



Lomonosov Moscow State University

Moscow, Russian Federation

<http://www.econ.msu.ru>

Preprint series of the economic department

Benefits assessment of Russian National Park "Lake Pleshchevo" (ecosystem services valuation for an environmental policy)

Sitkina Kira, Solovyeva Sofya¹

Article info

Abstract

Key words: biodiversity conservation, environmental policy, benefits of natural services, ecosystem services.

The article presents assessment of ecosystem services for National Park "Lake Pleshchevo".

JEL: Q50, Q51, Q57

¹ Sitkina Kira, Senior researcher, Department of Economics, Lomonosov Moscow State University

sitkinaks@gmail.com

Solovyeva Sofya, Principal researcher, Department of Economics, Lomonosov Moscow State University

solovyevasv@gmail.com

Biodiversity is of immense intrinsic value and human wellbeing depends upon it. It is the 'natural capital' that provides a country, its economy and its people with a flow of goods and services that are fundamentally important for prosperity, livelihoods and well-being. The values we receive from our natural capital are immense, and failure to adequately take these values into account in our decisions exposes us to the risk of losing yet more of it.

The main threats to biodiversity in the region include: logging natural / near-natural forest, expansion of agricultural land and agricultural intensification, wetland drainage, pollution, illegal hunting and overexploitation of some species, especially fish, and the spread of invasive species.

This case is to evince benefits of the environmental policy carried out in a nature protected area. A policy that should succeed but can easily fail if the benefits are not skillfully translated into sustainable development crowned by a green economy. The case coverage starts with a description of what could be called the present day's Alladin cave of wonders inscrutably generated by nature and history of ancient and medieval Russia and located in the middle of Russia's modern economic development. An environmental policy is built on this peculiar symbiosis of the past and the present. The case is to show that the benefits of natural services could be and are as or even more valuable than the benefits derived from technological change. And the environmental policy should strike a necessary balance between the two worlds acting in a small area.

Overview of current conditions

The national park "Lake Pleshcheevo" was established as a Russian Federal nature protected area in 1988. In 2000, it was put under the RF Ministry of natural resources

The Park's mission is preservation and restoration of a unique natural cum historical site near the town of Pereslavl - Zalessky in the upper Volga region.

The National Park (Fig.1) occupies 15,271 hectares of forest lands, 5,963 ha of aquifer, 554 hectares of agricultural lands as well as 2002 hectares of other lands. The total area of the national park is 23,772 hectares. The Pleshcheevo lake is of glacial origin and came about 30 thousand years ago. It is of oval shape, with a coastline of 27 km, length of 9.55 km, a maximum width - 6,7 km, a maximum depth of 24-25 m. It features unique limnological characteristics and is one of the largest freshwater lakes in the European part of Russia. Almost half of the inflow into the lake is provided by groundwater. There are 16 species of fish, with some rare species among them, such as the European whitefish, also called "the royal herring" The National Park abounds in flora and fauna. There are 790 species of plants, 9 of which are listed in the Red Book of Russia. The park has 60 species of wild animals, some are endangered, such as roe deer, flying squirrel, shrew-baby, muskrat. There are also 210 species of birds, with such rare species as the gray heron, gray goose, whooper swan and gray crane. The park has 26 archaeological monuments, 2 monuments of history.

The town of Pereslavl - Zalessky is located on the bank of Lake Pleshcheevo and-is one of the most ancient cities in central Russia. It was founded by Duke Yuri Dolgoruky in 1152. In 2012, the town will mark its 860-year anniversary. The population of the town is 42300 people as of January 1, 2008.

The town is a tourist attraction of the Golden Ring of Russia that encircles Moscow. It is a beautiful ancient town with an eventful history. One of the few Russian towns that features earth dams that were built for its protection in the 12th century. At the time of the Moscow period, the town was actually the second religious capital of Russian state, with the most ancient temples and cathedrals of the 12-18th centuries, magnificent ensembles of five monasteries remaining until now.

A memorable trail in the town's history was left by a dynamic "carpenter and-worker" tzar, Peter the Great I. In the late 17th century he founded a mockery fleet on the shore of the Pleshcheevo lake that heralded the beginnings of Russian shipbuilding. The estate turned into a museum got called "Peter the Great's boat" where Peter I had a workplace and where Peter I's boat "Fortunatus" is exhibited now.

A special feature of the national park "Lake Pleshcheevo" is that it is located in an economically developed area, 130 km from Moscow and is spread across two municipal districts, namely, the Pereslavsky region of Yaroslavl province and the town of Pereslavl-Zalessky. The park is bordered by diverse enterprises: industrial, agricultural, transport, land use, other pollution sources that affect the nearby environment and protected natural and cultural complexes.

The town's economy is based on industrial enterprises. Pereslavl-Zalessky is the second town in Yaroslavl province as regards industrial output per capita. Chemicals, plastic goods, food, tobacco, textiles prevail. Over 200 industrial facilities employed 4,500 people in 2009. A pharmaceutical enterprise is planned to be built. The housing construction is underway. Three large investment projects are being implemented, including the development of lake Pleshcheevo coast. The tourism sector boasts of three large investment projects, including one on the shore of lake Pleshcheevo.

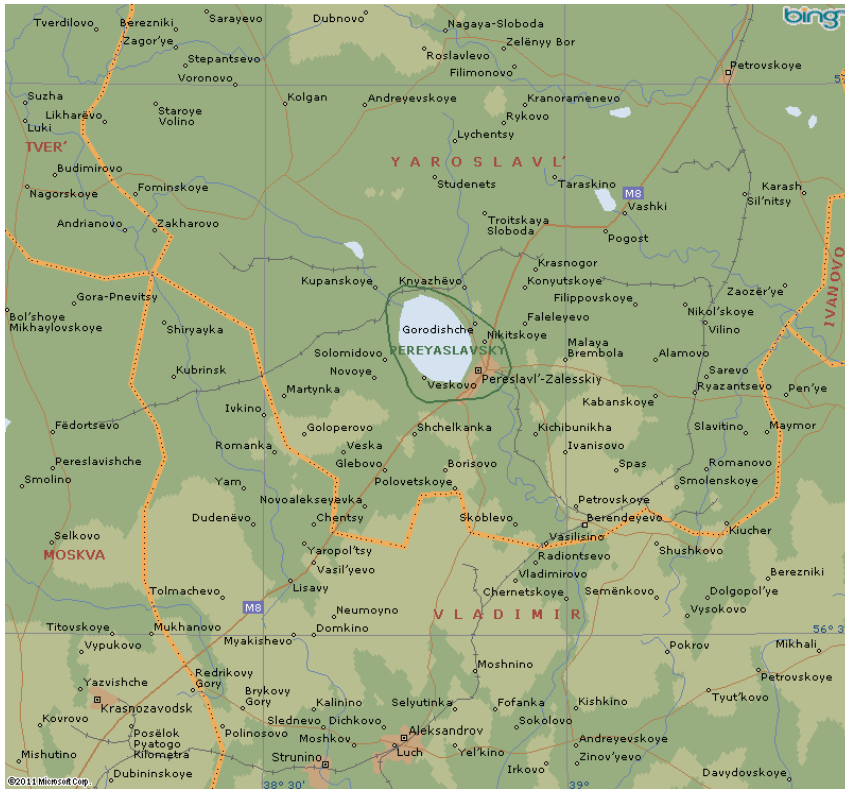


Figure 1: A map of the national park ‘Lake Pleshcheevo’

The source of water supply for Pereslavl-Zalesskiy is a closed aquifer on the east shore of lake Pleshcheevo. Centralised pipe water supply reaches 95 % of the town’s inhabitants 82% of which is equipped with water drainage. However, the equipment in both cases is obsolete and badly needs retrofitting. Sewerage networks extend for 109.8 km, of which 83.8 % is worn down by 82%, including 21.2 km which needs urgent replacement.

Threats:

1) A lack of new areas for further enlargement of the town as well as of an efficient land use policy which results in an inappropriate use of urban lands and a patchiness of industrial and warehouse sites.

2) Expansion of Moscow-like urban structures that do not consider interests of the people living in the town and the tendency of moving development sites beyond the town’s boundaries. Such kind of expansion narrows down possibilities of town municipalities to secure urban development and deprives the town budget of considerable tax revenues.

3) Absence of mechanisms of interaction and cooperation between municipal governments and such important land users cum investors at the federal level as the Russian ministry of defense, the ministry of natural resources (it deals with national parks), the Russian orthodox church.

4) Lack of a comprehensive plan of land use for the lakeside areas and finances to make such a plan. Chaotic construction activities can lead to the loss of amenities, historical and cultural sites, archeology monuments.

If the above threats persist considerable damage could be made to lake Pleshcheevo ecosystems.

Time frame: 2007-2010

Potential environmental improvements

The national park provides ecosystem services to the town and nearby areas. However they are poorly assessed in pecuniary terms and cannot compete with an alternative value of the land in question. The legal market and, of course, the shadow market do not take into account the most part of effects of biodiversity conservation. Undervalued nature protected areas make them uncompetitive and therefore under-budgeted for their maintenance.

Valuation of benefits from the national park conservation, both in qualitative and quantitative as well as monetary terms was carried out.

In line with the general economic value theory applied to valuation of the national park value, two kinds of categories were considered, such as direct and indirect use values.

Qualitative assessment of the benefits

- *Environmental benefits*

Conservation of biodiversity, flora and fauna, large forests, a wetland ecosystem, capacity to capture greenhouse gases.

- *Health benefits*

Healthy Pereslavl's inhabitants, neighbouring settlements and tourists. The national park is a source of berries, mushrooms, fish, water, public recreation.

- *Social benefits*

Preservation of historical cultural cum natural heritage.

- *Economic benefits*

Additional income support for the local population. **The tourism sector** provides employment and an additional sustained income to local people. During the 2008-2009 financial crisis the tourism sector was least affected in comparison with industrial production. Non-timber resources of the Park and subsistence fishing also helped to offset dwindling incomes of the local people. It should be noted that the average size of retirement benefits at that time was Euro 153, while there were 12,600 such people (30 % of the total population. (Russian ruble- RUB 1 was equal to about Euro 40)

The Park **wetlands** mitigate risks of flooding.

Quantitative and monetary assessment of the benefits

Direct use value

Forest maintenance (sanitary) logging in the Park area harvested 1438 cubic m. of **timber** in 2007, or between Euro 18,000 and 31,500 depending on varying market prices for timber in the province.

Revenues from **non-timber products** were also calculated on the basis of wholesale and retail prices at the local markets (see Table.1). Calculation of the amount of non-timber forest products can be made using data about productivity of various types and age of tree species. It is better to use retail prices in the markets of Pereslavl or other markets located close to the places of gathering like products. Furthermore, the use of prices established in the wholesale markets is possible.

Table.1: Valuation of non-timber products (berries)

Kinds of Berries	Amount, kg	Retail price per kg, Euro	Wholesale price per kg, Euro	Revenues, Euro	
				Retail	Wholesale
Cowberry	2045,4	3,75	2.13	7 670	4 346
Bilberry	28314,4	3,75	2.5	106 180	70 786
Cranberry	5877,9	3.5	2	20 570	11 760
TOTAL				134,420	86,892

Source: calculated by K.Sitkina

The Park is also a source of popular edible mushrooms bringing revenues (see Table.2)

Table.2: Valuation of non-timber products (mushrooms)

Kind of forest	Harvested area, ha	Total amount harvested (kg/ha)	
		Annual (average)	
		All	Most popular
Pine forests w/cowberry	221,2	5530	2212
Pine forests w/bilberry	1010,4	35364	20208
Pine forests w/cranberry	504,6	37845	17661
Furtree forest w/cranberry	2898,58	17391,5	5797,16
Birch tree w/cranberry	2358	200430	117900
Aspen w/cranberry	2199,5	65985	32992,5
TOTAL, kg		362545	196770,7

Source: the Ministry of natural resources of the Russian Federation. Central state forestry "Centresproject". The scheme of the organisation and development of national park "Lake Pleshcheevo", 2000

As it was the case with berries, wholesale and retails prices were taken into account to arrive at a range of revenues between **Euro 2,737,000 and Euro 4, 194,870**.

In order to protect biological resources of the lake Pleshcheevo, fish catches are annually regulated by establishing a total admissible catch (TAC). For example, in 2008, the average figure was **30.4** tonnes. The prices for fresh fish in the local market varied from Euro 2 to 3.2 per kg, depending on its kind. Thus, the annual cost of the annual catch would amount to from Euro **60,800 to 98,800**.

Water supply for the needs of Pereslavl-Zalessky is taken from the lake of Pleshcheevo. In 2007 the total amount of water withdrawals reached 7,842 thousand cubic metres. The water tariff in Pereslavl-Zalessky is Euro 0.19 per cub.m which makes the cost of an annual water use equal to Euro **1.5** mln. Incidentally, the charge for 1 cubic m of water supplied by housing public utilities to people living in the Pereslavsky district of Yaroslavl province (i.e. outside the town of Pereslavl), amounts to Euro 0.3. Thus, they pay about Euro **2.4** mln. for water use.

Tourism. In 2007, 250,000 people visited the Park, with the average visitation lasting one day. The entrance fee to the Park is 75 Eurocents. Therefore, minimum tourist services amounted to Euro **187,500**. If guided tours for tourists were taken into account the amount of revenues would be higher accordingly. In 2007, 186 tourist groups totaling 5331 visitors (or 29 people in a group) paid for guided tours. According to an expert estimation of the Park chief of department of tourism 90 % of tours were of one hour duration in the dendrology part of the Park. The remaining 10 % - the other tours lasting for 3 to 4 hours. Thus, 19 groups did 3.5 hour tours on average and 167 groups were one hour tours and that amounted to 233.5 hours of the guided tour services which, according to the price-list for park services, would add Euro **1,750** to make costs of tourist services reaching about Euro **189,250**.

The value of **indirect use** of ecosystems services includes a number of components, such as: GHG sequestration, regulation of water tables, water and air treatment, habitat maintenance, human health improvement. Many ecosystem services cannot be price tagged. Nevertheless, in some cases approximate values could be roughly estimated.

Carbon sequestration. An estimation was made of GHG absorption by different age groups of forest tree species on the basis of coefficients taken from some publications for major kinds of trees in the northern region of the European part of Russia. The results obtained are presented in Table.3.

Table.3: Carbon sequestration by forests in the National Park "Lake Pleshcheevo", in tons

Forest species	Young growth	Middle-age trees	Ripe age trees	Over-mature trees	Total
Pine	560.23	579.39	-215.76	0	923.86
Fur trees	232.07	447.33	-4	0	2767.4
Larch	21	0.78	0	0	21.78
Ceder	1.68	0	0	0	1.68
Hardwood deciduous					
Birch	1214.85	2762.76	-316.94	0	3660.67
Aspen	114.8	451.75	2090.4	0	2656.95
Softwood deciduous					
	32.13	366.48	-1	0	397.61
Total	4268.6	4608.49	1552.7	0	10429.95

Source: K.Sitkina

Table.3 shows a total amount of sequestered C amounting to about 10, 430 tons which is equivalent to 38 173.8 tons of CO2 a year. At a price of 1 ton of the sequestered CO2 equal to Euro 13, this ecosystem service would amount to Euro **496,260**.

The Park has 431 hectares of bogs (wetlands). A throughput of Park bogs on average amounts to 479, 5 cubic m / hectares/day. The throughput of an average industrial waste treatment installation makes 1500 cubic m. a day, with its annual marginal cost of Euro 685. Thus, an area covered with bogs of the Park "Lake Pleshcheevo" is equivalent to 137.7 industrial waste treatment installations, with their cost of Euro **94,315**.

In addition to water cleaning services, lake and bogs of the national park provide a number of other services, such as regulation of the water table, securing a habitat to wildlife and human recreation amenities. The assessment of these services was made by extrapolation of data obtained from research by K. Schuyt and L. Brander. On the basis of this research an average cost of water balance regulation (prevention of flooding) amounts to Euro 317.8 for one hectare year, habitat maintenance – Euro 137.7 per hectare-year, recreation services- Euro 337 per hectare a year. The value of these ecosystem services of wetlands in the Park "Lake Pleshcheevo" is presented in Table.4.

Table.4: Valuation of wetland ecosystem services of the Park Lake Pleshcheevo"

Ecosystem Services	Area, ha	Area Unit Value, Euro	Ecosystem Service Value, Euro
Flood Prevention	5529	317.8	1,757,162
Habitat Maintenance	5529	137.7	761,184
Recreation	5529	337	1,863,197
Water/Air treatment	431		94,315
Total, US \$			4,475,858

Source : calculated by Sitkina

The above results show that an indirect use value for the national park "Lake Pleshcheevo" amounts to about Euro **4.5** mln. a year.

A summary Table.5 shows that an annual flow of revenues of the Park amounts to Euro **9.5 – 12** million.

Table.5: The Value of Ecosystem Services provided by the National Park "Lake Pleshcheevo", thousand euro

Direct Use Value, thou Euro	
Timber	18 – 31.5
Wild berries	86.9 – 134.4
Forest mushrooms	2737 - 4195
Fish	60.8 – 98.8
Water	1500 – 2400

Tourism	187.5
Sub-Total	4590.2 – 7047.2
Indirect Use Value	
Carbon sequestration	496.2
Flooding prevention	1757.2
Habitat for wildlife	761.2
Human recreation	1863.2
Wetland cleaning services	94.3
Sub-Total	4972.1
TOTAL	9562.3 – 12019.3

This case is courtesy of Ms Kira Sitkina. The data was gathered, analysed and treated by Ms. Kira Sitkina for her dissertation under supervision of Professor Sergey Bobylev, Department of Economics, Lomonosov Moscow State University.

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