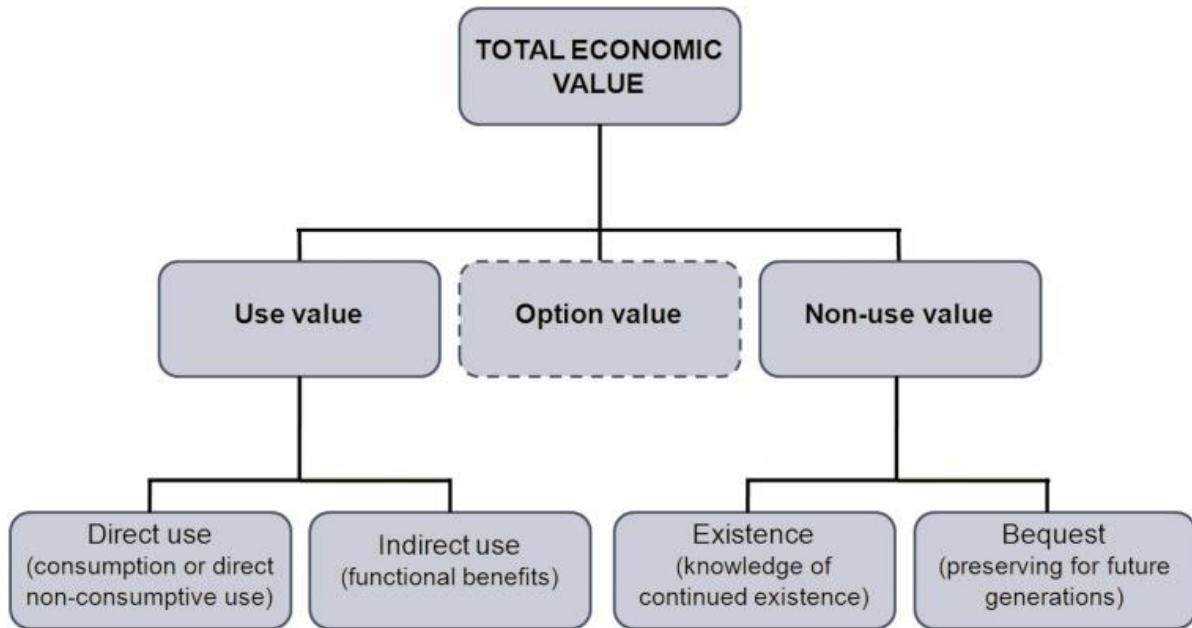

Figure 1.1. The Total Economic Value (TEV) framework for valuation of ecosystem services (adapted from Ledoux & Turner 2002, Chee et al. 2004, Saunders et al. 2010)[2]

In determining monetary values of ecosystem services (value that a good or service could provide if it was sold[3]) various methods are used, including:

✓ Direct Market Pricing - DMP – monetary value that is determined and paid for goods and services on the market;

✓ Production Function – PF – calculates economic values of ecosystem goods or services that promote production of commercial market goods;

✓ Avoided Cost – AC – methods value an ecosystem service through the reduction in costs that would be incurred if those services were no longer available/delivered;

✓ Replacement Cost – RC – methods estimate a value based on the cost to replace an ecosystem function or service;

---

[1] UNEP-WCMC (2011) *Marine and coastal ecosystem services: Valuation methods and their application.* UNEP-WCMC Biodiversity Series No.33. 46 pp.

[2] https://www.researchgate.net/figure/258104227_fig2_The-Total-Economic-Value-TEV-framework-for-valuation-of-ecosystem-services-adapted

[3] http://www.thefreedictionary.com/monetary+value

✓ Contingent Valuation – CV – the demand value of the service that is created by a hypothetical scenario based on evaluation of alternative land use types. For example, willingness of people to pay for preserving the shore and beach;

✓ Travel Cost – TC – the basic idea is that the price of the specific location is formed by the total costs of time and travel that people have spent when visiting this location.

✓ Hedonic Pricing – HP – estimates the economic value of those ecosystem services that directly impact market prices. Most often this method is applied to property price changes that reflect the value of the local environment[4];

✓ Benefit Transfer Method – BT – is used to estimate economic values by transferring information available from other studies performed in a different location/context;

✓ Other methods and combinations of mixed methods[5].

In fact it is possible to apply almost any of the aforementioned methods to any economic value categories, but most often these methods are used for a specific purpose:

✓ in valuing support services – direct market pricing and production function;

✓ in valuing regulating services – avoided cost, benefit transfer and replacement cost;

✓ in valuing cultural services – direct market pricing, benefit transfer, contingent valuation, and travel cost[6].

Each of the methods for economic valuation of ES has its advantages and disadvantages (Table 1.1).

Table 1.1
Comparison of the methods for economic valuation of ES

Advantages	Limitations
Direct Market Pricing	
Market prices reflect the readiness of private entities to pay for the goods and services on the market, provided by the ecosystems of the coastal area (e.g. timber, fish, recreation).	Shortcomings of market and/or politics can distort the market prices, which then do not reflect the economic value of the goods and services correctly. Using the Direct Market Pricing it is necessary to take into account seasonal variations and other price influencing factors.
Production Function	
The method is widely used for valuation of	Clear modelling of resources and economic output

---

[4] http://www.ecosystemvaluation.org/uses.htm - http://www.ecosystemvaluation.org/essentials.htm

[5] R. de Groot, L.Brander, S. van der Ploeg, R.Costanza, Fl.Bernard, L.Braat, M.Christie, N.Crossman, A.Ghermandi, L.Hein, S.Hussain, P.Kumar, A.McVittie, R.Portela, L.C.Rodriguez, P. ten Brink, P. van Beukering (2012). *Global estimates of the value of ecosystems and their services in monetary units.* Ecosystem Services 1, 50-61 pp.

[6] U.Pascual, R.Muradian, L.Brander, E.Gomez-Baggethun, B.Martin-Lopez, M.Verma, P.Armsworth, M.Chritie, H.Cornelissen, F.Eppink, J.Farley, J.Loomis, L.Pearson, C.Perrings, S.Polasky. (2010). *The economics of valuing ecosystem services and biodiversity*. In: Kumar, P. (Ed.), TEEB Foundations, The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations. Earthscan, London (Chapter 5), 133 pp. http://www.teebweb.org/our-publications/teeb-study-reports/ecological-and-economic-foundations/

Advantages	Limitations
e.g. impact of the water pollution on production related activities, such as fishing.	is required, making sure that there is a mutual "response reaction" between the two variables, that is, if one of the variables is affected by the impact on the other. The application of the method is comparatively simple if there is an existing direct connection between the variables but it gets more complicated if several variables are linked or if the linkage is mediated.
Replacement Cost and Avoided Cost	
The method is useful for identification of the indirect use benefits when ecological data are not available to assess the damages. The method can provide a rough value of economic indicator, considering the data limitations.	It is difficult to ensure that the net benefits from replacement do not exceed their original functions or value. The willingness to pay may be exaggerated if only the physical output indicators are available.
Contingent Valuation or Constructed Market method	
The only method that can measure the potential use value and existence value and provides a true total economic value as a result.	Requires acquiring of sensitive information, and as a result there is a risk of bias in the questionnaire design and implementation of surveys.
Travel Cost	
Widely used to assess the recreational value, including for parks and outdoor services. Can be used to assess the willingness to pay for eco-tourism and other services.	Large collection of data, restrictive assumptions about consumer behaviour (e.g. numerous destinations, numerous used means of transport). Sensitive statistical methods are used to determine the demand proportions.
Hedonic Pricing	
Hedonic Pricing method has the potential to assess a variety of natural values, taking into account their impact on the value of land, assuming that natural value fully reflect the property price.	Application of the Hedonic Pricing method in determining the environmental functions requires that the obtained values be reflected in surrogate market. This approach may be limited in cases of market distortion, when the options are limited by income, with limited information on environmental conditions and scarcity of available data.[7]
Benefit Transfer	
This method can be implemented significantly faster and is less costly than the original valuation study. It is easily applicable for identification of the gross value of recreational services. The more similar territories and output data is used, the more accurate are results.	Difficulties may occur with finding appropriate studies, since many are not published. Reporting of existing studies may be incomplete for assessment of their adequacy.[8]

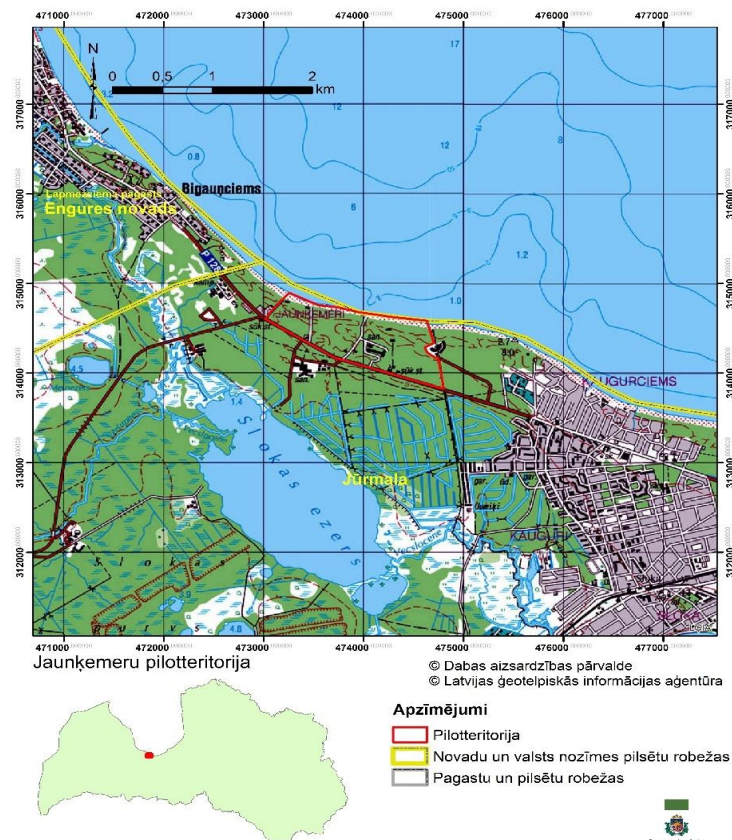## 2. CHARACTERISATION OF THE PILOT IMPLEMENTATION AREAS

In accordance with the Project goals the economic valuation of ES is carried out for both Project PIA – Saulkrasti and Jaunķemeri. In order to better understand the values and potentials of both territories the following description of both areas is provided.

Both Saulkrasti and Jaunķemeri PIA are biologically valuable coastal territories and are considered as protected on national, as well as European Union (hereinafter – EU) level. At the same time they are essential for the entire coastal area in economic, cultural and aesthetic context.

The selected PIA comprise various types of habitats, including protected coastal habitats of EU importance with constantly changing environmental quality as a result of natural processes and anthropogenic factors, forming the overall coastal ecosystem (more detailed description provided in the report of Baltic Environmental Forum (BEF))[9].

2.1. CHARACTERISATION OF JAUNĶEMERI PILOT IMPLEMENTATION AREA

Jaunķemeri PIA is located within the Jūrmala City, between the Gulf of Riga and Rīga - Kolka highway of national importance, Jaunķemeri road and Zvīņu Street. The overall area covers 90,85 ha and lies within the special area of conservation - Ķemeri National Park (Figure 2.1).

Jaunķemeru pilotteritorija

© Dabas aizsardzības pārvalde
© Latvijas ģeotelpiskās informācijas aģentūra

Apzīmējumi
- Pilotteritorija
- Novadu un valsts nozīmes pilsētu robežas
- Pagastu un pilsētu robežas

---

[9] BEF. Final Report "Identification and assessment of the ecosystems and their services in Jaunķemeri and Saulkrasti Pilot Implementation Areas within the Project LIFE EcosystemServices (LIFE13 ENV/LV/000839)" (BEF, 2016)

Figure 2.1 – Jaunķemeri Pilot Implementation Area

For a prolonged time the territory has been and is continuously used for tourism and recreation due to the high scenic value. The historical development and existing traditions in Jūrmala city are associated with recreation and rehabilitation, and consequently therefore a hotel with respective infrastructure is located within the PIA. As a place for relaxation and enjoying walks along the seaside or coastal woods it is also frequented by guests of surrounding hotels and health resorts, as well as other visitors of Jūrmala city and beach.

Most of the area is covered in wooded dunes with pine trees, criss-crossed by numerous narrow streets and walking paths leading to the beach, which is comparatively narrow - only 10-15 m wide.

Within the BEF report[10] the ES in Jaunķemeri PIA have been identified in accordance with the types of land cover or "geospatial units" (Table 2.1). The areas of the geospatial units have been used for assessment and definition of the qualitative and economical values of the ES.

Table 2.1

Geospatial units in Jaunķemeri PIA according to the types of land cover

Geospatial units	Area, ha
Beach	5,55
Embryonic dunes	0,82
Foredunes (white dunes)	3,85
Wooded coastal dunes and old or natural Boreal Forests (Western Taiga), mature or over-seasoned stands	45,12
Wooded coastal dunes and old or natural Boreal Forests (Western Taiga), middle-forest and seasoning stands	23,8
Wooded coastal dunes, mature or over-seasoned stands	0,12
Wooded coastal dunes, middle-forest and seasoning stands	3,8
Public housing areas, areas around the buildings	5,4
Buildings	0,74
Transport infrastructure	4,4
Total	**93,6**

---

[10] BEF. Final Report "Identification and assessment of the ecosystems and their services in Jaunķemeri and Saulkrasti Pilot Implementation Areas within the Project LIFE EcosystemServices (LIFE13 ENV/LV/000839)" (BEF, 2016)

2.2.   CHARACTERISATION OF SAULKRASTI PILOT IMPLEMENTATION AREA

The PIA is located within the area of Saulkrasti town between the Gulf of Riga, road of local importance (Rīgas Street), Inčupe and Pēterupe. The total area covers 132,86 ha. Part of the PIA lies within the special area of nature conservation – Nature Park "Piejūra" (Figure 2.2).
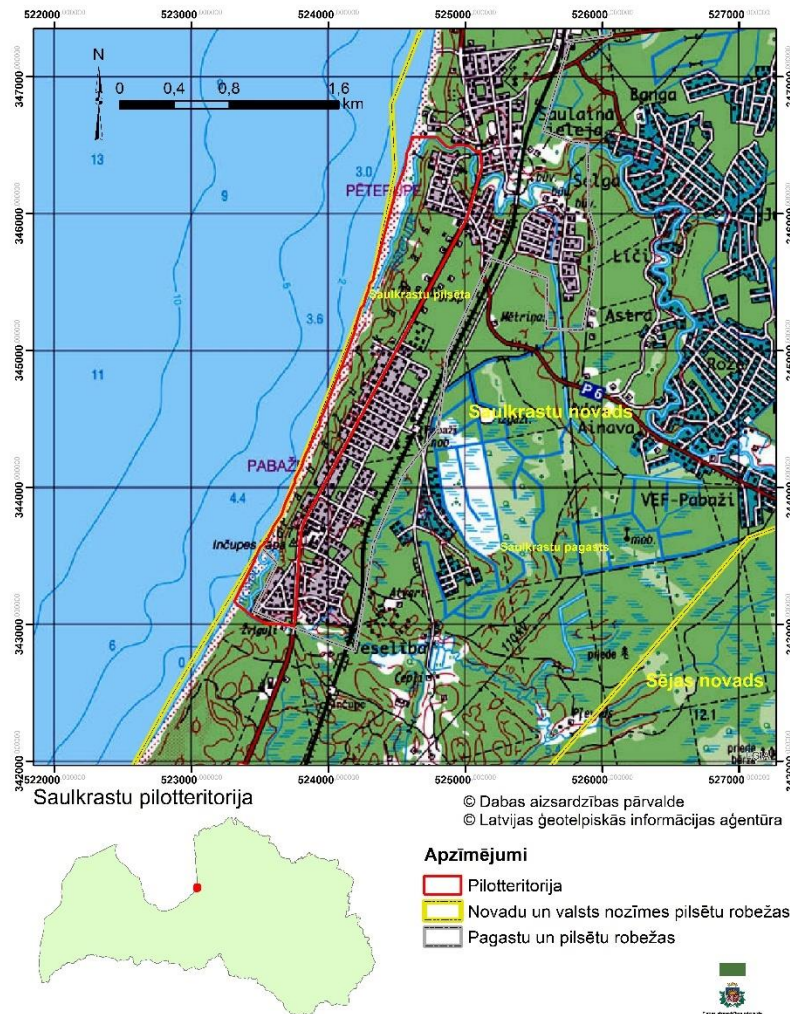
Figure 2.2 – Saulkrasti Pilot Implementation Area

The PIA is located between the estuaries of two rivers – Inčupe and Pēterupe. Similarly to Jaunķemeri, the territory has been historically used for tourism and recreation due to the high scenic value, including the beach. Within the area of Inčupe estuary a highly recognised tourism object is located – The White Dune of Saulkrasti.

Within the BEF report[11] the ES in Saulkrasti PIA have been identified in accordance with the types of land cover or "geospatial units" (Table 2.2). The areas of the geospatial units have been used for assessment and definition of the qualitative and economical values of the ES.

---

[11] BEF. Final Report "Identification and assessment of the ecosystems and their services in Jaunķemeri and Saulkrasti Pilot Implementation Areas within the Project LIFE EcosystemServices (LIFE13 ENV/LV/000839)" (BEF, 2016)

Table 2.2

Geospatial units in Saulkrasti PIA according to the types of land cover

Geospatial units	Area, ha
Beach	16,4
Embryonic dunes	0,85
Foredunes (White Dunes)	8,38
Water courses of plain to montane levels	7,42
Wooded coastal dunes and old or natural Boreal Forests (Western Taiga), mature or over-seasoned stands	12,05
Wooded coastal dunes and old or natural Boreal Forests (Western Taiga), middle-forest and seasoning stands	12,43
Wooded coastal dunes, mature or over-seasoned stands	13,39
Wooded coastal dunes, middle-forest and seasoning stands	22,85
Ruderal grasslands	2,35
Low-rise residential building area	25,63
Multi-storey residential building area	0,73
Public housing area	2,85
Transport infrastructure	7,52
Total	**132,85**

3. METHODS USED WITHIN THE STUDY

Monetary valuation of ES is a *standardized assessment*, as it provides conversion of several different ES indicator values into a single monetary value (e.g. EUR/ha/year), which makes it possible to perform a mutual comparison of different services, which have not been defined with this method.

It has to be pointed out that monetary valuation of the ES is also a *relative assessment*, namely, it is possible to compare the monetary values of the services A and B and determine, which of the services has more value, but it is impossible to assert the exact cost of the service as a monetary value, as that greatly depends on the assumptions within the particular study and limitations of the research during the process of valuation of ES.

One of the objectives in order to achieve the overall Project goal was to test a number of methods of the economic assessment of ES. Given that the economic valuation of ES is a complex and time-consuming process and due to the limitations of time and resources within the Project, it was decided to use three (3) most appropriate methods of economic evaluation of ES for the given situation: the Direct Market Pricing method, Travel Cost method and Benefit Transfer method.

Direct Market Pricing method has been used within the Project due to the reason that it comprises standardised methods of economics, which are based on relatively easily obtainable existing commercial market prices. This method was applied by determining all economic values for the provisioning services as well as some of the economic values for the regulating services, in particular, for those regulating services with identifiable commercial market prices for the ecosystem products.

Direct Market Pricing method is used in cases when environmental improvements cause changes in either quantity or quality of a good or service provided by the ecosystem, or the resources required for the production of such. The measuring of the economic benefits from marketed goods is based on the quantity of good or service purchased at different prices, and the quantity supplied at different prices. Direct Market Pricing method is applied as follows:

- ✓ using the market data for estimation of the market demand function and consumer surplus before the environmental improvement;
- ✓ estimation of the market demand function and consumer surplus after the environmental improvement;
- ✓ estimation of the economic benefit loss to consumers by subtracting the benefits after from the benefits before the environmental improvement;
- ✓ estimation of the producer surplus before the environmental improvement, which is measured by the difference between the total revenues earned from a good and the total variable costs of producing it;
- ✓ measuring the producer surplus after the environmental improvement;
- ✓ calculation of the loss in producer surplus by subtracting the benefits after from the benefits before the environmental improvement;
- ✓ calculation of the total economical losses as a sum of lost consumer surplus and lost producer surplus. The obtained result can be used to compare the benefits of

the actions to the costs of the actions required for the environmental improvements.[12]

Within the framework of the Project study the Direct Market Pricing method has been used in order to assess the economic (monetary) value of ecosystem provisioning and regulating services, based on the *secondary data* analysis. The practical approbation of the methodology and economical calculations are available in the Chapter III "*Economic valuation of ecosystem services for the Pilot Implementation Area of Jaunķemeri based on the secondary data*" and Chapter IV "*Economic valuation of ecosystem services for the Pilot Implementation Area of Saulkrasti based on the secondary data*".

The Benefit Transfer method within the Project has been chosen as it allows carrying out the assessment and obtaining economic values of ES significantly faster and at lower costs than performing an original study.

The Benefit Transfer method is used to estimate economic values for ES by transferring available information from studies already completed in another location and/or context. Therefore the goal of Benefit Transfer method is to estimate benefits for one context by adapting an estimate of benefits from some other context. Benefit Transfer is often used when it is too expensive and/or there is too little time available to conduct an original valuation study. The application of the Benefit Transfer method is as follows:
- ✓ identification of existing studies or data bases that can be used for the transfer of the values for economic valuation of ES in current context;
- ✓ evaluation of the identified values in order to assess their transferability and adequacy for the economic valuation of ES in current context;
- ✓ estimation of the quality of the identified studies to be transferred;
- ✓ adjustment of the existing values for better use for economic valuation of ES in current context, using all available and relevant information, e.g. demographical or spatial data;
- ✓ calculation of the potential economical benefits by applying the adjusted values of the good or service to the estimated demand for the good or service based on the surveyed data from the current study context.[13]

Within the Project study the Benefit Transfer method has been used to assess the economic (monetary) values for the regulatory and cultural ES, based on the *secondary data* analysis. The practical approbation of the methodology and economical calculations are available in the Chapter III "*Economic valuation of ecosystem services for the Pilot Implementation Area of Jaunķemeri based on the secondary data*" and Chapter IV "*Economic valuation of ecosystem services for the Pilot Implementation Area of Saulkrasti based on the secondary data*".

Travel Cost method is used in order to assess benefits or costs related to the use of ecosystems for recreation:
- ✓ defining a set of zones surrounding the site;
- ✓ collecting information on the number of visitors from each zone and the number of visits made in the last year;
- ✓ calculation of the visitation rates per 1000 population in each zone;

---

[12] http://www.ecosystemvaluation.org/market_price.htm
[13] http://www.ecosystemvaluation.org/benefit_transfer.htm.

- ✓ calculation of the average round-trip travel distance and travel time to the site for each zone;
- ✓ calculation of the travel cost per trip, using average cost per mile and per hour of travel time (EUR/km, EUR/h);
- ✓ estimation of the relation of visits per capita to travel costs and other important variables (such as age, income, gender, and education levels, etc.) by using regression analysis;
- ✓ construction of the demand function for visits to the site, using the results of the regression analysis;
- ✓ estimation of the total economic benefit of the site to visitors by calculating the consumer surplus, or the area under the demand curve. The results can be used for comparison against the costs required for protection of the recreational site.[14]

Within the Project the application of the Travel Cost method was possible as the necessary data was acquired as a result of surveying activities. (Detailed description in Chapter V: "*Comparative valuation of ecosystem services by analysing the data in the context of socio-economic/welfare factors*"). It is important to emphasize that the use of the Travel Cost method was most applicable for the assessment of cultural ES. However, within the Project this method was also used for valuation of a provisioning service related to gathering of *Medicinal herbs*.

Within the Project study the Travel Cost method has been used to assess the economic (monetary) values for the cultural and provisioning ES, based on the *primary data* analysis. The practical approbation of the methodology and economical calculations are available in the Chapter I "*Economic valuation of ecosystem services for the Pilot Implementation Area of Jaunķemeri based on the primary data*" and Chapter II "*Economic valuation of ecosystem services for the Pilot Implementation Area of Saulkrasti based on the primary data*".

In the Table 3.1 those indicators of ES are reflected, for which the economic values were determined. In addition, for each indicator the most appropriate method of economic valuation is defined. The indicators are coded in accordance with the mapping of ES carried out within the Project.

Table 3.1

Categories, classes and indicators of ES and methods for their economic valuation

Category	Class	Indicator	Methods applied
Provisioning services	Wild plants, mushrooms, algae and their outputs	Yield of forest berries (A1)	Direct Market Pricing method
	Wild fish (river)	Number of lamprey traps (A2)	
	Fibres and other materials from plants, algae and animals for direct use or processing	Potentially obtainable growing forest stock volume (A3)	
	Fibres and other materials from plants, algae and animals for direct use or processing	Medicinal herbs, yield (A4)	Direct Market Pricing method Travel Cost method

---

[14] http://www.ecosystemvaluation.org/travel_costs.htm.

Category	Class	Indicator	Methods applied
	Plant-based resources	Potentially obtainable biomass stock volume for energy use (A5)	Direct Market Pricing method
Regulating services	Filtration/sequestration/storage/ accumulation by ecosystems	Nutrient sequestration and storage capacity of soil (B1)	Benefit Transfer method
	Dilution of pollution in freshwater system	Dilution of pollution in river (B2)	
	Noise reduction	Thickness of the growing stands (B3)	Direct Market Pricing method
	Erosion control	Amount of sediments in contemporary Aeolian accumulation relief (B4)	Benefit Transfer method
	Buffering and attenuation of mass flows	Amount of sediments in sandy beaches (B5)	Direct Market Pricing method
	Hydrological cycle and water flow maintenance	Water flow maintaining capacity of forests (B6)	Benefit Transfer method
	Flood protection	Amount of sediments in contemporary Aeolian accumulation relief (B4)	
	Storm protection	Vegetation type (B7)	
	Pollination and seed dispersal	Diversity and distribution of pollinating insects (B8)	
	Decomposition and fixing processes	Population density of necrophagous and coprophagous insects (B9)	
	Maintenance of water chemical quality, including biogenic conditions	Water quality (B10)	
	Micro and regional climate regulation	Air quality (B11)	
	Global climate regulation by reduction of greenhouse gas concentrations	Carbon sequestration potential index (B12)	
Cultural services	Experiential or intellectual use of plants, animals and land-/seascapes in different environmental settings	Bird watching possibilities (C1)	Benefit Transfer method Travel Cost method
	Physical use of land-/seascapes in different environmental settings	Possibilities for active and passive recreation (C2)	
	Educational activities through ecosystems	Environmental education possibilities (C3)	
	Cultural heritage associated with ecosystems	Cultural heritage interaction possibilities (C4)	
	Aesthetic interactions	Visual identity of the cultural scenery (C5)	

The monetary values have been assessed based on data obtained within mapping of ES carried out as a Project activity, which provided the identification of the most appropriate indicators for the economic valuation of ES. In order to perform economic valuation of ES for the identified indicators a standardisation of acquired data according to common system of spatial, time and currency units (for instance, EUR/ha/per year) was required. Moreover, the standardised monetary values were adjusted in accordance with the level of inflation and other economical factors in order to assure objective comparison over the period of time.

As the value of ES is mainly determined by their economic impact in annual terms, seasonal adjustment or levelling for the assessment of ES was applied. One option how to achieve this is to determine the amplitude of variations of the economic value of the ES during the period when the respective service is characterized by seasonality (where applicable).

The assessment of ES is traditionally carried out in a specific site for specific services. However, in some cases it is necessary to perform the assessment for larger areas an over longer periods of time. On such occasions it is necessary to perform data aggregation, using methods with the following assumptions:

- ✓ a constant value is assigned to each of ecosystem types (*Basic Value Transfer*),
- ✓ an adjusted expert evaluation is passed for each of ecosystem types (*Expert Modified Value Transfer*),
- ✓ a statistical model is elaborated depending on timeline an other factors (*Statistical Value Transfer*),
- ✓ a spatial statistical model or system dynamic model is elaborated (*Spatially Explicit Functional Modelling*).[15]

The resulting total economic value of ecosystems and their services can be converted to Latvian conditions, using the conversion factors of gross domestic product (GDP) deflator and GDP Purchasing Power Parity (PPP):

- • GDP deflator conversion factor provides that the economic value of the service in USD/ha/year in terms of prices of a particular year is converted to USD/ha/year using price index of another year;
- • by application of GDP Purchasing Power Parity conversion factors the economic value of another currency (e.g. USD) is converted to EUR.

Purchasing Power Parity method in economics is a theoretical price comparison, where the exchange rate is calculated on the basis of price difference for a basket of similar or identical goods in each currency in its core countries. This often differs significantly from the market exchange rate, as also same currency prices tend to vary in different countries due to geographical situation, production differences and market specifications. As a result economical value of the service in EUR/ha/year is acquired corresponding to the actual price levels for a particular year instead of the previous value expressed in USD/ha/year in prices of a particular year.

---

[15] R.Costanza, R. de Groot, P.Sutton, S. van der Ploeg, S.J.Anderson, I.Kibiszewski, S.Farber, R.K.Turner (2014). *Changes in the global value of ecosystem services.* Global Environmental Change 26, 152-158 pp.

4. ECONOMIC ASSESSMENT OF THE ECOSYSTEM SERVICES

4.1. COMPONENTS OF THE PROCESS OF THE MONETARY VALUATION OF ECOSYSTEM SERVICES

The monetary valuation of the ES within the Project was performed in accordance with a methodology, consisting of the following stages:

- monetary valuation of provisioning, regulating and cultural services provided by ecosystems, comprising the following steps:
  - standardisation of the *secondary* data in common spatial, time and currency units (e.g. EUR/ha/year);
  - adjustments of the *secondary* data, taking into consideration the level of inflation and other factors in order to perform a comparison over period of time;
- monetary valuation of provisioning and cultural services provided by ecosystems, comprising the following steps:
  - standardisation of the *primary* data in common spatial, time and currency units (e.g. EUR/ha/year);
  - adjustments of the *primary* data, taking into consideration the level of inflation and other factors in order to perform a comparison over period of time;
  - seasonal adjustments of the *primary* data (levelling) in the annual context of the values of the services;
- valuation of ES in larger areas over longer periods of time, comprising the following steps:
  - aggregation of data according to geospatial units;
  - aggregation of data according to ES;
  - determination of the economic impact area for ES;

4.2. ECONOMIC VALUATION BASED ON THE PRIMARY DATA

The economic valuation of ES carried out within the Project with application of the **Travel Cost method** resulted in the primary data for the predefined Pilot Implementation Areas (PIA). In order to acquire information about the ES used in PIA, as well as the time spent, and related costs incurred from the use of the ES, 375 respondents were interviewed in each PIA (in total 750 respondents surveyed). Since the required amount of data for each of the ES to be assessed is relatively large, the information was obtained on the 6 (six) ES indicators.

- provisioning service:
  - A4: medicinal herbs (yield);
- cultural services:
  - C1: bird watching possibilities;
  - C2: possibilities of active and passive recreation;
  - C3: environmental education possibilities;
  - C4: cultural heritage interaction possibilities;
  - C5: visual identity of cultural scenery.

Detailed description of economic valuation of ES carried out within the Project is available in the Chapter I "*Economic valuation of ecosystem services for the Pilot Implementation Area of*

Jaunķemeri based on the primary data" and Chapter II *"Economic valuation of ecosystem services for the Pilot Implementation Area of Saulkrasti based on the primary data".*

4.3. SUMMARY OF THE ECONOMIC VALUES OF ECOSYSTEM SERVICES ACQUIRED BY APPLICATION OF METHODOLOGY BASED ON THE PRIMARY DATA COLLECTION FOR SAULKRASTI AND JAUNĶEMERI PILOT IMPLEMENTATION AREAS

Summary of the monetary values of ES from Saulkrasti and Jaunķemeri PIAs is given in the Table 4.1. The results were obtained using the methods of primary data collection. At the same time total economic (monetary) values of cultural ES was estimated for each PIA (Saulkrasti and Jaunķemeri). From the acquired primary data it can be concluded that the higher monetary values both for cultural services and provisioning service for gathering of *Medicinal herbs* are in Saulkrasti PIA.

Table 4.1

Monetary values of ES obtained using the methods based on the primary data collection in Saulkrasti and Jaunķemeri PIAs

PIA	Jaunķemeri		Saulkrasti	
Total area of PIA	93.6 ha		132.85 ha	
ES	EUR/year	EUR/ha/year	EUR/year	EUR/ha/year
Cultural services	€431 648.39	€4 611.63	€5 589 191.93	€42 071.45
Experiential or intellectual use of plants, animals and land-/seascapes in different environmental settings (C1)	€506.03	€5.41	€7 956.00	€59.89
Physical use of land-/seascapes in different environmental settings (C2)	€412 821.08	€4 410.48	€5 371 050.33	€40 429.43
Educational activities through ecosystems (C3)	€2 970.62	€31.74	€19 554.54	€147.19
Cultural heritage associated with ecosystems	€8 552.95	€91.38	€44 730.59	€336.70
Aesthetic interactions (C5)	€6 797.71	€72.63	€145 900.47	€1 098.23
Provisioning services	€412.12	€4.40	€8 293.45	€62.43
Fibres and other materials from plants, algae and animals for direct use or processing (A4)	€412.12	€4.40	€8 293.45	€62.43

The resulting data demonstrate effectively that the results reflect the diversity, even provided that the used ES valuation methods and number of surveyed respondents were identical in both PIA (Saulkrasti and Jaunķemeri) and the data was obtained in a relatively similar areas.

The resulting data can be explained by analysing them in the context of the basic information obtained from the surveys.

The economic valuation of ES in accordance with the Travel Cost method is based on the specific costs associated with travelling to the area, unearned income, time spent, the frequency of the use of the ES and other variables.

By analysing information from social surveys, which is described in detail in Chapter V "*Comparative valuation of ecosystem services by analysing the data in the context of socio-economic/welfare factors*" it can be concluded that visitors of Jaunķemeri PIA use the available ES relatively more rarely. Namely, large proportion of visitors of Saulkrasti are using the provided ecosystem services almost on a daily basis, whereas in Jaunķemeri the proportion of such visitors is considerably smaller, hence the use value of the ES decreases.

At the same time this conclusion confirms the hypothesis set out already in the conceptual assessment of ES - that nature is able to provide the ES only at the time when a person is in a given area and the services are used.

The data obtained also provides an estimate of the monetary value of the both PIA. As it is reflected in the Table 4.1, the total estimated monetary value of ES in Saulkrasti PIA (EUR/ha) is 10 times higher than the total estimated monetary value of ES in Jaunķemeri PIA.

The most significant value difference between the results of both PIA is for the cultural service – *Aesthetic interactions*. The value of this ES indicator is 15 times higher in Saulkrasti PIA than in Jaunķemeri.

Insignificant economic value difference between the tboth PIA is for the cultural service - *Cultural heritage associated with ecosystems*. In Saulkrasti this service was estimated at three (3) times higher than in Jaunķemeri.

4.4. ECONOMIC IMPACT AREAS OF THE ECOSYSTEM SERVICES IN SAULKRASTI AND JAUNĶEMERI PILOT IMPLEMENTATION AREAS

In the Figure 4.1 the economic impact areas of the ES for both PIA are reflected (Saulkrasti and Jaunķemeri), which has been calculated based on the average number of visitors per 1000 population and average monetary values of ES, depending on the residence place of the visitors.

Jaunķemeri PIA can be considered as a destination favoured by tourists, because most of the visitors of the area are residing elsewhere, therefore ES in Jaunķemeri PIA are used by population of other, not even nearby areas. In contrast, in Saulkrasti PIA local residents for the most part are the ones that use the locally provided ES. The only ES that reportedly has more users from outside Saulkrasti PIA rather than among the Saulkrasti local population is a cultural service – *Educational activities through ecosystems*. In Jaunķemeri the only ES that was used more frequently by respondents living within the PIA rather than outside it was the cultural service *Cultural heritage associated with ecosystems*.
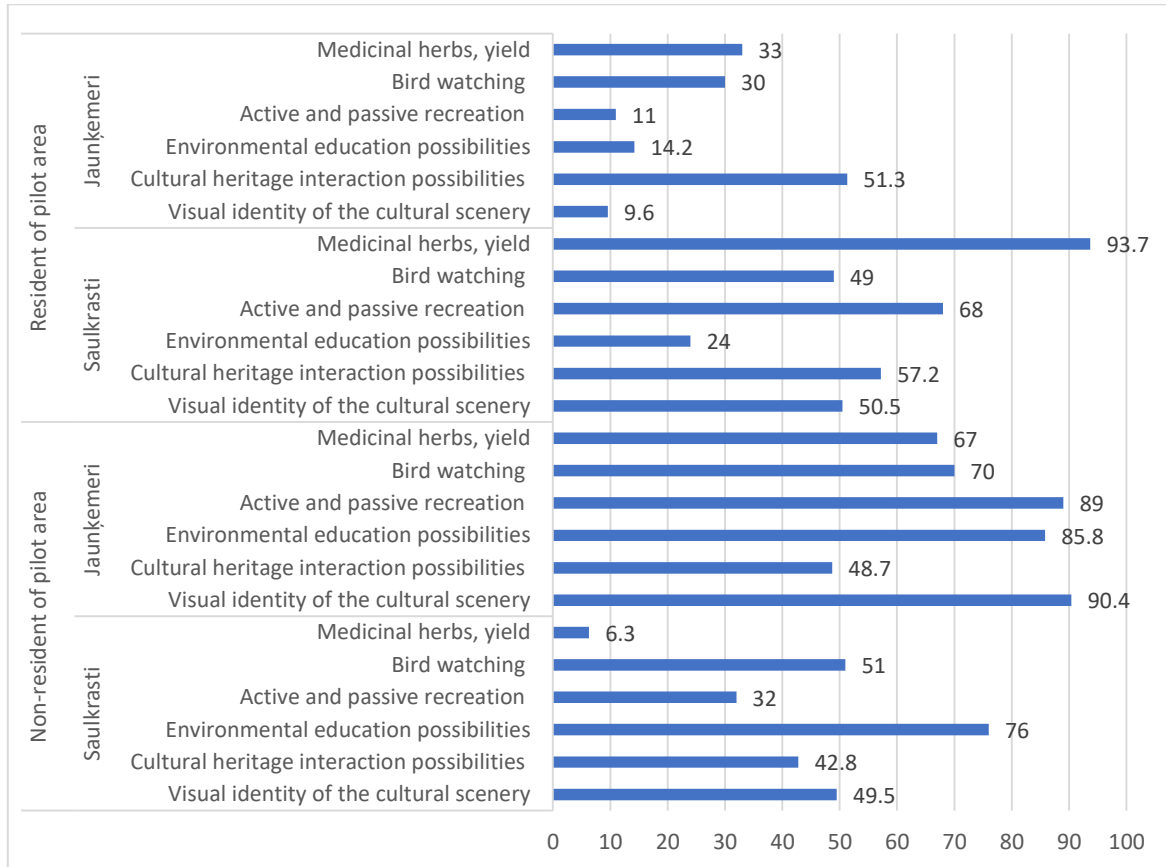
Figure 4.1 – The economic impact areas of the ES in Saulkrasti and Jaunķemeri PIAs

4.5. ECONOMIC VALUATION OF ECOSYSTEM SERVICES BASED ON THE SECONDARY DATA IN SAULKRASTI AND JAUNĶEMERI PILOT IMPLEMENTATION AREAS

Economic valuation of ES based on the secondary data has been carried out by application of the Direct Market Pricing method and Benefit Transfer method.

Direct Market Pricing method
- Harvest of forest berries (A1)
- Number of lamprey traps (A2)
- Potentially obtainable growing forest stock volume (A3)
- Medicinal herbs, yield (A4)
- Potentially obtainable biomass stock volume for energy use (A5)
- Thickness of the growing stands (B3)
- Amount of sediments in sandy beaches (B5)

Benefit Transfer method
- Nutrient sequestration and storage capacity of soil (B1)
- Dilution of pollution in river (B2)
- Amount of sediments in contemporary Aeolian accumulation relief (B4)
- Water flow maintaining capacity of forests (B6)
- Vegetation type (B7)
- Diversity and distribution of pollinating insects (B8)
- Population density of necrophagous and coprophagous insects (B9)
- Water quality (B10)
- Air quality (B11)
- Carbon sequestration potential index (B12)
- Bird watching possibilities (C1)
- Possibilities for active and passive recreation (C2)
- Environmental education possibilities (C3)
- Cultural heritage interaction possibilities (C4)

- Visual identity of the cultural scenery (C5)

Detailed description of economic valuation of ES based on the secondary data carried out within the Project is available in the Chapter III "*Economic valuation of ecosystem services for the Pilot Implementation Area of Jaunķemeri based on the secondary data*" and Chapter IV "*Economic valuation of ecosystem services for the Pilot Implementation Area of Saulkrasti based on the secondary data*".

4.6. SUMMARY OF THE ECONOMIC VALUES OF ECOSYSTEM SERVICES ACQUIRED BY APPLICATION OF METHODOLOGY BASED ON SECONDARY DATA COLLECTION FOR SAULKRASTI AND JAUNĶEMERI PILOT IMPLEMENTATION AREAS

The Table 4.2 provides a summary of monetary values of ES for Saulkrasti and Jaunķemeri PIA, acquired by using the methods based on secondary data collection (EUR/year, given in prices of 2015). The comparison is provided for provisioning, regulating and cultural services separately (EUR and EUR/ha/year), as well as calculations were performed for the estimates of total economic (monetary) value for each PIA, with the assumption that a constant value has been assigned to each ecosystem type (geospatial unit).

Table 4.2

Summary of monetary values of ES for Saulkrasti and Jaunķemeri PIA, acquired by the methods based on secondary data collection (EUR/year, given in prices of 2015)

PIA	Jaunķemeri		Saulkrasti	
Total area of PIA	93.6 ha		132.85 ha	
ES	EUR/year	EUR/ha/year	EUR/year	EUR/ha/year
Provisioning services	392 645.2	4 194.9	494 391.0	3 721.4
Wild plants, mushrooms, algae and their outputs: A1	163 082.4	1 742.3	182 133.6	1 371.0
Wild fish (river): A2	0.0	0.0	153.4	1.2
Fibres and other materials from plants, algae and animals for direct use or processing: A3	11 623.9	124.2	109 730.0	826.0
Fibres and other materials from plants, algae and animals for direct use or processing: A4	216 600.0	2 314.1	189 750.0	1 428.3
Plant-based resources: A5	1 338.9	14.3	12 624.0	95.0
Regulating services	2 268 128.8	24 232.1	2 332 691.6	17 558.8
Filtration/sequestration/storage/ accumulation by ecosystems: B1	5 138.9	54.9	5 124.6	38.6
Dilution of pollution in freshwater system: B2	0.0	0.0	18 238.9	137.3
Noise reduction: B3	1 307 752.1	13 971.7	1 120 012.7	8 430.7
Erosion control: B4	35 094.0	374.9	69 361.3	522.1
Buffering and attenuation lif mass flows: B5	105 000.0	1 121.8	255 000.0	1 919.5
Hydrological cycle and water flow maintenance: B6	10 634.1	113.6	8 864.6	66.7

PIA	Jaunķemeri		Saulkrasti	
Total area of PIA	93.6 ha		132.85 ha	
ES	EUR/year	EUR/ha/year	EUR/year	EUR/ha/year
Flood protection: B4	35 094.0	374.9	69 361.3	522.1
Flood protection: B7	572 495.0	6 116.4	595 171.5	4 480.0
Pollination and seed dispersal: B8	18 139.4	193.8	17 579.7	132.3
Decomposition and fixing processes: B9	12 226.0	130.6	16 896.1	127.2
Maintenance of water chemical quality, including biogenic conditions: B10	0.0	0.0	18 238.9	137.3
Micro and regional climate regulation: B11	36 151.3	386.2	30 136.0	226.8
Global climate regulation by reduction of greenhouse gas concentrations: B12	130 404.1	1 393.2	108 705.8	818.3
Cultural services	352 904.5	3 770.3	499 540.2	3 760.2
Experiential or intellectual use of plants, animals and land-/seascapes in different environmental settings: C1	472.6	5.0	1 319.7	9.9
Physical use of land-/seascapes in different environmental settings: C2	167 531.9	1 789.9	237 784.3	1 789.9
Educational activities through ecosystems: C3	20.5	0.2	23.7	0.2
Cultural heritage associated with ecosystems: C4	55.01	0.59	78.65	0.59
Aesthetic interactions: sense of place, nature /landscape attractiveness: C5	184 824.4	1 974.6	260 333.8	1 959.6
Total economic (monetary) value	3 013 678.5	32 197.4	3 326 622.9	2 5040.4

The resulting secondary data are comparable as the data for the both PIA were obtained using identical data collection techniques.

Overall, the values of ES in euros per hectare (Table 4.2) for provisioning and regulating as well as cultural services are higher for Jaunķemeri PIA than in Saulkrasti PIA.

The Figure 4.2 shows a graphic representation of the economic valuation of ES for Saulkrasti and Jaunķemeri PIA broken down by provisioning, regulating and cultural services (EUR/ha/year). The figure demonstrates effectively that the most significant differences between the both PIA are related directly with regulating services, for which the resulting economic values are higher for Jaunķemeri PIA.
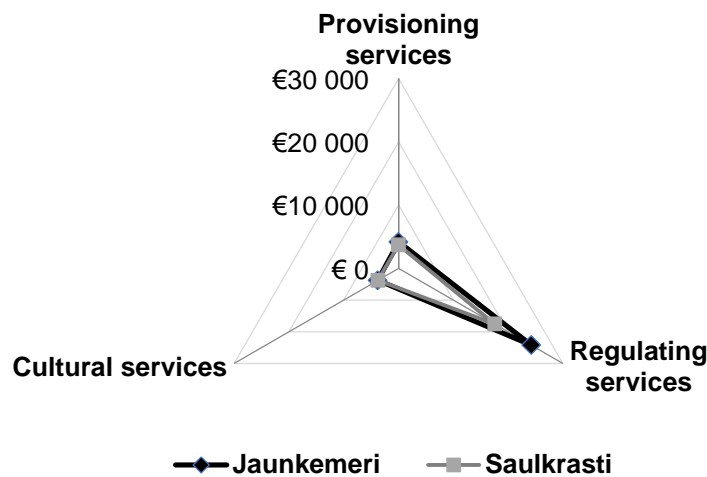
Figure 4.2 - Diagram for the ES assessment for Saulkrasti and Jaunķemeri PIA by provisioning, regulating and cultural services (EUR/ha/year)

Whilst analysing each of the ES types separately, it appears that for each of the PIA there are specific services, which have relatively higher valuation result than the other PIA of the Project, reflecting the different advantages of each area.

The most important differences between the both PIA within the provisioning service category are for the indicator A3 *Potentially obtainable growing forest stock volume*, under the ES class *Fibres and other materials from plants, algae and animals for direct use or processing* and A5 indicator *Potentially obtainable biomass stock volume for energy use* under the ES class *Plant-based resources*. These two indicators have higher values for Saulkrasti PIA. In contrast, the economic rating for *Medicinal herbs* is significantly higher for Jaunķemeri PIA.

Comparing the economic valuation results for the regulating services in the of the two PIAs, it is evident that the indicator B4 *Amount of sediments in contemporary Aeolian accumulation relief* respective to the ES classes *Erosion control* and *Flood protection*, as well as the indicator B5 *Amount of sediments in sandy beaches* under the ES class *Buffering and attenuation of mass flows* has significantly higher economic values in Saulkrasti PIA. The assessed economic values for other regulating services are relatively higher for Jaunķemeri PIA.

The closest resulting values of assessed ES for both PIA are for the cultural services. For instance, the indicators for *Physical use of land-/seascapes in different environmental settings*, *Educational activities through ecosystems* and *Cultural heritage associated with ecosystems* are assessed identically for both PIA.

4.7. COMPARISON OF MONETARY VALUES ACQUIRED BY APPLICATION OF METHODS BASED ON THE PRIMARY AND SECONDARY DATA COLLECTION

A comparative analysis was performed for the economic values of ES resulting from assessments based on the primary data against the values previously obtained by secondary data analysis.

The overview of monetary values for Project PIA (EUR/ha/year) resulting from both data extraction methods is given in the Table 4.3.

Table 4.3
Overview of monetary values of ES for PIAs of Saulkrasti and Jaunķemeri, based on the primary and secondary data collection

PIA	Jaunķemeri		Saulkrasti	
Total area of PIA	93.6 ha		132.85 ha	
ES	Primary data	Secondary data	Primary data	Secondary data
	EUR/ha/year		EUR/ha/year	
Cultural services	4 611.63	3 770.3	42 071.45	3 760.2
Experiential or intellectual use of plants, animals and land-/seascapes in different environmental settings: C1	5.41	5.0	59.89	9.9
Physical use of land-/seascapes in different environmental settings: C2	4 410.48	1 789.9	40 429.43	1 789.9
Educational activities through ecosystems: C3	31.74	0.2	147.19	0.2
Cultural heritage associated with ecosystems: C4	91.38	0.59	336.70	0.59
Aesthetic interactions: C5	72.63	1 974.6	1 098.23	1 959.6
Provisioning services	4.40	2 314.1	62.43	1 428.3
Fibres and other materials from plants, algae and animals for direct use or processing: A4	4.40	2 314.1	62.43	1 428.3

The comparison of the resulting primary and secondary data within the ES valuation was carried out to assess the applicability of various methods. The comparison of the services should be conducted using the same valuation methods, namely, mutual comparison of ES can be carried out either based only on secondary or only on primary data.

As can be seen in Table 4.3, the data obtained using different valuation methods vary greatly, for example, because the primary data represents information about a specific beneficiary of a service, while the secondary data reflects the current market situation (Direct Market Pricing method), also providing information on the approximate value of the service based on the values obtained in other studies (Benefits Transfer method). At the same time it can be

hypothetically assumed that the primary data acquired by surveying the actual users of the ES would reflect the economical value of those services more accurately and objectively.

As it is shown in the Table 4.3 the values of the secondary data for most of the cultural services are lower than the primary data values. Only difference is the resulting value for the indicator C5 *Visual identity of the cultural scenery* respective to the ecosystem service class *Aesthetic interactions*.