Available online at www.centmapress.org

Proceedings in
System Dynamics and Innovation in Food Networks 2017

INTERNATIONAL JOURNAL ON FOOD SYSTEM DYNAMICS

A Mixed Methods Approach Towards Mapping and Economic Valuation of the Divici-Pojejena Wetland Ecosystem Services in Romania

Lamprinakis, L.[NIBIO], Rodriguez, D. G. P.[NIBIO], Prestvik, A. S.[NIBIO], Veidal, A.[NIBIO] and Klimek, B.[NIBIO]

The Norwegian Institute of Bioeconomy Research (NIBIO), Postboks 8024 Dep., 0030 Oslo, Norway.
Lampros.Lamprinakis@nibio.no

ABSTRACT

Mapping and valuating ecosystem services has gained increasing attention over the last years and remains high in the research agenda. In this paper, a mixed methods approach is used to valuate ecosystem services provided by the Divici-Pojejena wetland in Romania. A qualitative part relied on focus group discussions and interviews to identify key stakeholders and the ecosystem services provided by the wetland site. The benefit transfer (BT) method was used for the monetary valuation of the identified ecosystem services that the wetland provides. Bird watching opportunities, water quality, and flood prevention services are among the highest valued services, while the amenity services are the least valued among all wetland services.

Keywords: *mixed methods, wetland, benefit transfer, ecosystem services, Danube.*

Introduction

Wetlands are relatively common in Romania, covering an area of 3 860 km², which is 1.6% of the national territory (Petrișor, 2010; Tanislav, 2014). Most of the Romanian wetlands are found in the Danube Delta and on the plains, for instance the Comana Natural Reserve, near Bucharest. This article examines the wetland in Divici-Pojejena region that is located on the south-west part of the country. The wetland site is part of the Iron Gates National Part and was established as a result of construction of the Iron Gates hydropower plant in the 1970's, which locally raised the water level of the Danube River. The Divici-Pojejena wetland is recognized to be of both national and international importance: it was declared a Special Avifaunistic Protected Area by a 2000 Government Decision, as well as an Integrated Protected Area, according to the Management Plan of the Iron Gates Natural Park. The reserve is part of the protected areas framed in the Fourth Category of the International Union for Conservation of Nature (2007). Since 2011, the site was also declared as a wetland of international importance – a Ramsar Site.

The purpose of this article is to map and valuate the ecological services connected to the Divici-Pojejena wetland. The analysis follows a mixed methods approach, where qualitative methodology is used to inform quantitative research (Creswell and Clark, 2007). The qualitative part identified key stakeholders in wetland management and the ecosystem services provided by the site, while the quantitative part applied benefit transfer (BT) methodology to monetary valuate the relevant ecosystem services of the wetland. The qualitative

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

approach relied mainly on focus group discussions and interviews. Two focus group meetings were conducted – one in Oslo with experts on the wetland ecosystem services of the area, and one on the policy site in Romania with local stakeholders. The experts described several services of the wetland – especially in terms of bird watching, habitat and recreation. Interviews with local actors, inhabitants, and tourists show that there is limited awareness of the wetland as a special protection site. With BT, environmental benefit estimates from existing case studies (i.e., study sites) are transferred to a new, policy case study (i.e., policy site) (Richardson et al., 2015). A thorough literature review presented no primary study that could accurately reflect all the particular details of the Divici-Pojejena wetland, in terms of geographic location and species present in the area. After exploring different approaches we chose a meta-regression model as a basis for our monetary estimation.

Policy context and the site area

The wetland site is part of the Caraș-Severin County, that together with the Counties of Arad, Hunedoara and Timiș comprise the Vest Development Region of Romania. The Special Protection Area in Divici-Pojejena is located in the administrative area of the Pojejena village (settlements of Divici, Belobresca, Susca and Pojejena) and covers in total 498 ha (1 230,58 acres) (Niculae, 2014). The official working languages in the village of Pojejena are Romanian and Serbian, both being used in public signage and in administration, education, and justice.

The surrounding region is characterized by low incomes and a high degree of out-migration. The National Institute of Statistics (NIS) estimated 3 022 inhabitants in 2014, facing a negative trend with both a declining and ageing population. NIS further estimates that the monthly average total income per household in 2015 was RON 2 795.02, or approximately USD 687 (NIS, table BUF104J). Total income includes all money income irrespective of the source as well as the equivalent value of the income in kind (the human and animal consumption of food products and non-food products from the household's own resources and the goods and services obtained free of charge or at a lower cost from public and private economic units) which is not salary in kind.

The main categories of land use in Pojejena are agricultural land (47 %), forest land (44 %) and water-related (6 %) (data provided by the Pojejena Municipality). Pastures and meadows comprise the main use of agricultural land (73 %), followed by arable land (26 %). The most productive fields in the area were flooded in the 1970's by the construction of the Iron Gates barrier lake, decreasing the size of arable land. Nowadays, the main crops are maize, wheat and rye, potato and vegetable crops. Agriculture is the main economic industry of the area, but tourism is considered to have broad economic potential due to the natural environment of the wetland (Sava, 2011).

The protected area in Divici-Pojejena is part of the greater European biogeographical region, being characterised by hydrophilic vegetation and wetland hygrophile vegetation. According to the International Union for Conservation of Nature (IUCN), there are several species in the area that are now part of the IUCN red list: three endangered species (*Groenlandia densa, Litorella uniflora, Marsilea quadrifolia*), and eight rare species (*Carex bohemica, Elodea canadensis, Montia fontana, Nasturtium officinale, Oenanthe aquatica, Ranunculus circinatus, Potamogeton obtusifolius, Typha*). Three more species (*Acorus calamus, Vallisneria spiralis, Najas marina*) are vulnerable, while one species (*Lythrum tribracteatum*) remains undetermined since

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

there is no specific information regarding this particular species. Among the species of mammals that can be confirmed in Divici-Pojejena area, the most important species are represented by *Lutra lutra* (otter), being classified according to IUCN, as near threatened. The most numerous bird species are the common pochard, coot, tufted duck, mallard and wigeon. During migration season, the site hosts aquatic birds which can reach an impressive number of over 50 000 specimens. The fish fauna is represented by lymnophile species and on streams that flow into the Danube River there are mainly species such as *Barbus meridionalis, Phoxinus phoxinus.K*. The type of the Divici-Pojejena wetland is identified as *freshwater marsh*.

It is worth noting that the Danube River is rarely flooded in that area, but in 2006 the river rose to an almost historic maximum level and caused significant damage. Landslides occur frequently and affect people's comfort and mobility. Drought also occasionally causes problems in the wetland area, the last time in 2003 when an extended dry period affected the whole Europe.

Theoretical perspectives in qualitative methodology for the mapping and valuation of ecosystem services

A qualitative approach to valuation of ecosystem services can be an alternative and a supplement to a quantitative approach. Alone, the qualitative methods are useful when possible changes need to be assessed or rated in order to make decisions (Busch et al., 2012). The main strength of a qualitative approach is that it can be used to express the multi-dimensional nature of human well-being (rather than just one monetary dimension), which is particularly useful when it comes to symbolic, cultural and spiritual sides of ecosystem services (ibid.). As a supplement, qualitative methods add that dimension to the monetary valuation. In this paper, qualitative methods are used to inform, validate and assess the monetary valuation. In addition, a qualitative method is used for stakeholder analysis. Focus group discussions and interviews are the main qualitative approaches used in this study.

Even when the output is a monetary value of ecosystem services, identification and involvement of relevant stakeholders is critical (Hein et al., 2006). Stakeholders may help in identifying the most relevant services, discuss their values and trade-offs, and the main policy objectives. Different stakeholders may attach different values on the ecosystem services according to their cultural background, where they live, etc. (Hein et al., 2006; Maynard et al., 2015). Analyzing the interests, social, cultural and economic characteristics of stakeholders is also useful as it will reveal possible conflicts and how changes in management strategies may create winners and losers (Pascual et al., 2010). A study of ecosystem services in a wetland in the Netherlands revealed that stakeholders at different spatial scales had very different interests related to the ecosystem (Hein et al., 2007). Recreation, for example, is most relevant at the municipal and provincial level, while nature conservation is the most important on the national and international level. Hence, a change in policy will affect stakeholders at different levels differently. Typically, local agents tend to attach more value to provisioning services, while national and global agents tend to attach more value to regulating and cultural services. The former services include everything obtained from the ecosystem (e.g., food, crops, raw materials, genetic resources, medicinal resources, etc.), while the latter include any benefits obtained from the regulation of ecosystem processes (e.g., carbon sequestration, climate regulation, purification of water, etc.) and any nonmaterial benefits related to spiritual enrichment, cognitive development, aesthetic experiences etc. (Millennium Ecosystem Assessment, 2005). In many cases, what influences the value of ecosystem services may be more interesting than making a simple inventory of monetary value estimates (Adamowicz, 2004).

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

In the valuation of the Divici-Pojejena wetland, qualitative methods are used to increase the understanding of the values of the ecosystem services from the wetland, and how different stakeholders understand and value the ecosystem services differently. In general, the economic benefits from wetlands are classified as direct or indirect use values, and as non-use existence values (Brander et al., 2006). Direct uses relate to outputs that may be "consumed" directly, such as food, timber or recreational activities; indirect uses arise from functions related to the local ecosystem, such as flood control, storm protection, etc. Non-use existence values are intangible and site-specific (Oglethorpe and Miliadou, 2000), often related to moral and aesthetic properties, and the production of experiences in people's minds (Pascual et al., 2010). Non-use existence values are sometimes broken down into different concepts, such as bequest values, option values, and altruistic values (Oglethorpe and Miliadou, 2000). While altruistic value is the value people put on knowing that the ecosystem service is there; bequest and option value is having the possibility to use the ecosystem later, either for the next generations (bequest) or for themselves (option).

Qualitative research methodology and findings

Two focus group discussions were conducted – one in Oslo with experts on the wetland ecosystem services of the study area, and one on the policy site in Romania with local stakeholders (at the village of Pojejena). The experts described several direct and indirect uses of the wetland – particularly in terms of bird watching, and habitat. The experts further signified the great potential of the wetland that however remains largely underdeveloped. Interviews with local actors, inhabitants, and tourists show that there is limited awareness of the wetland as a special protection site.

Focus group discussions with local experts

A focus group discussion with nine experts on the wetland ecosystem services of the studied area was held in Oslo in June 2016. The experts were from the National Institute for Research and Development in Environmental Protection (INCDPM) and the Danube Delta National Institute for Research and Development (INCDDD Tulcea). The focus group was facilitated by five researchers from NIBIO. Talking to experts allows accessing a research field quite effectively and is an alternative to time-consuming field work: "…talking to experts in the exploratory phase of a project is a more efficient and concentrated method of gathering data than, for instance, participatory observation (…). Conducting expert interviews can serve to shorten time-consuming data gathering processes, particularly if the experts are seen as crystallization points for practical insider knowledge and are interviewed as surrogates for a wider circle of players." (Boger and Menz, 2009).

The main difference between single interviews and focus groups is group dynamics during the discussions. While the focus group interviews run on group dynamics, the individual interviews focus on a single person. Since a group discussion better simulates real-world dynamics, we could easily get an understanding not only of our study area but also on consensus, conflicting perceptions and lack of information. Based on our focus group discussions held in June 2016 we developed some first remarks which became guiding imperatives for the later stages of the research.

Among the experts there was a common understanding that the Divici-Pojejena wetland has great potential to maintain certain ecosystem services, but those were largely not yet developed. Most visibly and partly maintained are the issues of bird watching with its related potential for recreation both for the local population and visitors to the area. Some experts also pointed out the rich cultural and religious features of the region,

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

which includes historic and religious places and festivals. These features already attract visitors, but could potentially attract even more tourists to the area. Although these features are seemingly unrelated to the ecosystem services of the wetland, the combination of a unique wetland and cultural and religious sites are perceived as possibilities for touristic development. As the area is characterized as low-income with out-migration, the possibilities for development are seen as something very positive.

The direct use of the wetland by the local population was not completely clear. The wetland and river has fish and other wildlife that may be used for consumption, but the protection of the wetland makes it illegal to fish or hunt in the protected wetland area. Although reed can be used in some places for roof thatch, the particular reed that grows in this wetland is not used as such. Whether other plants are used by the local population is not known. Farm animals may browse in or near the wetland as a lot of farmland stretches into the wetland area. In sum, however, the wetland seems to offer few provisional services to the local population.

Other ecosystem services highlighted by the experts were regulating and supporting services such as flood control and river bank erosion control. The wetland also has a high degree of biodiversity and serves as an important habitat especially for birds. These points were maintained under the focus group interviews and were guiding our further research process as we started to prepare for further data collection in the Divici-Pojejena area.

Focus group discussions with local environmental protection agents

In July 2016, a workshop was held in Pojejena with some of the main local and regional stakeholders. The participants in the focus group were mainly stakeholders with environmental protection interests (rangers and the administration from the Iron Gates National Park and the Environmental Guard in the Caraș-Severin County). The participants agreed that some of the most valuable ecosystem functions of the wetland are bird habitat and biodiversity. The workshop further highlighted the different interests of the people working to protect the wetland and the local population. Because of the different interests, the value they attach to the ecosystem services of the wetland will also likely be different.

People involved in the protection of the wetland had the impression that the local population was not committed to protecting and managing the wetland. Part of this issue seems to relate to inefficient communication among the stakeholders and limited awareness – local inhabitants are not well aware of the restrictions put on the wetland and may take part in activities in the wetland that are not allowed. For instance, fishing in the wetland is strictly prohibited, but is believed to still occur. As fishing is legal and quite common outside the protected area, it is quite likely that people who are not aware of the regulations continue to fish in the wetland also. Similarly, inefficiencies in communication between protection agencies and local inhabitants may undermine initiatives from the protection agencies. For instance, a major attraction in the area is bird watching, so the Iron Gates National Park built a bird watching tower and information kiosks about the birds in the wetland. According to the park rangers, however, the tower is hardly visited at all. In response to these issues, there are now several programs from the Iron Gates National Park that aim to raise the awareness, particularly among school children. A survey conducted among the local population by the Iron Gates National Park authorities showed that awareness about the wetland was increasing, especially among the younger population (Ciocănea et al., 2016).

Questionnaires to tourists

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

A short questionnaire was handed out to hotels and guesthouses in the area with the request that they ask their guests to fill it out. The purpose of this questionnaire was to find out the main attraction in the area for visitors, and the value of the Divici-Pojejena wetland for tourists. The very small amount of responses does not allow for any concrete conclusions, however, it appears that tourists do attach some value to the wetland when asked how important it is for their appreciation of the area they are visiting.

Interviews and questionnaires with local inhabitants

In a short interview with the Mayor in Pojejena in July 2016, some of the main concerns of the Pojejena administration were revealed. The wetland seems to have the potential of attracting visitors to the area and the municipality, therefore the administration also has interests in protecting and enhancing its value. However, the protected area that constitutes the wetland also brings some limitations for construction and housing near the wetland. This was perceived as a limitation for development of the wider area, including the possibilities of attracting tourists and new habitants.

Semi-structured interviews were conducted in Pojejena in July 2016 via a convenience sampling method. Residents of the village were approached in local coffee shops and were asked about their attitudes and opinions on the following topics: knowledge about the wetland, use of the wetland (i.e., fishing, wood and other plant collection and recreational use, other ecosystem services the wetland provides), and likeability of the wetland. A second round of interviews was conducted in October 2016 in Pojejena and in the nearby area among local residents, and forty responses were received in total. A synthesis of those responses resulted in the following:

- The details about the size, borders/limits and regulation of the wetland are not particularly well known among local inhabitants.
- The majority of the informants find the wetland “attractive” and half of them thinks that it is sufficiently protected and in a good state.
- Almost everybody consider the wetland as a tourist attraction because of its flora and fauna.
- The large majority considers the wetland as a place for recreation.
- Almost everyone knows that there are fish and birds in the wetland.
- Few of the respondents use any plant material from the wetland

Overall, the field work helped us identify the main stakeholders that include the local population, local municipal administration, the Iron Gates National Park and the environmental guards in Caraș-Severin – all these agents have interest in the preservation and development of the site. Our approach revealed that there may be potential conflicts between those stakeholders whose main objective is to protect the wetland and the local population who may have some interests in exploiting the wildlife in the wetland, especially fish. There seem to be limited awareness among the local population about the restrictions around the protected wetland, although they show some support for protecting the site. With increasing awareness, this conflict may be removed altogether, especially if the local population also sees the value of protecting the wetland for future use. An overall synthesis of the results from the qualitative study is presented on Table 1.

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

Table 1. Synthesis of the results from the qualitative study.

Key stakeholders	Local inhabitants, regional and local authorities, Iron Gates National Park environmental guards, local businesses, research institutions.
Regulations and limits	Confusion among local citizens on what is allowed in the site; confusion regarding the limits of the protected area.
Potential conflicts	Protection agents believe that local population is not fully committed to the protection of the site; protecting area regulations may impose limitations to construction and housing around the area; different stakeholders attach different values on the ecosystem services.
Potential for economic development	The site can increase visitation in the wider area, which is particularly important since those communities are characterized by low-incomes and out-migration. However, the potential remains underdeveloped.
Reputation	Area is known mainly for the birds populations; beautiful surroundings.
Main ecosystem services	Contribution towards flood prevention, improved water quality, increased water supply, reduced soil erosion (storm services); opportunities for several activities, such as bird watching, amenities; providing habitat for wildlife.

Theoretical perspectives in quantitative methodology for the valuation of ecosystem services

While it is desirable to perform primary research, due to time considerations we opted to use the benefit transfer (BT) methodology, a commonly used alternative to primary valuation attempts (Hanley et al., 2007; Turner et al., 2011; Schägner et al., 2013; Richardson et al., 2015). In BT, environmental benefit estimates from existing cases (i.e., the study sites) are transferred to a new case study (i.e., the policy site) (Brouwer, 2000). Despite that BT has been used to inform policy analysis since the 1950's (Bergstrom and De Civita, 1999; Ruckelshaus et al., 2015), the method is still under revision and the knowledge gaps about the benefit transfer are still identified and discussed (Kaul et al., 2013; Johnston et al., 2015). The interest of applying BT in environmental policy is increasing, however, along with greater knowledge and understanding on how to decrease transfer errors (Brouwer et al., 2015). Four main benefit transfer methodologies have emerged: benefit estimate transfer, benefit function transfer, meta-analysis transfer, and preference calibration transfer (Rosenberger and Loomis, 2017). Each of these transfer methodologies can be used to transfer benefit estimates obtained from various benefit estimation methodologies, such as travel cost, contingent valuation, and hedonic valuation (Johnston et al., 2015).

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

A thorough literature review presented no primary study that could accurately reflect all the particular details of the Divici-Pojejena wetland, in terms of geographic location and species present in the area. After exploring different approaches we finally chose the meta-regression model by Woodward and Wui (2001) as a basis for our valuation. Woodward and Wui (2001) evaluate the relative value of different wetland services, the sources of bias in wetland valuation and the returns to scale exhibited in wetland values, using 39 studies in such sites. They restrict the scope of their meta-analysis to include valuation studies for North American and European wetlands. From these cases they identified functions, the economically valuable ecological service, and the techniques for quantification (Table 2).

Table 2. Wetland functions, associated economically valuable goods and services and techniques typically used for quantification.

Function	**Economically valuable good(s) service(s)**	**Technique(s) typically used to quantify the value of the service(s)**
Recharge of ground water	Increased water quantity	Net factor income or replacement cost
Discharge of ground water	Increased productivity of downstream fisheries	Net factor income, replacement cost or travel cost
Water quality control	Reduced costs of water purification	Net factor income or replacement cost
Retention, removal and transformation of nutrients	Reduced costs of water purification	Net factor income or replacement cost
Habitat for aquatic species	Improvements in commercial and/or recreational fisheries either on or offsite. Nonuse appreciation of the species.	Net factor income, replacement cost, travel cost or contingent valuation
Habitat for terrestrial and avian species	Recreational observation and hunting of wildlife. Nonuse appreciation of the species.	Travel cost or contingent valuation
Biomass production and export (both plant and animal)	Production of valuable food and fiber for harvest	Net factor income
Flood control and storm buffering	Reduced damage due to flooding and severe storms	Net factor income or replacement cost
Stabilization of sediment	Erosion reduction	Net factor income or replacement cost
Overall environment	Amenity values provided by proximity to the environment	Hedonic pricing

Source: Woodward and Wui (2001).

Building on this conceptual framework, the examined variables segregate into five main categories: socioeconomic variables (year), size (in acres), type of the wetland (coastal or not), functions (eco-services and products), and methodology used in the various studies (Table 3).

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

Table 3. Main variables and definitions.

Variable	Variable Definition
USD / Acre	Annual USD value of an acre of wetlands, converted to 2006 base year.
Intercept	Constant
Year	Date of the study (1960=0).
Acres	Size of the wetland in acres.
Coastal	Whether the wetland was a coastal wetland.
Flood (Flood Prevention)	Reduced damage due to flooding and severe storms resulting from flood control and storm buffering.
Quality (Water Quality)	Reduced costs of water purification resulting from water quality control and/or retention, removal and transformation of nutrients.
Quantity (Water Quantity)	Increased water quantity resulting from recharge of ground water.
Recreational Fish	Improvements in recreational fisheries (on or off-site) resulting from a habitat for aquatic species.
Commercial Fish	Improvements in commercial fisheries (on or off-site) resulting from a habitat for aquatic species.
Bird hunting	Recreational hunting of wildlife resulting from a habitat for terrestrial and avian species.
Bird watching	Recreational observation of wildlife resulting from a habitat for terrestrial and avian species.
Amenity	Amenity values provided by proximity to the environment resulting from the overall environment.
Habitat	Nonuse appreciation of the species resulting from a habitat for aquatic species, as well as terrestrial and avian species.
Storm	Erosion reduction resulting from stabilization of sediment.
Publish	Whether the results had been published.
Data	Dummy variable (set at 1 if the data used in the study was deemed highly questionable).
Theory	Dummy variable (set at 1 if the theory used in the study was deemed highly questionable).
Metric	Dummy variable (set at 1 if the econometrics used in the study was deemed highly questionable).
PS	Whether the value was an estimate of producer's surplus.
HP	Hedonic pricing method.
NFI	Net factor income method.
RC	Replacement cost method.
TCM	Travel cost method.

Source: *Woodward and Wui (2001)*.

The year variable in Woodward and Wui (2001) is included to control for refinements in wetland valuation that have occurred over time (studies done in earlier time periods may be expected to have smaller value estimates compared to studies done in later time periods). The overall functions of a wetland they considered include: (1)

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

contribution towards flood prevention; (2) improving water quality; (3) increasing water supply/quantity; opportunities for activities such as (4) recreational fishing, (5) commercial fishing, (6) bird hunting, (7) bird watching; (8) amenities, (9) providing habitat, and (10) reducing soil erosion (storm). The methodological variables of the model include a set of variables characterizing the method of estimation such as whether the value was an estimate of producer's surplus (PS), hedonic pricing (HP), net factor income (NFI), travel cost (TCM), and replacement cost (RC).

The econometric model in Woodward and Wui (2001) considers that the value of a wetland per acre (y) is a function of the provided services ($\boldsymbol{x}_s$), the methodology used ($\boldsymbol{x}_m$), the size of the wetland (in acres) ($\boldsymbol{x}_a$), other remaining variables describing the study - including year and location ($\boldsymbol{x}_o$), and a constant term:

$$\ln(y) = \alpha + \beta_a ln(x_a) + \beta_s' x_s + \beta_m' x_m + \beta_o' x_o + \epsilon \quad (1)$$

where α is the constant term and β's are the estimated coefficients on each explanatory variable. Woodward and Wui (2001) have focused primarily on the marginal effects of wetland services and attributes on economic benefits.

Estimating the monetary value of wetland services in Divici-Pojejena

Valuations on ecosystem services can be expressed in several ways – e.g., USD/Ha/Year, RON/Ha or RON/Year, thus raising the need for standardization (Dupras et al., 2015). In our case the estimates on ecosystem services are normalized with gross domestic product (GDP) deflators and purchasing power parity (PPP) conversion factors from the World Development Indicators (World Bank, 2006). The value of the economic benefit was calculated using the estimates from the meta-analytical variables (Table 4), along with the associated documentation for conducting benefit transfer of environmental benefits (Loomis et al., 2007). We use the annual value per acre in USD and then converted the values into annual value per hectare in RON using the purchasing power parity (PPP) factor (2006 base year). We then scaled the annual value over the geographical area of the wetland by multiplying the value per hectare by the total size of the wetland area.

Table 4: Descriptive statistics of wetland meta-analytical variables.

Variable	Mean	Coefficient	Product of Mean & Coefficient
Intercept	1,00	7,87** (1,74)	7,87
Year	14,91	0,02 (0,04)	0,24
Ln Acres	9,28	-0,29** (0,11)	-2,65
Coastal	0,43	-0,12 (0,68)	-0,05
Flood	0,14	0,68 (0,77)	0,09
Quality	0,20	0,74 (0,75)	0,15
Quantity	0,06	-0,45 (1,54)	-0,03
Rec. Fish	0,35	0,58 (0,56)	0,21
Com. Fish	0,28	1,36 (1,01)	0,38
Birdhunt	0,40	-1,06** (0,52)	-0,42
Birdwatch	0,28	1,80** (0,59)	0,50

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

Amenity	0,15	-4,30** (0,95)	-0,66
Habitat	0,31	0,43 (0,59)	0,13
Storm	0,03	0,17 (1,66)	0,01
Publish	0,77	-0,15 (0,71)	-0,12
Data0	0,25	0,00 (0,60)	0,00
Theory0	0,22	-1,05 (0,84)	-0,22
Metric0	0,12	-3,19** (1,22)	-0,39
PS	0,28	-3,14** (0,86)	-0,87
HP	0,03	5,04** (1,12)	0,16
NFI	0,25	0,27 (0,90)	0,07
RC	0,28	2,23** (0,89)	0,62
TCM	0,11	-0,34 (1,05)	-0,04

Standard errors are in parenthesis.

*** Significant at 5% level.*

For the Special Protection Area in Divici-Pojejena we follow the insights from our qualitative analysis and therefore we account for seven services, namely: flood prevention, water quality, water supply, bird watching, amenity, storm and habitat, as described on Table 3. Using the coefficients estimates in Table 4, we calculated the values for each of the seven wetland ecosystem services that we identified (Table 1). The annual value of ecosystem services from the wetland in Divici-Pojejena (total benefit, adjusted by the PPP factor from World Bank – Local Currency Unit per international USD in 2006) is estimated to be approximately RON 1 124 000 (Table 5). The purchasing power parity (PPP) conversion factor is the amount of RON required for buying the same amounts of goods and services in the domestic market as USD would buy in the United States. The calculated total economic value takes into account both recreational use and passive use (existence) value. Bird watching opportunities, water quality, flood prevention and habitat services provided by the Divici-Pojejena wetland are among the highest valued services, while the amenity services are the least valued among all wetland services. Only the bird watching and amenity services are statistically significant. A wetland that provides bird watching opportunities is more valuable than an average wetland, while those that offer amenity services are less valuable (Woodward and Wui, 2001).

Table 5. Benefit Estimates of Ecosystem Services in Divici-Pojejena Wetland

Ecosystem Service	**Ecosystem Benefit**		**Total Benefit (for 498 hectares)**	
	USD/Ha/Yr	**RON/Ha/Yr** [a]	**USD/Yr (in 1000)**	**RON/Yr** [a] **(in 1000)**
Flood prevention	235	329	117	164
Water quality	249	349	124	174
Water quantity	76	106	38	53
Bird watching	725	1 015	361	505

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

Amenity	2	3	1	1,4
Habitat	183	256	91	128
Storm	142	199	71	99
TOTAL	**1 612**	**2 257**	**803**	**1 124**

[a] Based on 2006 PPP factor adjustment from the World Bank (LCU per international USD)

Discussion

In its current state, the Divici-Pojejena wetland is a source of direct and indirect use values, as well as of non-use existence benefits (Figure 1). Due to the several restrictions in the area, the direct use values are limited to bird watching and amenity services. Indirect uses, however, are more diverse and include flood control, water filtration and groundwater recharge, storm protection and erosion control. The non-use and existence benefits in the wetland relate to its biological diversity and in our case are captured by the habitat services.

Figure 1. Classification of ecosystem services in the Divici-Pojejena wetland area and their relative contribution.

The qualitative analysis revealed that the presence of several species of aquatic birds is well known in the area and highly valued among the stakeholders. For instance, the common pochard, coots, tufted ducks, mallards and wigeons remain common sightings in the wetland. Therefore, it is of no surprise that bird watching is the service that contributes the most, relative to all services of the wetland (Figure 2). Interestingly, most stakeholders agreed that this service has great potential in attracting tourists, even though several issues remain in its proper communication.

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

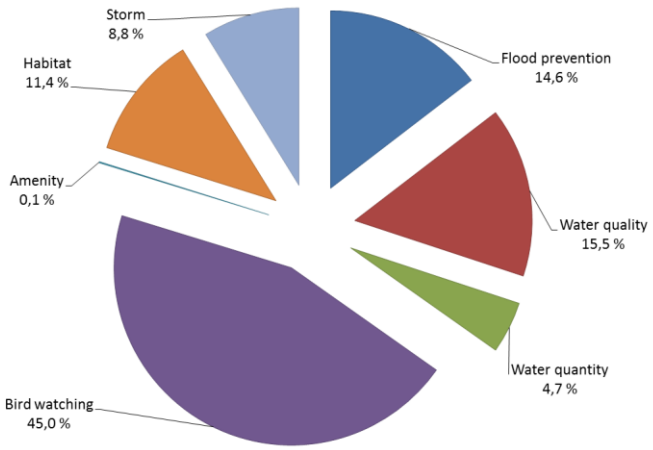

Figure 2: Relative contribution of each ecosystem service in the Divici-Pojejena wetland area.

The services of flood prevention and water quality follow, signifying the importance of the area in reducing damage due to flooding and severe storms, as well as the reduced costs of water purification resulting from retention and transformation of nutrients. Habitat services also have a significant contribution, therefore reflecting results from our qualitative analysis that showed how the wetland serves as a significant habitat for several species, many of which are categorized by the IUCN as vulnerable or near threatened. Such services are particularly valued by stakeholders with environmental protection interests, and that particular group may even value it more than what was estimated using BT. The recharging of ground water and the reduction of erosion resulting from stabilization of sediment, are captured by the water quantity and storm services that come next. Amenity appears to have the least contribution of the ecological services, probably due to the restrictions that are applied to the area. For instance, fishing (both commercial and recreational) and bird hunting are prohibited within the limits of the protected area. Interestingly, our qualitative analysis showed that some of these activities are believed that still occur, at least sporadically.

Reconsidering these monetary benefit estimations together with the insights from the qualitative analysis allows for the possibility of substantial improvements, especially with respect to direct use and non-use existence benefits accruing from the site. However, any further development of the wetland requires rigorous management of the area and better communication among the stakeholders. Additional recreational activities such as hunting, fishing (recreational and/or commercial), boat rides, organized camping areas, and trekking routes may substantially improve any future benefit valuations; an efficient implementation of such activities can be demanding though, both for the protection agencies and the local administration. For instance, there will be a need for setting up and enforcing proper licensing schemes (e.g., hunting rights), clarification of existing misconceptions regarding the limits of the protected area and local regulations, as well as a continuous outreach activities. The responsible development of the wetland may also impose limitations to housing and construction nearby, but it has the potential to become a significant driving force for the development of the whole area.

While our results can be used in making wetland-related policy decisions, there is a number of caveats to consider. The model by Woodward and Wui (2001) does not account for socio-economic (e.g., income, population density) and distinct geographical (e.g., climate, topography) characteristics. Therefore the results can be very limited in giving insights into the important variables or factors that need to be studied when carrying out research in the wetland valuation field. Moreover, Woodward and Wui (2001) distinguish only

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

coastal wetlands in their research. This definition is too broad in determining whether a coastal wetland was a freshwater marsh, saltwater marsh, or both (in our case, the wetland in Divici-Pojejena is a freshwater marsh).

Summary and conclusions

The paper follows a mixed methods approach to map and valuate the ecosystem services provided by the Divici-Pojejena wetland in Romania, where qualitative methodology is used to inform and validate quantitative research. The qualitative part identified key stakeholders and services provided by the protected wetland while a quantitative part applied BT methodology to monetary valuate the relevant ecosystem services of the site.

The qualitative approach relied on focus groups and interviews. Two focus groups were conducted – one in Oslo with experts on the wetland ecosystem services of the area, and one on the policy site in Romania with local stakeholders. The local experts described several ecosystem services related to the wetland – direct and indirect use values, as well as non-use existence values. Wetland services such as bird watching and recreation can attract more visitors, something that is particularly valuable for a region characterized by low incomes and out-migration. The experts further signified the great potential of the wetland that however remains largely underdeveloped. Other ecosystem services highlighted by the experts were regulating and supporting services such as flood control and river bank erosion control. The wetland also has a high degree of biodiversity and serves as an important habitat, especially for birds. Interviews with local actors, inhabitants, and tourists show that there is limited awareness of the wetland as a special protection site.

The BT methodology was used for the monetary valuation of the ecosystem services of the site and a meta-regression model was used as a basis for the valuation. Bird watching opportunities, water quality, and flood prevention services provided by the wetland are among the highest valued services, while the amenity services are the least valued among all wetland services. Even though BT methodology comes with certain caveats and limitations, it is widely used in decision-making and policy development. In our approach, BT is further enhanced by the qualitative analysis therefore allowing for a more robust approach towards the mapping and valuation of ecosystem services in the Divici-Pojejena wetland area.

Acknowledgements: This article is part of the project “Mapping and evaluation of wetland ecosystem services in Divici-Pojejena area and identifying their contribution to economic sectors,” financed by the SEE Financial Mechanism 2009-2014 (EEA/Norway Grants), RO02 Biodiversity and ecosystem services Programme, call for proposals no. 1: “Studies and training regarding protected areas’ natural ecosystems contribution to main economic sectors.” The authors are grateful to the participants of the 11th Igls Forum for their suggestions and comments.

References

Adamowicz, W. L. (2004). What’s It Worth? An Examination of Historical Trends and Future Directions in Environmental Valuation. *The Australian Journal of Agricultural and Resource Economics*, **48**(3): 419-443.

Bergstrom, J. C. and De Civita, P. (1999). Status of Benefits Transfer in the United States and Canada: A Review. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*, **47**(1): 79-87.

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

Boger, A., Littig, B., and Menz, W. (2009). Interviewing Experts. Palgrave Macmillan.

Brander, L. M., Florax, R. J. G., and Vermaat, J. E. (2006). The empirics of wetland valuation: a comprehensive summary and a meta-analysis of the literature. *Environmental and Resource Economics*, **33**(2): 223-250.

Brouwer, R. 2000. Environmental value transfer: state of the art and future prospects. *Ecological Economics*, **32**(1): 137-152.

Brouwer, R., Martin-Ortega, J., Dekker, T., Sardonini, L., Andreu, J., Kontogianni, A., Skourtos, M., Raggi, M., Viaggi, D., Pulido-Velazquez, M., Rolfe, J., and Windle, J. (2015). Improving value transfer through socio-economic adjustments in a multi-country choice experiment of water conservation alternatives. *Australian Journal of Agricultural Resource Economics*, **59**(3): 458-478.

Busch, M., La Notte, A., Laporte, V., and Erhard, M. (2012). Potentials of Quantitative and Qualitative Approaches to Assessing Ecosystem Services. *Ecological Indicators*, **21**: 89-103.

Ciocănea, C. M., Sorescu, C., Ianoşi, M., and Bagrinovschi, V. (2016). Assessing Public Perception on Protected Areas in Iron Gates Natural Park. *Procedia Environmental Sciences*, **32**: 70-79.

Creswell, J.W. and Clark, V.L.P. (2007). *Designing and Conducting Mixed Methods Research*. Wiley Online Library.

Dupras, J., Alam, M., and Revéret, J. P. (2015). Economic value of greater Montreal's non-market ecosystem services in a land use management and planning perspective. The Canadian Geographer / Le Géographe canadien, **59**(1): 93-106.

Hanley, N., Shogren, J., and White, B. (2007). Environmental economics in theory and practice. Palgrave Macmillan, Hampshire/New York.

Hein, L., van Koppen, K., de Groot, R. S., and van Ierland, E. C. (2006). Spatial Scales, Stakeholders and the Valuation of Ecosystem Services. *Ecological Economics*, **57**(2): 209-28.

Johnston, R. J., Rosenberger, R. S., Rolfe, J., and Brouwer, R. (2015). Benefit Transfer of Environmental and Resource Values: A Guide for Researchers and Practitioners. Dordrecht, Springer Netherlands.

Kaul, S., Boyle, K. J., Kuminoff, N. V., Parmeter, C. F., and Pope, J. C. (2013). What can we learn from benefit transfer errors? Evidence from 20 years of research on convergent validity. *Journal of Environmental Economics and Management*, **66**(1): 90-104.

Loomis, J., Kroeger, T., Richardson, L., and Casey, F. (2007). The benefit transfer and use estimating model toolkit. Fort Collins, CO: Colorado State University Dept. of Agric. and Resource Economics. http://dare.agsci.colostate.edu/outreach/tools/#BTT.

Millennium Ecosystem Assessment (2005). Ecosystems and Human Well-Being: Synthesis. Island Press, Washington.

Maynard, S., James, D., and Davidson, A. (2015). Determining the value of multiple ecosystem services in terms of community wellbeing: Who should be the valuing agent? *Ecological Economics*, **115**: 22-28.

Niculae, M. I. (2014). Integrated Management of Biological and Landscape Diversity for Sustainable Regional Development and Ecological Connectivity in the Carpathians (Bioregio Carpathians): Study on the methodology for identification, characterization and classification of landscapes from the cross-border area Iron Gates Natural Park and Djerdap National Park. BioREGIO Carpathians, final report.

Oglethorpe, D. R., and Miliadou, D. (2000). Economic Valuation of the Non-Use Attributes of a Wetland: A Case-Study for Lake Kerkini. *Journal of Environmental Planning and Management*, **43**(6): 755-767.

Petrișor, A. I. (2010). GIS analysis of wetland covered by Natura 2000 sites. *Environmental Engineering and Management Journal*, **9**(2): 269-273.

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705

Richardson, L., Loomis, J., Kroeger, T., and Casey, F. (2015). The role of benefit transfer in ecosystem service valuation. *Ecological Economics*, **115**: 51-58.

Rosenberger, R. S., and Loomis, J. B. (2017). Benefit Transfer. In "A Primer on Nonmarket Valuation" (pp. 431-462). Springer Netherlands.

Ruckelshaus, M., McKenzie, E., Tallis, H., Guerry, A., Daily, G., Kareiva, P., Polasky, S., Ricketts, T., Bhagabati, N., and Wood, S. A., and Bernhardt, J. (2015). Notes from the field: Lessons learned from using ecosystem service approaches to inform real-world decisions. *Ecological Economics*, **115**: 11-21.

Sava, C. (2011). The Possibility of Sustainable Development of Rural Tourism in Protected Wetland Divici-Pojejena, Caraş - Severin County. *Agricultural Management / Lucrari Stiintifice Seria I, Management Agricol [serial online]*, **13**(4): 157-164.

Schägner, J. P., Brander, L., Maes, J., and Hartje, V. (2013). Mapping ecosystem services' values: Current practice and future prospects. *Ecosystem Services*, **4**: 33-46.

Tanislav, D. (2014). Protected wetlands in Romania. Paper presented at the 2nd International Conference - Water resources and wetlands, Tulcea-Romania. Available online at: http://www.limnology.ro/water2014/proceedings.html

Turner, R. K., Georgiou, S., and Fisher, B. (2011). Valuing Ecosystem Services: The Case of Multi-functional Wetlands. London: Routledge.

Unai, P., Muradian, R., Brander, L., Gómez-Baggethun, E., Martín-López, B., Verma, M., Armsworth, P., Christie, M., Cornelissen, H., Eppin, F., Farley, J., Loomis, J. Pearson, L., Perrings, C., and Polasky, S. (2010). The Economics of Valuing Ecosystem Services and Biodiversity. In P. Kumar (Ed.), The Economics of Ecosystems and Biodiversity: The Ecological and Economic Foundations. London and Washington: Earthscan from Routledge: 183-255.

Woodward, R. T., and Wui, Y-S. (2001). The economic value of wetland services: a meta-analysis. *Ecological Economics*, **37**(2): 257-270.

World Bank (2006). PPP conversion factor, GDP (LCU per inter-national $). Available online at: http://data.worldbank.org/indicator/PA.NUS.PPP

DOI: http://dx.doi.org/10.18461/pfsd.2017.1705