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HOW MUCH IS THE "WONDER OF NATURE" WORTH? THE VALUATION OF TOURISM IN THE GREAT MASURIAN LAKES USING TRAVEL COST METHOD

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ILE JEST WART "CUD NATURY"? WYCENA TURYSTYKI W REGIONIE WIELKICH JEZIOR MAZURSKICH METODĄ KOSZTÓW PODRÓŻY

STRESZCZENIE: W artykule przedstawiono wycenę turystyki jako usługi ekosystemowej w regionie Wielkich Jezior Mazurskich. Wycenę przeprowadzono metodą kosztów podróży, wykorzystując wyniki badania kwestionariuszowego (n=499) i dane statystyczne. Uwzględniono szerokie spektrum elementów: koszty dojazdu, koszt czasu dojazdu, koszty noclegu, koszty podejmowanych aktywności oraz koszt zakupu spożywczych wyrobów regionalnych. Uzyskane wyniki pozwoliły na opracowanie mapy zróżnicowania przestrzennego przyrodniczej wartości turystyki w omawianym regionie. Wyrażona wydatkami turystów wartość Wielkich Jezior Mazurskich to ok. 277 mln PLN na sezon letni.

SŁOWA KLUCZOWE: wycena usług ekosystemowych, turystyka, metoda kosztów podróży, Wielkie Jeziora Mazurskie

Introduction

Although natural values are crucial for most of outdoor activities, they are rarely included into tourism accounts. Balmford et al.[1] estimate the global value of tourism in natural protected areas as USD 600 billion per year in direct expenditure. These calculations describe just a part of all nature based activities, that embrace both variety of natural settings and different tourism activities.

Tourism & recreation, recognized as a type of cultural services, are frequently assessed and mapped ecosystem services (ES)[2]. This paper concerns mapping of ES monetary value of nature, which recently has become a hot research topic[3].

We focus on the use value. The revealed preferences method has been chosen as this type is claimed to be more reliable[4]. As far as tourism and recreation are concerned, Travel Cost Method (TCM) is widely applied. In Poland, TCM has been used for valuation of protected areas including Białowieski[5], Pieniński[6] and Wielkopolski[7] national parks.

TCM is based on the assumption, that the consumption of non-marked good (visiting natural area) corresponds to buying some market goods. It assumes that users are rational in their decisions, and that a benefit from visiting natural area is always higher than a cost of the visit[8]. Consequently, the total costs of visits to the area can be identified as its value.

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1 A. Balmford et al., *Walk on the Wild Side: Estimating the Global Magnitude of Visits to Protected Areas*, "PLoS Biol" 2015 no. 13(2), www.journals.plos.org [29-09–2016].

2 K.M. Chan et al., *Where are cultural and social in ecosystem services? A framework for constructive engagement*, "BioScience" 2012 no. 62(8), p. 744–756.

3 A. Troy, M.A. Wilson, *Mapping ecosystem services: practical challenges and opportunities in linking GIS and value transfer*, "Ecological Economics" 2006 no. 60(2), p. 435–449; J. Maes, M.L. Paracchini, G. Zuliani, *A European assessment of the provision of ecosystem services*, JRC Scientific and Technical Reports, Luxembourg 2011, p. 81; J.P. Schägner et al., *Mapping ecosystem services' values: Current practice and future prospects*, "Ecosystem Services" 4, p. 33–46.

4 T. Żylicz, *Valuating ecosystem services*, "Ekonomia i Środowisko" 2012 no. 2(42), p. 18–38.

5 M. Giergiczny, R*ekreacyjna wartość Białowieskiego Parku Narodowego*, "Ekonomia i Środowisko" 2009 no. 2(36), p. 117–127.

6 D. Panasiuk, *Wycena środowiska metodą kosztów podróży w praktyce. Wartość turystyczna Pienińskiego Parku Narodowego,* w: F. Piontek (ed.) *Ekonomia a rozwój zrównoważony*, *Teoria i kształcenie*, Białystok 2001, p. 264–277.

7 A. Zydroń, O. Pruchlat, *Określenie społecznej wartości Wielkopolskiego Parku Narodowego metodą kosztów podróży*, "Barometr Regionalny. Analizy i prognozy" 2014 no. 4, p. 155–164.

8 T. Żylicz, *Ekonomia środowiska i zasobów naturalnych*, Warszawa 2004.

This study aims to estimate the value of tourism in the Great Masurian Lakeland using TCM. The second goal is to map spatial diversity of this value, pointing out the parts of the region that should be a priority for tourism management.

Study Area

The study has been realized in northern Poland, in the Great Masurian Lakeland (GML), (figure 1). The post-glacial landscape of the region features numerous lakes, including the largest lake in Poland, Śniardwy (113.8 km^2). The region consists of ten municipalities (2811 km^2). Forestry, agriculture and fisheries, the primary economic industries of the region, are supported by tourism. This is highly seasonal. July and August are the peak season: more than a half of total number of visits is realized in these months[9].

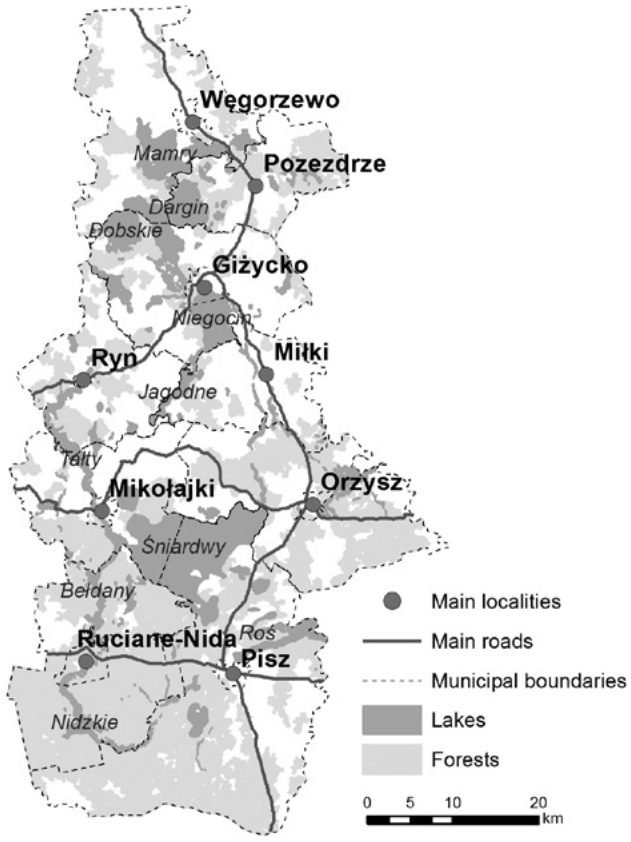

Figure 1. Study Area

9 Central Statistical Office of Poland.

The GML is commonly perceived as an attractive destination for nature based tourism. From 2007 to 2011, the region competed in the global New 7 Wonders of Nature Competition held by the Switzerland-based foundation New7Wonders and was highly ranked as one of the final group of 28 sites[10].

Methods

General overview

TCM analysis is based on survey data. There are two possible approaches: zonal one, where results are calculated for zones and individual, where cost of journey of every respondent is calculated separately. The Individual TCM has been chosen as this approach is concerned to give more precise results[11] than the zonal one. In this study the expanded formula has been applied and not only transportation costs, but also costs that are substantial for different outdoor activities as well as costs of accommodation and regional food have been taken into account in order to improve valuation results. Therefore the tourism value has been calculated as:

$$TV = JC + AC + UC + FC$$

where:
TV – Tourism value
JC – Journey cost
AC – Accommodation cost
UC – Use cost (cost of activities undertaken by tourists)
FC – Food cost (cost of regional food purchased during visit)

The individual costs were mapped by assigning them to places of overnight stays given in the survey. If any tourist was accommodated in more than one place the total sum has been divided proportionally. On this basis the density of all variables has been calculated and mapped.

Finally, the Total Tourism Value has been estimated taking into account all travelled distances, accommodation types, undertaken activities and regional food purchased related to the total number of tourists visiting the region.

In the following paragraphs we describe the procedure in details.

10 www.world.new7wonders.com [20-08–2016].

11 T. Żylicz, *Ekonomia środowiska …*, op. cit.

Survey

499 interviews were conducted with tourists in 9 locations throughout the area. The survey was conducted in the centre of each municipality in front of convenience stores. Using this approach, we hoped to get a sample representative in terms of the activities undertaken by tourists and their spatial distribution.

The survey was conducted simultaneously in all locations during two weekends and two working days in the summer of 2014, regularly throughout the day. The survey was limited to the Poles, as they constitute the majority of visitors in the region. The questionnaire's topics included type and location of accommodation, outdoor activities and regional food purchases, in addition to general questions about the tourist. The analysis has been conducted using SPSS 22 and ArcGis 10.1. All given accommodation places were mapped and the information about respondents has been assigned to these points. Also places where the tourists carried out different outdoor leisure activities were mapped and the information about the frequency of the realization of the activity was adjusted to these points.

Individual Travel Cost Method: calculating partial costs

The cost of the journey (JC) was calculated for each respondent as:

$$JC = D \times Fp + T \times Jc$$

where:
D – Travelled distance
Fp – Cost of fuel
T – Time of journey
Jc – Cost of journey time

The distances and times of travels were taken from Google Maps. Travelled distance was measured as the shortest road distance [km] between the respondent's place of origin and his accommodation in the GML. If the place of accommodation had been changed during a respondent's stay in the region, the mean distance to all overnight places of the respondent within the region was calculated. It was assumed that the travel was made by car and that the average use of fuel was 8 l per 100 km[12]. The mean price of unleaded petrol (PB95) for July and August 2014 (5,45 PLN) was taken for account[13]. Apart from distance the cost of time spent in travel was also calculated.

12 M. Giergiczny, op. cit., p. 124.

13 Bank of Local Data, Statistical Office of Poland, www.bdl.stat.gov.pl [12-08–16].

The cost of an hour of journey was described as fraction of mean wage in Poland in 2014 (4 003,99 PLN[14] / 160 hours).

The cost of accommodation (AC) was calculated as:

$$AC = P_{ac} \times Ls$$

where:

P_{ac} – mean accommodation price per type based on authors' own estimation (see table 1)

Ls – respondent's length of stay.

The use cost (UC), understood as a cost of activities undertaken by tourists, was estimated on the basis of costs of equipment rentals.

$$UC = \sum \sum_{n=1}^{15} (f \, x \, P \, x \, Ls)$$

where:

n – Number of undertaken activities

f – Frequency of undertaken activity[15]

P – Price of equipment rental per person (see table 1)

Ls – Length of stay

Table 1. Prices of goods and services purchased by tourists. Own field research

Accomodation		Equipment rentals		Regional Food	
type	price [PLN/ person/night]	type	Price [PLN/ person/day]	type	Price [PLN/kg or one pot]
Hotel	200	Windsurfing	150	Fish	50
Bed&Breakfast	50	Motor boat	100	Honey	30
Resort	50	Sailing yacht	87,5	Mush-rooms	30
Camping site	20	Horse	50	Wild berries	15
Port	20	Kayak, rowing boat, pedalo	17,5		

14 Ibidem.

15 The respondents declared the frequency at which they undertook the activity using a 5-point Likert scale, ranging from 1 (never) to 5 (very often). The following assumptions were made: rarely: once during a stay; from time to time: 0.2 × length of stay (at least one); often: 0,75 × length of stay, very often: every day during the visit.

Cost of purchase of regional food (FC) was estimated according to the information on type of food purchased by respondents. (see table 1). Therefore:

$$FC = \sum_{1}^{n=4} P$$

where:
n – Number of food types
P – Price per unit

Total number of tourists

In order to transform individual results to the total value for the region it was necessary to estimate the total number of tourists in the GML. The existing statistics are underestimated as they do not include all the accommodation located in the region.

We assume, that as the World Tourism Organization defines tourist as a person who stay out of home at least one night, accommodation and its level of use is a good measure of the number of tourists. Consequently

$$NT_n = \frac{A \times U^{VII} \times 31 + A \times U^{VIII} \times 31}{Ls}$$

where:
NT_n – number of tourists per accommodation type
A – accommodation (number of beds in the region) by types[16]
U – occupancy rate: mean for July (VII) and August (VIII) by types of accommodation[17]
LS – average length of stay: sailors – 7 days (charter time unit), others – 3,3 days[18]

$$TNT_{public} = \sum_{n=1}^{5} NT_n$$

where:
TNT_{public} – number of tourists in public access accommodation places
n – type of accommodation (hotel, B&B, resort, port, camping site)
NTn – number of tourists per accommodation facility type

$$TNT = TNT_{public} \times (1 + \%TNT_{private})$$

where:
TNT – total number of tourists
TNT_{public} – number of tourists in a public access accommodation places
$\%TNT_{private}$ – percent of tourists visiting friends and relatives and staying in second homes[19]

16 Own research.

17 *Tourism in Warmińsko-Mazurskie Voivodeship in 2014*, Olsztyn 2015, p. 22

18 Ibidem, p. 32.

19 Estimation based on survey data.

Total tourism value

The total tourism value was calculated as:

$$\text{TTV} = \sum_{dc=1}^{n} JC_{dc} \times \%TN_s \times TNT + \sum_{at=1}^{5} AC_{at} \times \%TN_s \times TNT + \sum_{ut=1}^{5} UC_{ut} \times \%TN_s \times TNT + \sum_{at=1}^{4} FC_{ft} \times \%TN_s \times TNT$$

where:
TTV – total tourism value
TNT – total number of tourists
$\%TN_s$ – percent of tourists per category according to the survey
JC_{dc} – journey cost in distance category
AC_{at} – accommodation cost per accommodation type
UC_{ut} – use cost per activity
FC_{ft} – regional food cost per type per unit

The estimated value was mapped taking into account area's diversity of use identified by the realized survey.

Results

Sample profile

The sample profile was slightly dominated by men (56%). The majority of respondents was between 25 and 44 years old (54.9%) and most of the sample possessed university degrees (48.3%). Most of the respondents came from big towns and cities. They visit the region regularly and spend there one or two weeks of their holidays on average. Natural features are highly appreciated by the tourists, with special emphasis on the proximity to water and forest.

Individual travel value

Visitors cover on average 274 km to reach the destination. The most numerous group travel the distance between 201 and 300 km. A significant part of tourists (20%) travel from 501 to 600 km to reach the area. This two zones correspond to distances between the GML and the most urbanized areas in Poland. It takes on average 4 hours and 14 minutes to reach the destination.

A significant group of respondents don't pay for their accommodation. These are people who stay by friends and relatives, in their second homes or who moor their yachts outside of ports. The most of tourists who use accommodation services stayed in resorts and bed & breakfast. Resorts were usu-

ally chosen for longer holiday stays and consequently influenced significantly total accommodation costs.

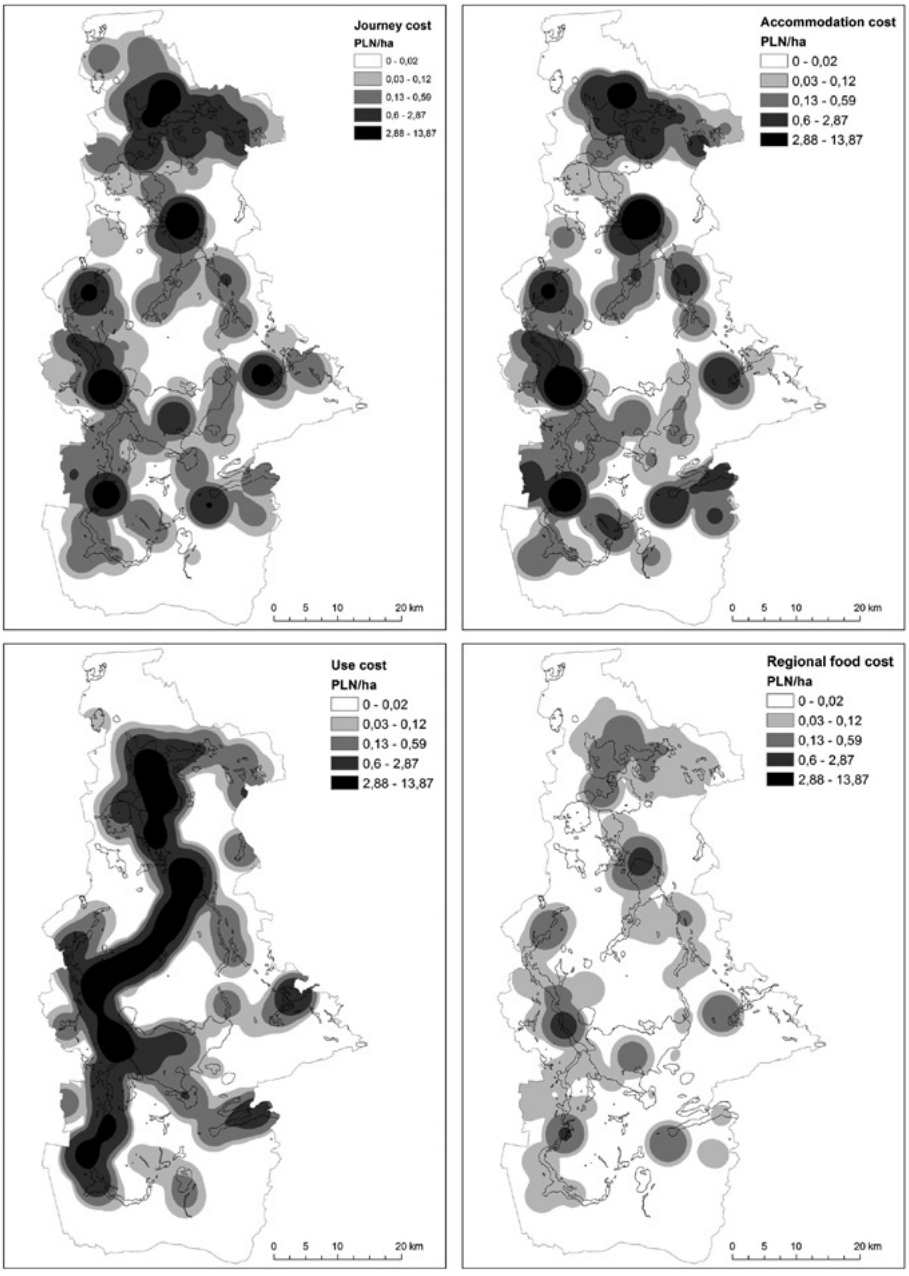

Figure 2. Individual travel cost – spatial diversity of partial costs

As far as equipment rentals are concerned, sailing generates the highest cost. Due to the high maintenance costs, the majority of Polish sailors tend to charter a yacht. Riding a horse is the least popular activity, possibly because of small number of studs.

Fish is the most often purchased regional food and its price is also the highest. Consequently, fish purchase is the most significant of all food costs.

The partial costs differ not only in their value, but also in spatial pattern. Figure 2 presents the spatial diversity of the journey cost, accommodation cost, use cost and regional food cost of the respondents. All the highest values are concentrated along the shores. Whereas journey and accommodation costs are more dispersed, the areas of highest use extend along the main sailing trail. Comparing to other costs, that of regional food is less significant. Also it is needed to mention that this value is ascribed to the place of the purchase not to the place of the production.

Total travel value

Our estimations give 305 563 tourists who visited the region in July and August of 2014. This number was used to calculate the total value of tourism in the region, which is 276 820 523 PLN per summer season. The diversity of elements that influence the value of respondent's travel is described by table 2.

Table 2. Travel costs of tourists in the GML region

Good / service	% of users	Estimated sum spent by respondents [PLN]
TRAVELLED DISTANCE		
≤ 100 km	5.6	545 603
100.1 – 200 km	19.0	4 026 093
200.1 – 300 km	29.7	9 784 289
300.1 – 400 km	12.4	5 766 785
400.1 – 500 km	7.6	4 530 178
500.1 – 600 km	20.4	15 171 102
More than 600 km	5.2	5 256 911
TOTAL COST OF TRAVELLED DISTANCE	100	45 080 961
JOURNEY TIME		
≤ 60 minutes	1.4	82 622
60.1–120 minutes	9.6	1 126 059

Good / service	% of users	Estimated sum spent by respondents [PLN]
120.1–180 minutes	11.2	2 193 121
180.1–240 minutes	22.4	6 011 608
240.1–300 minutes	17.2	5 793 496
300.1–360 minutes	9.0	3 758 596
360.1–420 minutes	15.2	7 586 533
>420 minutes	13.8	8 430 119
TOTAL COST OF JOURNEY TIME	100	34 982 155
ACCOMODATION		
Accommodation	9.02	24 800 174
Bed & Breakfast	16.03	11 022 300
Resort	18.64	28 474 274
Camping site	5.41	1 488 010
Mooring in port	7.21	4 408 920
Free of charge	42.28	0
Not identified	1.4	964 451
TOTAL COST OF ACCOMMODATION	100	71 158 130
EQUIPMENT FOR ACTIVITIES		
Sailing yacht	36.8	84 839 659
Rowing boat, pedalo	28.7	6 317 967
Kayak	21.7	6 797 246
Motor boat	6.8	12 902 229
Windsurfing	1.2	3 954 255
Horse	0.2	956 798
TOTAL COST OF ACTIVITIES	100	115 768 153
REGIONAL FOOD		
Fish	39.1	5 972 178
Honey	28.1	2 572 630
Wild fruits	14.0	643 158
Mushrooms	7.0	643 158
TOTAL COST OF REGIONAL FOOD	100	9 831 124
TOTAL COST OF SUMMER TOURISM IN THE GML		276 820 523

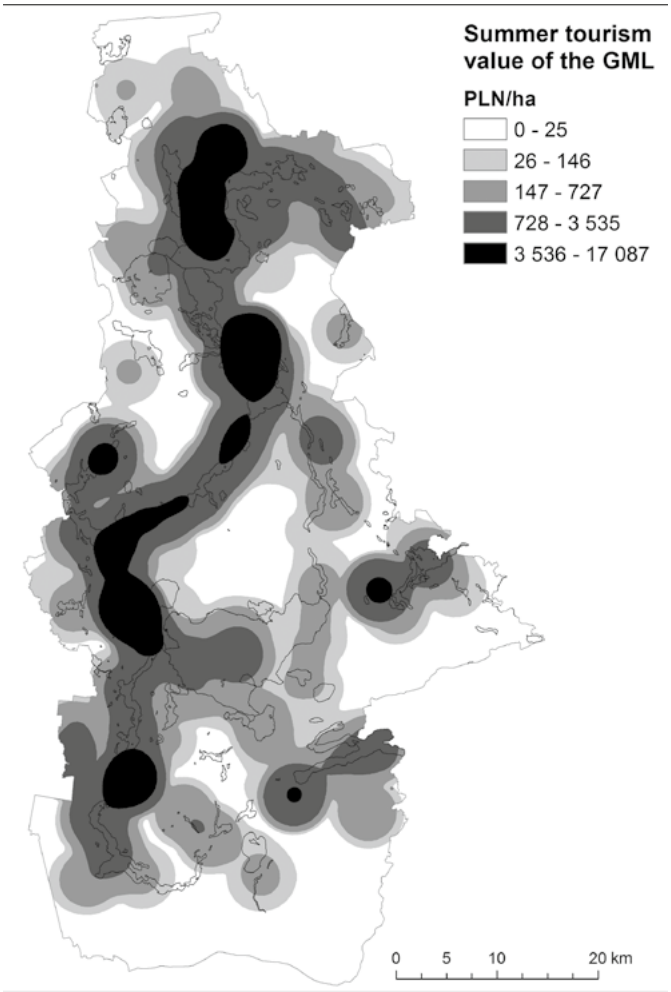

Figure 3. Total tourism value of GML

From all of the considered types of costs, equipment rental remains the highest (41,8% of all costs payed by the respondents). This cost is mainly generated by charter of sailing yachts. Although inshore sailing is rather unimportant part of the whole tourism industry, it remains the key activity in the GML. Because sailors sleep on their yachts, in their case rental costs cover also (when not mooring in ports) accommodation costs. As for all tourists, accommodation is 25,7% of their expenses. It is only slightly less then journey costs (distance and time), which make 28,8% of the total sum.

Figure 3 presents spatial diversity of the total travel value. It remains the highest along the main sailing trail. The hot spots are located in regional tourist hubs. Despite their urbanized status, nature remain easily accessible

there, as towns are located by lakes, remain relatively small and encompass many green areas. Surprisingly, Śniardwy lake, commonly considered as a significant tourist attraction, has a relatively low value. This reflects the low level of its real use by tourists. Due to unsuitable natural conditions the shores of Śniardwy are difficult to access and lack tourism infrastructure. The lake itself is known to sailors as potentially unsafe. Another area whose value remains unexpectedly low is Piska woodland. This big forest in the south of the region has high potential for tourism, but lack accommodation.

Discussion and conclusions

The total value of summer tourism for the GML was estimated on around 277 million PLN. It must be emphasized that it is not the money that tourists leave in the region (some costs, such as travel costs, are incurred outside of the destination).

In comparison to other economically important activities in the GML, the calculated tourism value is high. The value of wood production in the areas is estimated on 88 042 107 PLN and the value of sold wild fruit and mushrooms on 173 638 PLN[20].

The tourism value is spatially diversified; the biggest lakes and their shores are up to 27 times more valuable than agricultural areas out of shoreline. The described diversity proved the importance of water to tourists. They not only declare, but also actively use the GML water bodies. The high value of water and shores is the regularity found worldwide[21], but to our knowledge detailed spatiality of the phenomenon has not been studied. In GML, the value of waters is the highest near towns that provide infrastructure and for the lakes that are not only big but also connected to the others. The use value of forest is not only lower than water bodies, but also spatially limited to more densely populated areas, where accommodation is available.

The study shows clearly, that the tourism value and its spatial pattern are driven by many different factors. As many factors as possible should be included in valuation process in order to obtain reliable results. Such calcula-

20 Values for warmińsko-mazurskie region recalculated by forest area in GML region. Source of the data: Bank of Local Data, Statistical Office of Poland, www.bdl.stat.gov.pl [12-08–16].

21 C.M. Fleming, A. Cook, *The recreational value of Lake McKenzie, Fraser Island: An application of the travel cost method*, "Tourism Management" 2008 no. 29(6), p. 1197–1205; I. Maharana, S.C. Rai, E. Sharma, *Valuing ecotourism in a sacred lake of the Sikkim Himalaya, India,* "Environmental conservation" 2002 no. 27(03), p. 269–277; N.H. Lansford Jr, L.L. Jones, *Recreational and aesthetic value of water using hedonic price analysis,* "Journal of Agricultural and Resource Economics" 1995, p. 341–355.

tions can help to improve the management of an area. For example a land tax for tourism infrastructure could be lowered in areas of lower value to tourism.

The realized analysis has some limitations. Firstly, only use value has been included. The existence and bequest values are surely important in the GML region, which is iconic Polish landscape. Secondly, the presented valuation is limited to summer season. If not as busy as in summer, winter season in the GML should not be neglected. Still, due to totally different character of winter tourism, the method should be significantly modified.

The presented study is the first attempt to estimate how precious this area is, what is the impact of particular groups of costs, and how much tourism is important for the region. This, in turn, should result in appropriate tourism management.

Acknowledgements

The research was funded by the National Science Center on the basis of the decision DEC–2012/07/B/HS4/00306.

The contribution of the authors in the article:

Sylwia Kulczyk, Ph.D. – 40%
Edyta Woźniak, Ph.D. – 35%
Marta Derek, Ph.D. – 25%

Literature

Balmford A. et al., *Walk on the Wild Side: Estimating the Global Magnitude of Visits to Protected Areas*, "PLoS Biol" 2015 no. 13(2)

Chan K.M. et al., *Where are cultural and social in ecosystem services? A framework for constructive engagement*, "BioScience" 2012 no. 62(8), p. 744–756

Fleming C.M., Cook A., *The recreational value of Lake McKenzie, Fraser Island: An application of the travel cost method*, "Tourism Management" 2008 no. 29(6), p. 1197–1205

Giergiczny M., R*ekreacyjna wartość Białowieskiego Parku Narodowego*, "Ekonomia i Środowisko" 2009 no. 2(36), p. 117–127

Lansford N.H. Jr, Jones L.L., *Recreational and aesthetic value of water using hedonic price analysis,* "Journal of Agricultural and Resource Economics" 1995, p. 341–355

Maes J., Paracchini M.L., Zuliani G., *A European assessment of the provision of ecosystem services*, JRC Scientific and Technical Reports, Luxembourg 2011, p. 81

Maharana I., Rai S.C., Sharma E., *Valuing ecotourism in a sacred lake of the Sikkim Himalaya, India,* "Environmental conservation" 2002 no. 27(03), p. 269–277

Panasiuk D., *Wycena środowiska metodą kosztów podróży w praktyce. Wartość turystyczna Pienińskiego Parku Narodowego,* w: F. Piontek (ed.) *Ekonomia a rozwój zrównoważony*, *Teoria i kształcenie*, Białystok 2001, p. 264–277

Schägner J.P. et al., *Mapping ecosystem services' values: Current practice and future prospects*, "Ecosystem Services" 4, p. 33–46

Tourism in Warmińsko-Mazurskie Voivodeship in 2014, Olsztyn 2015

Troy A., Wilson M.A., *Mapping ecosystem services: practical challenges and opportunities in linking GIS and value transfer*, "Ecological Economics" 2006 no. 60(2), p. 435–449

www.bdl.stat.gov.pl

www.world.new7wonders.com

Zydroń A., Pruchlat O., *Określenie społecznej wartości Wielkopolskiego Parku Narodowego metodą kosztów podróży*, "Barometr Regionalny. Analizy i prognozy" 2014 no. 4, p. 155–164

Żylicz T., *Ekonomia środowiska i zasobów naturalnych*, Warszawa 2004

Żylicz T., *Valuating ecosystem services*, "Ekonomia i Środowisko" 2012 no. 2(42), p. 18–38