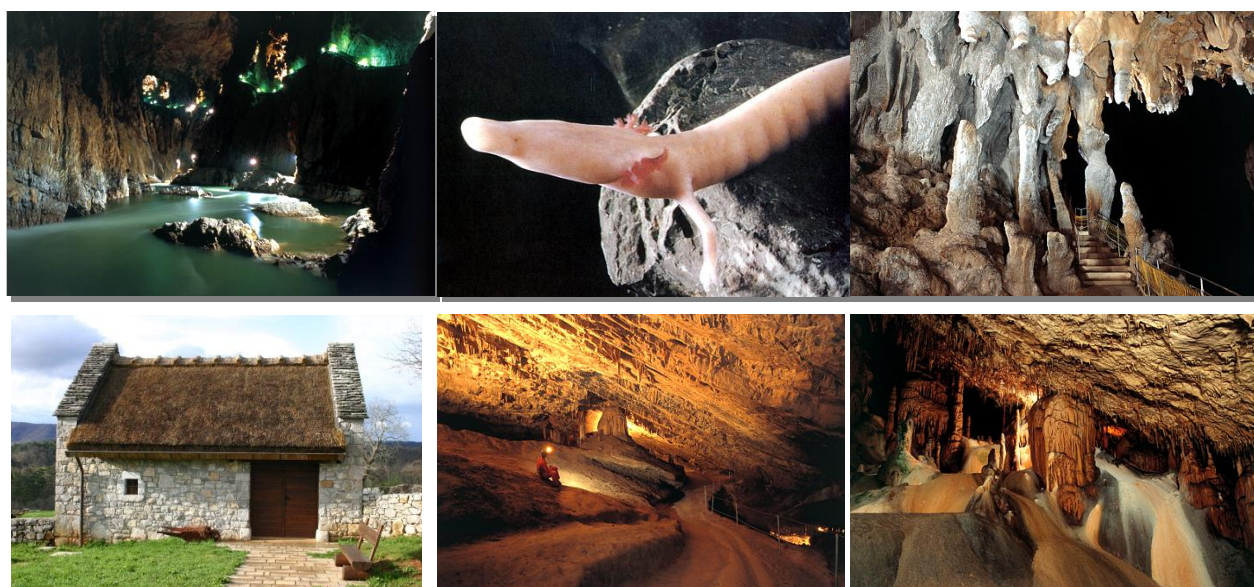




# ECOSYSTEM SERVICES EVALUATION IN THE ŠKOCJAN CAVES REGIONAL PARK



Contracting authority:  
**World Wide Fund for Nature**  
Via Po, 25C Rome  
Italy

Contractor:  
**Actum, d.o.o.**  
Verovškova 60, Ljubljana  
Slovenia

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## **AUTHORS**

### **ACTUM, LTD.**

E-mail: [info@actum.si](mailto:info@actum.si)

Address: Verovškova 60, 1000 Ljubljana, Slovenia

Internet: [www.actum.si](http://www.actum.si)

Contact:

#### **Jasmina Žujo**

Telephone: +386 (0)590 80 999

Fax: +386 (0)590 80 941

E-mail: [jasmina.zujo@actum.si](mailto:jasmina.zujo@actum.si)

#### **Miha Marinšek**

Telephone: +386 (0)590 80 990

Fax: +386 (0)590 80 941

E-mail: [miha.marinsek@actum.si](mailto:miha.marinsek@actum.si)

## **REVIEW**

### **WWF Mediterranean Programme Office**

E-mail: [mventimiglia@wwfmedpo.org](mailto:mventimiglia@wwfmedpo.org)

Address: Via Po, 25C, 00198 – Rome, Italy

Internet: [www.panda.org/mediterranean](http://www.panda.org/mediterranean)

Project supervisor:

#### **Stella Šatalić,**

Telephone: +385 1 2361 653

E-mail: [ssatalic@wwfmedpo.org](mailto:ssatalic@wwfmedpo.org)

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## **CONTRACTING AUTHORITY**

*WWF – World Wide Fund for Nature*

## **FRAMEWORK OF THE STUDY**

*The study has been made in the framework of the project Protected Areas for a Living Planet – Dinaric Arc Eco-region Project. The aim of developing and conducting the study on ecosystem services evaluation in the Škocjan Caves Regional Park was to increase the capacity of the protected area management.*

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## ABBREVIATIONS

EIA	Environmental Impact Assessment
EPO	Ecologically important area
ES	Ecosystem services
EU	European Union
GPP	Gross Primary Production
GVA	Gross value added
HD	Hunting district
MAB	Man and Biosphere
MAE	Millennium Ecosystem Assessment
MV	Market value
NGO	Non-governmental Organization
NPP	Net Primary Production
PA	Protected area
RP	Škocjan Caves Regional Park
SCI	Site of Community Importance
SPA	Special Protected Area
TEEB	the Economics of Ecosystems & Biodiversity
TEV	Total economic value
TSV	Total service value
UNESCO	United Nations Educational, Scientific and Cultural Organization

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## 1. ABSTRACT

The world in which ecosystem services are limited and in which the environment can only take a limited amount of waste and emissions without sustaining serious damage, is already inhabited by 7 billion people. Nevertheless, there are enough ecosystem services to meet all of the basic needs of the population, as long as those services do not become subject of speculation or trade primarily based on the principle of profit – market economy. Humanity can only achieve wellbeing and peace if it learns how to fulfil basic needs of all living beings. However, this agenda is impossible without sharing the common ecosystem services and enhancing collaboration and solidarity. It is imperative that we find new social options and even more importantly new economic options that might lead to prosperity and sustainable development of the entire planet.

The present study examines how people can benefit from well preserved ecosystems through provision of different ecosystem services and shows the importance of making decisions based on clearly defined economic/ecological programs, planned for several years ahead.

The park is rich with unique natural site features (caves, collapse dolines and underground stream) and cultural heritage, has abundant diversity of plants and animals, but limited agriculture and livestock opportunities.

The area was protected at the national level in 1996 with the establishment of the Regional Park, inscribed as a wetland of international importance under the Ramsar Convention on Wetlands in 1999 and was included in the UNESCO – MAB World Network of Biosphere Reserves under the name of the Karst Biosphere Reserve in 2004. The entire protected area is further also part of the Natura 2000 network under the EU legislation and ecologically important area according to national nature conservation law.

Market value of the Škocjan Caves Regional Park in 2011 is estimated at 12.8 million €, of which tourism and recreation account to almost 90%. With the discount factor of 5% and the estimated investment value of approximately 5 million €, the net present value of the Škocjan Caves Regional Park in the period of 30 years is estimated at be around 215.8million€.

## 2. EXECUTIVE SUMMARY

The Škocjan Caves Regional Park is an area of 413 ha, located in the south-western Slovenian municipality of Divača on the Karst Plateau, the very place, where first discoveries of the typically karstic caves and karst phenomena were made. In fact, it is the Škocjan dolines (Velika and Mala dolina) that led researchers to borrow the name "doline", nowadays an internationally used term in karstology.

The area was protected at the national level in 1996 with the establishment of the Regional Park, inscribed as a wetland of international importance under the Ramsar Convention on Wetlands in 1999 and was included in the UNESCO – MAB World Network of Biosphere Reserves under the name of the Karst Biosphere Reserve in 2004. The entire protected area is further also part of the Natura 2000 network under the EU legislation and ecologically important area according to national nature conservation law

The particular climat conditions in the dolines and cave entrances give birth to a mixture of both Alpine and Mediterranean flora. Due to the unique distribution of both the said flora and fauna, which coexist in an extremely small area, conservation of the Škocjan Caves is a step towards the conservation of biodiversity.

In the present study, we estimated the market value of the park in the case of two different scenarios; with no changes in the current management of the park (market value in 2011 was estimated at 12.8 million €, net present value estimated at 215.8 million €) and in the case of harnessing the ecosystem service potential provided by the park (market value was estimated at 14.7 million €, net present value estimated at 253.4 million €).

Based on the results of the study, it can thus be concluded that it would be reasonable to consider the possibility of additional sustainable use of the Škocjan Caves Regional Park's potential and obtain additional approximately 2 million € per year.

It should, furthermore, be noted that the park enables the inhabitants and workers in the wider area to benefit from the ecosystem services that it provides. Thus, the calculated market value of the Škocjan Caves Regional Park is a benefit of all the people related to the existence of the RP and not merely a profit made by the Škocjan Caves Regional Park.

### 3. INTRODUCTION

Ecosystem services (hereinafter referred to as the ES) can be defined as the wide range of valuable benefits that a healthy ecosystem provides for people, either directly or indirectly. According to the Millennium Ecosystem Assessment, ES can be classified into four broad categories:

- Provisioning services – products obtained from ecosystems,
- Regulating services – benefits obtained from the regulation of ecosystem processes,
- Cultural services – nonmaterial benefits obtained from the ecosystem and
- Supporting services – support production of all other services.

It is important to note that classic market economy does not apply for the services provided by ecosystems due to the absence of an active market and the market itself being unreceptive for such services. Therefore, the value of ecosystem services is frequently underrated and fails to reflect the actual importance of services for the society. Naturally, however, there are also moral, ethical and aesthetical reasons for conserving and evaluating natural resources regardless of the benefits for the society (Constanza et al., 1996: 225).

One of the frequently used welfare indicators is gross national product, which is, however, not a true indicator of economic growth or sustainability. This is due to the fact that it does not reflect the deterioration of ES caused by industry and commerce (Goodland & Daly, 1996). The ES evaluation approach therefore presents itself as one of the key instrument for the efficient allocation of resources as it considers the full range of ES provided by an area and assesses how various policies or planning decisions influence the value of those services rather than merely the profit of individuals.

The Škocjan Caves Regional Park (hereinafter referred to as the RP) has been selected for the evaluation of ecosystem services due to the exceptional significance of the park on not only the national, but also the European scale. The park lies on a karst surface above the Škocjan Caves on the SE part of the Kras Plateau between the sinks of the Reka river and the village of Divača. Different geomorphologic features here, like dolines, caves, shafts and deep collapse dolines offer a habitat for endemic and rare animal and plant species. The park also prides itself with a unique architectural heritage and many archeological findings, for instance a renowned cult/sacrificial site from the Bronze Age and a number of valuable prehistoric findings.

The Škocjan Caves are designated as one of the UNESCO World Heritage Sites and appear on the Ramsar List of Wetlands of International Importance. The RP, or rather the “Karst Biosphere Reserve” is further a part of the UNESCO – MAB World Network of Biosphere Reserves.

Generally, the Kras Plateau is scarcely inhabited. Even though the dry climate of the area with warm temperatures and little snow during the winter months may provide great conditions for tourism, it offers very few opportunities for agriculture and livestock

production.

The purpose of the ES evaluation in the RP is to demonstrate the contribution of the Škocjan Caves Regional Park to the local, national and global economy, thus calling for conservation and sustainable use of ecosystem services provided by the RP as well as a stronger local and political support of the latter.

The objective of the ES evaluation was to identify the number of currently used ES provided by the Škocjan Caves Regional Park and the number of ES that could be used in a sustainable manner.

Data regarding the main ES of the area was in part provided by the locals and the area specialists, who participated in a workshop entitled “Ecosystem services in the Škocjan Caves Regional Park” held in May 2011. In order to obtain additional and more detailed data, we conducted several interviews with relevant stakeholders and engaged in desk study research, thus obtaining relevant information about the characteristics of the Regional Park, the visitors and the management of the area.

Furthermore, current data on the number of visitors, their preferences and characteristics was obtained by a survey designed specifically for this study. The collecting of data took place from mid-May to mid-August.

#### 4. GENERAL INFORMATION ON THE ŠKOCJAN CAVES REGIONAL PARK

The Škocjan Caves Regional Park, an area of 413 ha, is located in the south-western Slovene municipality of Divača. It is part of the Karst (Kras) Plateau, also known as the Classical Karst for having given the name to karst topography, and comprises the villages of Škocjan, Betanja and Matavun with 70 inhabitants. The Regional Park is managed by the Public Agency "Park Škocjanske jame, Slovenija", a member of three international associations: ALPARC – Alpine Network of Protected Areas, EUROPARK federation – Federation of Nature and National Parks of Europe and International Show Caves Association (ISCA).

The Škocjan caves were discovered in 1815. In 1980 they were designated as a Natural Monument and in 1981 they were protected by the Decree of the Municipality of Sežana on the protection of the Škocjan Caves. The Regional Park itself was established in 1996 by the Škocjan Caves Regional Park Act (Official Gazette of the Republic of Slovenia, No. 57/96).

The area is characterised by a sub-Mediterranean climate with the rainfall evenly distributed throughout the year. Also typical of the area is a strong bora wind. As the bora wind dries out the soil, vegetation can only be found in the dolines and depressions, it does, however, provide the area fresh air and good weather.

The Škocjan Karst surface is rocky and depressed. The only constant watercourse in the RP is the underground stream Reka river which springs from below Snežnik plateau and flows some 54 km on the surface, approximately 4 km in the area of the RP. The river then flows through the cave system for approximately 3 km and after that disappears into the underground. It comes back to the surface in Italy some 35 km away at the springs of the Timavo river.

The main habitat types with a significant biotope and biotic characteristics in the area are: woodland (277.34 ha), inland rocks scree and sands (13.7 ha), cultivated land (10.73 ha), dry and semi-dry grassland (52.24 ha), hay meadows (5.34 ha), wet meadows 0.76 ha, human made habitats (13.11 ha), inland waters (5.6 ha), tall-herb communities (0.24 ha), scrub and areas in succession (12.09 ha).

RP is particularly well-known for its rich subterranean fauna with a variety of terrestrial and aquatic species. Apart from troglobiotic (permanently cave-dwelling) species of invertebrates, some caves in the park are also inhabited by olm (*Proteus anguinus*), which is the only troglobiotic vertebrate in Europe. Caves in the park further serve as important summer and winter roosts for several species of bats. Besides the rich subterranean biodiversity, the area is also valued for its terrestrial qualities. The area is home to several species and habitat types of EU importance and therefore the entire area is part of two rather vast Natura 2000 sites.

The area of the RP has 54 natural features (Rules on the designation and protection of valuable natural features; Official Gazette Nos. 111/04 and 70/06), of which most are

primarily conserved for their hydrological, geological or geomorphological features, 8 natural monuments, 46 units of cultural heritage and 37 buildings protected as cultural monuments.

Škocjan Caves are the deepest and the largest underground canyon in Europe, which is why they are designated as one of the UNESCO World Heritage Sites, i.e. sites of a special cultural or physical significance, and appear on the Ramsar List of Wetlands of International Importance. Under the name “The Karst Biosphere Reserve” the RP also features on the UNESCO – MAB World Network of Biosphere Reserves.

**International scientific circles have thus acknowledged the importance of the Caves as one of the natural treasures of planet Earth.**

*Table 1: General information and national designations*

<b>General information and national designations of the Škocjan Caves Regional Park</b>	
Location of protected area	Škocjan Caves Regional Park is located on the SE part of the Karst Plateau in SW Slovenia
The establishment of the park	1996
Protected area status	Regional park, IUCN category III
International significance	1986 - World Heritage UNESCO
	1999 - Underground wetland on the Ramsar List
	2004 - Karst Biosphere Reserve, the UNESCO-MAB World Network.
Membership in international associations	1995 - Member of the Network of Protected Areas in the Alps
	Member of the International Show Caves Association ISCA
	Member of EUROPARC, federation of European national parks
Areas of conservational importance	Regional Park – 413 ha (4.13 km <sup>2</sup> )
	Buffer zone of the RP – 45.000 ha (450 km <sup>2</sup> )
	Natura 2000 (SCI KRAS 61.910, SPA KRAS 61.910 ha)
	Ecologically important area
	Protected forests and special-purpose forests
Number of natural features	54
Number of natural monuments	8
Number of cultural monuments	37
Number of units of cultural heritage	46
Number of settlements	3
Number of residents	70

## 5. ECOSYSTEM SERVICES OF ŠKOCJAN CAVES REGIONAL PARK

### 5.1. Introduction to ecosystem services

“Ecosystem services are the wide range of valuable benefits that a healthy natural environment provides for people, either directly or indirectly” (Defra, 2007b).

According to Daily (1997), there is an important distinction between ecosystem services and ecosystem goods:

**Ecosystem services** are the conditions and processes through which natural ecosystems and species as part of those ecosystems sustain and fulfil human life. They maintain biodiversity, the production of ecosystem goods, such as seafood, forage, timber, biomass fuels, natural fibre and a wide range of pharmaceutical industry products as well as their precursors. In addition to the production of goods, ecosystem services provide life-support functions, such as cleansing, recycling and renewal and confer many intangible aesthetic and cultural benefits as well (Daily, 1997: 3).

**Ecosystems goods**, on the other hand, can be defined as tangible material products provided by ecosystem processes, as opposed to ecosystem services, which can be seen as improvements in the condition or location of things of value (Daily, 1997: 5).

A list of ecosystem services and ecosystem goods is provided in the table below.

*Table 2: Ecosystem goods and services*

ECOSYSTEM GOODS	ECOSYSTEM SERVICES
Non-renewable	Purification of air and water
Rocks and minerals	Translocation of nutrients
Fossil fuels	Maintenance and renewal of soil and soil fertility
Renewable	Pollination of crops and natural vegetation
Wildlife and fish (food furs viewing)	Dispersal of seeds
Plants (food fibre fuel medicinal herbs)	Maintenance of regional precipitation patterns
Water	Erosion control
Air	Pest control
Soil	Maintenance of biodiversity
Recreation, aesthetic and education	Protection from the sun’s harmful ultraviolet rays
	Partial stabilization of climate
	Moderation of temperature extremes and the force of winds and waves
	Mitigation of floods and droughts

*Source: Brown et al., 2006*

For the sake of simplification, the term ecosystem service is used for both the ecosystem services and ecosystem goods.

## 5.2. Classification of ecosystem services

Among a wide range of classifications of ES, we decided to follow the Millennium Ecosystem Assessment/the economics of ecosystems & biodiversity typology, which identifies four broad categories of ES and biodiversity, which is not listed in the MEA classification as a service (Millennium Ecosystem Assessment, 2005):

### Biodiversity

In the MEA framework, biodiversity is not listed as a service; however, it is included in the report due to its recognised value/benefit to key stakeholders.

Biodiversity is the wealth of the entire biosphere, which is reflected in the genetic diversity of organisms, in a diversity of species and in a diversity of the systems that organisms compose. Namely, all of the most important ES depend on the diversity and variability of genes, species, populations and ecosystems. It represents a source of food, source for construction and textile materials, medicines, recreation and spiritual relaxation (Marolt, 2009). Some endemic, rare or endangered species that can be found in the analysed area are listed in Appendix 2, in Chapter 12.6. “Flora” and Chapter 12.7. “Fauna”.

### Provisioning services

Provisioning services are the products obtained from ecosystems, including:

- **Food:** The vast range of food products derived from plants, animals and microbes.
- **Fibre:** Wood, jute cotton, hemp, silk and wool.
- **Fuel:** Wood, dung and other biological materials serve as sources of energy.
- **Genetic resources:** The genes and genetic information used for animal and plant breeding and biotechnology.
- **Biochemical natural medicines and pharmaceuticals:** Many medicines, biocides, food additives, such as alginates and biological materials.
- **Ornamental resources:** Animal and plant products, such as skins, shells and flowers are used as ornaments.
- **Fresh water:** People obtain fresh water from ecosystems and thus the supply of fresh water can be considered a provisioning service. Fresh river water can also be used as a source of energy when using the water flow for electricity production in hydroelectric power plants. Because water is required for other life to exist, it could also be considered a supporting service.

### Regulating services

Regulating services are the benefits obtained from the regulation of ecosystem processes:

- **Air quality regulation:** Ecosystems both contribute chemicals to and extract chemicals from the atmosphere, influencing many aspects of air quality.
- **Climate regulation:** Ecosystems influence climate both locally and globally. At a local scale, for example, changes in land cover can affect both temperature and precipitation. At the global scale, ecosystems play an important role in climate by either sequestering or emitting greenhouse gases.

- **Water regulation:** The timing and magnitude of runoff flooding and aquifer recharge can be strongly influenced by changes in land cover, including, in particular, alterations that change the water storage potential of the system, such as the conversion of wetlands or the replacement of forests with croplands or croplands with urban areas.
- **Erosion regulation:** Vegetative cover plays an important role in soil retention and the prevention of landslides.
- **Water purification and waste treatment:** Ecosystems can be a source of impurities (for instance, in fresh water) but can also help filter out and decompose organic wastes introduced into inland waters and coastal and marine ecosystems and can assimilate and detoxify compounds through soil and subsoil processes.
- **Disease regulation:** Changes in ecosystems can directly change the abundance of human pathogens, such as cholera, and can alter the abundance of disease vectors, such as mosquitoes.
- **Pest regulation:** Ecosystem changes affect the prevalence of crop and livestock pests and diseases.
- **Pollination:** Ecosystem changes affect the distribution, abundance and effectiveness of pollinators.
- **Natural hazard regulation:** The presence of coastal ecosystems, such as mangroves and coral reefs, can reduce the damage caused by hurricanes or large waves.

### Cultural services

These are the intangible benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences, including:

- **Cultural diversity:** The diversity of ecosystems is one factor influencing the diversity of cultures.
- **Spiritual and religious values:** Many religions attach spiritual and religious values to ecosystems or their components.
- **Knowledge systems** (traditional and formal): Ecosystems influence the types of knowledge systems developed by different cultures.
- **Educational values:** Ecosystems and their components and processes provide the basis for both formal and informal education in many societies.
- **Inspiration:** Ecosystems provide a rich source of inspiration for art, folk art, national symbols architecture and advertising.
- **Aesthetic values:** Many people find beauty or aesthetic value in various aspects of ecosystems as reflected in the support for parks scenic drives and the selection of housing locations.
- **Social relations:** Ecosystems influence the types of social relations that are established in particular cultures. Fishing societies, for example, differ in many respects in their social relations from nomadic herding or agricultural societies.
- **Sense of place:** Many people value the “sense of place” that is associated with recognised features of their environment, including aspects of the ecosystem.
- **Cultural heritage values:** Many societies place high value on the maintenance of either historically important landscapes (“cultural landscapes”) or culturally significant species.

- **Recreation and ecotourism:** People often choose where to spend their leisure time based in part on the characteristics of the natural or cultivated landscapes in a particular area.

### Supporting services

Supporting services are those that are necessary for production of all other ES. Their impacts on people are often indirect or occur over a very long time. Some services, like erosion regulation, can be categorised as both a supporting and a regulating service, depending on the time scale and immediacy of their impact on people.

Although supporting services are not included in the audit framework, this does not mean that they are not part of the entire ecosystem or that they do not offer any benefits to the community. Their influence and impact is usually evaluated in relation to supported services (O'Gorman & Bann, 2008). These ES include:

- **Microclimatic regulation:** Forest cover buffers the daily and seasonal temperature differences compared to open ground.
- **Nutrient cycling:** Approximately 20 nutrients essential for life, including nitrogen and phosphorus, cycle through ecosystems and are maintained at different concentrations in different parts of ecosystems.
- **Photosynthesis:** Photosynthesis produces oxygen necessary for most living organisms.
- **Primary production:** The assimilation or accumulation of energy and nutrients by organisms.
- **Soil formation:** Many provisioning services depend on soil fertility.
- **Water cycling:** Water cycles through ecosystems are essential for living organisms.

Pollination is basically one of the regulating services, but is categorised as a supporting service and is therefore valued in conjunction with ES that pollination supports (production of food raw materials and recreation).

### 5.3. Overview of ecosystem services in the Regional Park and their significance

In determining the current strategic significance of ES, a range of criteria can be used. It is important that the criteria evidence be clearly stated to provide an audit trail. The following significant criteria could be used (Glaves et al., 2009):

- **Magnitude** of the ES type within the area under study and contribution of the ES type to the region (including size and spatial distribution of ES);
- **Sensitivity and vulnerability** of the ES type;
- **Replaceability** of ES with an alternative (ability to economically and technically compensate for loss of ES) and/or the ability to reverse loss of Ecosystem Service through management, etc.;
- **Cumulative impact**, including any known threshold effects or critical limits to ES, and whether such thresholds are being approached.

Ecosystem services listed in Table 3 are marked with different colours of strategic significance. It is important that the criteria evidence be clearly stated to provide an audit trail.

Dark green	Strategically very significant	or	Strategically significant ES
Light green	Moderately strategically important ES	or	Low strategic significance
Grey	Strategically insignificant	or	Not present ES
White	Significance of ES is unknown		

Table 3 contains an overview of the main ES and their significance in the RP using the classification of the Millennium Ecosystem Assessment. Data about the main ES provided by the area of the RP was obtained by the workshop “Ecosystem services in the Škocjan Caves Regional Park” (see Appendix 3). Local inhabitants and site experts participated at the workshop. Additionally, interviews with the relevant stakeholders were held and a literature study was made.

Table 3: Overview of ecosystem services in the analysed area of the Škocjan Caves Regional Park by habitat types

	MAIN HABITAT TYPES						
Ecosystem Services	Caves	Woodland (277.3 ha)	Cultivated Land (10.7 ha)	Grasslands (58.3 ha)	Inland waters (5.6 ha)	Human made habitats (13.1 ha)	Scrubs and areas in succession (12,33 ha)
<b>PROVISIONING SERVICES</b>							
Food		Game contribution of the regional value to the presence of the RP as a refuge; Honey; Mushrooms, juniper berries; Roe deer, red deer, wild boar, hare, mallard, pheasant, grey partridge;	Wheat, potatoes, oat, organic products, garden produce;	Honey; Milk, cheese, meat; Old varieties of fruit trees;			
Fibre and Fuel		Firewood timber;	Wool and hay for bedding as a potential;		Water concessions for electricity production in small hydropower plants to 10 MW and for mills and sawmills		Biomass as a potential;
Biodiversity/ Genetic resources	Conservation of local genetic resources;	Conservation of local genetic resources;	Conservation of local genetic resources; Nursery fruit tree;	Conservation of local genetic resources;			Conservation of local genetic resources;
Biochemical natural medicines pharmaceuticals							
Ornamental resources		Game trophy - contribution of the regional value to the Presence of the RP as a refuge;		Wool products;			
Fresh water					Drinking water, water for watering and irrigation;	Irrigation from communal stone well and karst ponds;	

	MAIN HABITAT TYPES						
Ecosystem Services	Caves	Woodland (277.3 ha)	Cultivated Land (10.7 ha)	Grasslands (58.3 ha)	Inland waters (5.6 ha)	Human made habitats (13.1 ha)	Scrubs and areas in succession (12,33 ha)
					water for technological purposes		
Saline water							
New environmental products/markets							
REGULATING SERVICES							
Air-quality regulation		Natural purification/ filtration;	Natural purification/ filtration;	Natural purification/ filtration;		Natural purification/ filtration;	Natural purification/ Filtration;
Climate regulation		Carbon sequestration;			Carbon sequestration;		
Water regulation and flood attenuation	Water flow fluctuation;						
Buffer – and connectivity			Depressions as buffers to agricultural land;				
Natural hazard regulation							
Pest regulation							
Disease regulation							
Erosion regulation		Soil erosion;					
Water quality regulation - purification	Natural purification/ filtration;	Natural purification/ filtration;		Natural purification/ filtration;	Natural purification/ filtration;		Natural purification/ filtration;
Pollination		Habitat for pollinating species;	Food source for pollinating species;	Habitat for pollinating species;			Habitat for pollinating species;
Fire							
CULTURAL SERVICES							
Cultural heritage						Museum collections, traditional vernacular buildings, the Školj castle,	

	MAIN HABITAT TYPES						
Ecosystem Services	Caves	Woodland (277.3 ha)	Cultivated Land (10.7 ha)	Grasslands (58.3 ha)	Inland waters (5.6 ha)	Human made habitats (13.1 ha)	Scrubs and areas in succession (12,33 ha)
						Church of St. Kancian, archaeological sites, icehouses, memorials, old train, dry stone, wells, karst ponds;	
Recreation & tourism	Caving, hiking, wildlife tourism;	Hiking, walking – footpaths, cycling – national cycling path, wildlife tourism, game shooting;		Hiking, walking – footpaths, cycling – national cycling path;	Fishing, hiking – aquatic treasure trail – annual event;	Walking – footpaths, festivals – annual events;	Wildlife tourism – birds and game;
Aesthetic value	Caves, collapse dolines;	Traditional parkland sites;	Traditional parkland sites, depressions, collapse dolines;	Traditional parkland sites, depressions, collapse dolines;	Attractive riverside sites;	Traditional vernacular buildings;	
Employment	Guides, staff to manage the park;	Small scale employment – managers of woodland;	Small scale employment in cultivated land;	Guides; staff to manage the park;		Guides; staff to manage the park; caterers, hoteliers;	Guides; staff to manage the park;
Scientific value	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;
Spiritual value	Contact with nature, tranquillity, inspiration, beauty	Contact with nature, tranquillity, inspiration, beauty;	Contact with nature, tranquillity, inspiration, beauty;	Contact with nature, tranquillity, inspiration, beauty;	Contact with nature, tranquillity, inspiration, beauty;	Contact with nature, tranquillity, inspiration, beauty;	Contact with nature, tranquillity, inspiration, beauty
Education	Educational trails, cave exploration, guided school groups;	Guided school groups;	Guided school groups;	Guided school groups;	Guided school groups;	School groups, learning programs for employees of the RP and for locals;	Guided school groups;
Social relations	Excursions, festivals;					Participation of local people;	

Table template after: Glaves et al., 2009

A detailed breakdown and explanation of highly significant ecosystem services / benefits is shown in the table below.

*Table 4: Detailed breakdown of highly significant ecosystem services / benefits*

<b>ECOSYSTEM SERVICES</b>	<b>Current significant service types</b>	<b>Details</b>
<b>Caves</b>		
Provisioning	Biodiversity/genetic resources	Conservation of local genetic resources;
Regulating	None identified	
Cultural	Recreation/tourism	Caving, hiking, wildlife tourism;
	Aesthetic value	Caves, collapse dolines;
	Employment	Guides, personnel of the PA;
	Scientific value	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;
	Spiritual value	Contact with nature, tranquillity, inspiration, beauty;
	Education/Research	Education trails, cave exploration, guided school groups;
	Social relations	Excursions, festivals;
Supporting		
<b>Woodland</b>		
Provisioning	Biodiversity/genetic resources	Conservation of local genetic resources;
Regulating	None identified	
Cultural	Recreation/tourism	Hiking, walking – footpaths, cycling – national cycling path, wildlife tourism, game shooting;
	Aesthetic value	Traditional parkland sites
	Scientific value	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;
	Spiritual value	Contact with nature, tranquillity, inspiration, beauty;
	Social relations	
Supporting		
<b>Cultivated land</b>		
Provisioning	None identified	
Regulating	None identified	
Cultural	Aesthetic value	Traditional parkland sites, depressions, collapse dolines;
	Scientific value	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;
	Spiritual value	Contact with nature, tranquillity, inspiration, beauty;
Supporting		
<b>Dry and semi-dry grassland</b>		
Provisioning	None identified	
Regulating	None identified	
Cultural	Recreation/tourism	Hiking, walking – footpaths, cycling – national cycling
	Aesthetic value	Traditional parkland sites, depressions, collapse dolines;
	Employment	Guides, personnel of the PA;
	Scientific value	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;
	Spiritual value	Contact with nature, tranquillity, inspiration, beauty;
	Education/Research	Guided school groups;
Supporting		
<b>Inland waters</b>		
Provisioning	None identified	
Regulating	None identified	
Cultural	Aesthetic value	Attractive riverside sites;
	Scientific value	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;
	Spiritual value	Contact with nature, tranquillity, inspiration, beauty;
	Education/Research	Guided school groups;

Supporting		
<b>Human made habitats</b>		
Provisioning	None identified	
Regulating	None identified	
Cultural	Cultural heritage	Museum collections, traditional vernacular buildings, the Školj castle, Church of St. Kancian, archaeological sites, icehouses, memorials, old train, communal stone, wells, karst ponds
	Recreation/tourism	Walking – footpaths, festivals;
	Aesthetic value	Traditional vernacular buildings;
	Employment	Guides, personnel of the PA; caterers, hoteliers;
	Scientific value	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;
	Spiritual value	Contact with nature, tranquillity, inspiration, beauty;
	Education/Research	Guided school groups, learning programs for employees of the RP and for locals;
Supporting		
<b>Scrubs and areas in Successions</b>		
Provisioning	Biodiversity/genetic resources	Conservation of local genetic resources;
Regulating	None identified	
Cultural	Employment	Guides, personnel of the PA;
	Scientific value	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA;
	Spiritual value	Contact with nature, tranquillity, inspiration, beauty;
Supporting		

*Table frame: Glaves et al., 2009*

#### 5.4. Ecosystem services and the current protection regime of the Regional Park

*Prepared by Jana Kus Veenvliet, Institute Symbiosis*

ES, which are under a special protection regime of a protected area, have been recognised as vulnerable (prone to e.g. overexploitation or misuse), potentially also because of purely economic interests of individuals. At the same time, including them into the protection regime indicates that there is a broader, societal interest in preserving these ES.

The Škocjan Caves Regional Park Act was adopted in 1996. The first article, stating the purpose of the establishment of the protected area, already stresses the value of:

- Outstanding geomorphological, geological, and hydrological formations;
- Rare and threatened plant and animal species;
- Paleontological and archaeological sites;
- Ethnological and architectural characteristics and the cultural landscape.

All of the above features can be categorised under cultural services. Geomorphological, geological and hydrological formations can be classified under aesthetical value. Biodiversity is usually not considered to be an ES in itself, but presence of species is needed for the supply of many ES. However, rare and endangered species are protected for their intrinsic value (life forms should be conserved simply because they exist), so we can classify them under ethical values (part of cultural services). Paleontological, archaeological sites and cultural heritage all fall under cultural heritage values. In the further analysis, we wanted to check how this overarching value of the protected area is reflected in the protection regimes. Four levels of regimes are included in the Act: regime in the buffer zone, within the whole territory of the park, within areas of natural monuments (narrow protected areas) and within the area of cultural monuments. The regime limits or prohibits the use of some ES or prohibits actions that could threaten the existence or quality of these services and activities damaging natural or cultural assets typical of Škocjan Caves. We have also attempted to conclude from the regime what (desired) effect such regime would have on particular ES. The results are shown in the table below (Table 5).

Looking at the results of this analysis, it can be concluded that the aesthetic, ethical and cultural values are well integrated into the protection regime. At the first glance, it is surprising that very few protection regimes address tourism and recreation, which has proven to be the most important ES in the park. However, examining this more closely reveals that one of the protection regimes stipulates that it is prohibited to pay unsupervised visits to the caves. This means that allowing guided visits only ensures that actions of tourists in subterranean parts can be strictly supervised by cave guides. It can be concluded that the current regime is adequate and, assuming it is being respected, can contribute to the long-term conservation of the most important ES of the protected area.

The table below presents an overview of provisions of protection regimes in the RP, according to the ES they address and the desired effects of these prohibitions.

Table 5: Overview of provisions of protection regimes in the Škocjan Caves Regional Park

Ecosystem service	Provision in the Act	Effect of the regime on ES
<b>PROVISIONING SERVICES</b>		
<b>Food</b>	[Within the territory of the park, it is prohibited] ... <i>to disturb, displace, poison, keep in confinement, hunt or kill animals contrary to the law or regulations adopted by the Government</i> <sup>1</sup> ;	preventing of disturbance and overexploitation of animals
	[Within the territory of the park, it is prohibited] ... <i>to pick wild plants or parts of plants for commercial purposes;</i>	preventing overexploitation of forests
<b>Fibre</b>	[Within the territory of the park, it is prohibited] ... <i>to make a fire or prepare embers in the open or in the vicinity of woods, except in fireplaces that are specifically designed and arranged for this purpose.</i>	securing fire safety of forests
	[Within the territory of the park, it is prohibited] ... <i>to use open fire in woods contrary to law;</i>	securing fire safety of forests
	[Within the territory of the park, it is prohibited] ... <i>to make changes in vegetation by planting non-indigenous plant species;</i>	preserving composition and function of forests
	[Within the territory of the park, it is prohibited] ... <i>to burn down sections of grassland and pastures and incinerate plant remains in the fields without the supervision of a person of full age;</i>	securing fire safety of all habitats
<b>Minerals and fuels</b>	[Within the territory of the park, it is prohibited] ... <i>to take away sand, gravel or stones from the river's bed or banks;</i>	preventing changes in rock formations/landscape, conserving riparian habitats
	[Within the territory of natural monuments, it is prohibited] ... <i>to explore or exploit mineral raw materials;</i>	preventing overexploitation of rocks
	[It is exceptionally allowed, pending approval of the Minister, when necessary for the development needs of the park and inhabitants of the park] ... <i>to exploit sandpits or quarries for the needs of the inhabitants of the park.</i>	allowing limited extraction of rocks
	[Within the territory of natural monuments, it is prohibited] ... <i>to change the form and composition of the surface by land work;</i>	preventing changes in rock formations/landscape
	[Within the territory of natural monuments, it is prohibited] ... <i>to excavate, pick or carry away petrographical, mineralogical or paleontological samples;</i>	preventing overexploitation of minerals
	[Within the territory of natural monuments, the Minister may allow, for the purpose of scientific and research studies, a research organisation to carry out procedures and activities]... <i>such as the taking of petrographical, mineralogical and paleontological samples ...</i>	allowing limited taking of minerals for research
<b>Genetic resources</b>		
<b>Biochemicals (natural</b>		

<sup>1</sup> Provisions on hunting are included in the Wild Game and Hunting Act and provisions on killing animals in the Animal Protection Act.

<b>medicines and pharmaceuticals)</b>		
<b>Ornamental resources</b>		
<b>Fresh water</b>	[Within the buffer zone of the park, it is prohibited] ... <i>to spill polluted water, oil products or other dangerous substances on the surface, into the karst underground or in watercourses;</i>	preventing pollution of water resources
	[Within the buffer zone of the park, it is prohibited] ... <i>to transport dangerous substances over the territory of the park;</i>	preventing pollution of water resources
	[Within the buffer zone of the park, it is prohibited] ... <i>to use agro-chemical substances for the control and eradication of pests and weeds outside the land that is designed for cultivation (gardens, fields);</i>	preventing pollution of water resources
<b>REGULATING SERVICES</b>		
<b>Air quality regulation</b>	[Within the territory of the park, it is prohibited] ... <i>to pollute air beyond permitted levels;</i>	preventing air pollution
<b>Climate regulation</b>		
<b>Water regulation</b>	[Within the buffer zone of the park] ... <i>all activities which are likely to alter the existing water regime of the Reka river and the quality of water, except in the cases of protection against floods are prohibited;</i>	protecting water regime
	[Within the territory of the park, it is prohibited] ... <i>to alter the water regime of the Reka river;</i>	protecting water regime
	[It is exceptionally allowed, pending approval of the Minister, when necessary for the development needs of the park and inhabitants of the park] ... <i>to reconstruct and reinforce dams and the banks of the Reka river outside the Škocjan Caves;</i>	allowing limited changes of water regime for flood prevention
<b>Erosion regulation</b>	no specific regime in the Act, but parts of forests within the park have a status of protection forests, in which the management is directed to maintaining their function in preventing erosion	preventing erosion through maintenance of forested terrain
<b>Water purification and waste treatment</b>		
<b>Disease regulation</b>		
<b>Pest regulation</b>		
<b>Pollination</b>		
<b>Natural hazard regulation</b>		
<b>CULTURAL SERVICES</b>		
<b>Cultural diversity</b>		

<b>Ethical, spiritual and religious values<sup>2</sup></b>	[Within the territory of the park, it is prohibited] ... <i>to use motor vehicles of all sorts, except emergency vehicles and agricultural and forestry machinery, outside the public roads: 1. on the road leading from the crossroads on the Kozina-Postojna trunk road via Matavun to Vremski Britof; 2. on the road that branches off from the above-mentioned road, leading to the artificial entrance to the Škocjan caves in the Globocak doline; 3. on the road from the branching off of the Matavun-Betanja road to the crossroads with the Divača-Famlje road;</i>	tranquillity
	[Within the territory of the park, it is prohibited] ... <i>to disturb, displace, poison, keep in confinement, hunt or kill animals contrary to the law or regulations adopted by the Government;</i>	protection of animals
	[Within the territory of natural monuments, the Minister may allow, for the purpose of scientific and research studies, a research organisation to carry out procedures and activities] ... <i>such as the hunting of individual animals.</i>	limited hunting of animals for research
	[Within the territory of the park, it is prohibited] ... <i>to pick wild plants or parts of plants for commercial purposes;</i>	preventing overexploitation of plants
	[Within the territory of the park, it is prohibited] ... <i>to make changes in vegetation by planting non-indigenous plant species;</i>	changes of plant-compositions/ecosystems
	[Within the territory of the park, it is prohibited] ... <i>to introduce non-indigenous animal species;</i>	changes of species-compositions/ecosystems
	[Within the territory of natural monuments, it is prohibited] ... <i>to dig out, pick or carry away individual samples of plant species, except for felling at the cave's entrance for sanitary reasons;</i>	conservation plants
<b>Knowledge systems</b>		
<b>Educational values</b>	[Within the territory of natural monuments, the Minister may allow, for the purpose of scientific and research studies, a research organisation to carry out procedures and activities] ... <i>the hunting of individual animals.</i>	allowing limited hunting of animals for research
	[Within the territory of natural monuments, the Minister may allow, for the purpose of scientific and research studies, a research organisation to carry out procedures and activities] ... <i>such as the collecting of samples of plant species for research purposes.</i>	allowing limited taking of plants for research
<b>Inspiration</b>		
<b>Aesthetic values</b>	[Within the territory of the park, it is prohibited] ... <i>to deposit, in the course of construction or renovation works, the excavated material outside the locations that are specifically designed for this purpose;</i>	conservation of cultural landscape
	[Within the territory of the park, it is prohibited] ... <i>to put up advertising billboards, except</i>	conserving aesthetic values of landscape

<sup>2</sup> This also includes the conservation of biodiversity, which cannot be considered an ecosystem service as such, but rather underpins the supply of ecosystem services. As we recognise the intrinsic value of biodiversity through the protection of species and habitats, regimes regarding plants/animals can be included under ethical values

	<i>information signs for the needs of the park;</i>	
	[Within the territory of natural monuments, it is prohibited] ... <i>to destroy, damage or remove speleothems and other cave inventory;</i>	conserving special (aesthetic) features of caves
	[Within the territory of natural monuments, it is prohibited] ... <i>to use explosives;</i>	conserving special (aesthetic) features of caves
	[Within the territory of natural monuments, it is prohibited] ... <i>to pollute in any way the walls, ceiling and floor of the cave;</i>	conserving special (aesthetic) features of caves
	[Within the territory of natural monuments, it is prohibited] ... <i>to throw stones and other objects in cave gorges, entrances and precipices;</i>	conserving special (aesthetic) features of caves
	[Within the territory of natural monuments, it is prohibited] ... <i>to carry out activities that could endanger the entrances and the vicinity of the caves;</i>	conserving special (aesthetic) features of caves
	[Within the territory of natural monuments, it is prohibited] ... <i>shoot films in the caves.</i>	controlling purposes of shooting
	[Within the territory of natural monuments, the Minister] <i>may allow shooting films in the caves subject to the conditions specified in detail in a regulation issued on the basis of this Act.</i>	allowing limited shooting
	[Within the territory of natural monuments, it is prohibited] ... <i>to set up self-standing poles or antennas;</i>	conserving aesthetic values of landscape
<b>Social relations</b>		
<b>Sense of place</b>	[Within the territory of the park, it is prohibited] ... <i>to carry out any construction or land works outside the areas of settlements, except in the cases referred to in the second paragraph of this Article;</i>	conserving cultural landscape
	[It is exceptionally allowed, pending approval of the Minister, when necessary for the development needs of the park and inhabitants of the park] ... <i>to construct infrastructural buildings or facilities for the needs of the settlements (electricity, waterworks, waste water systems);</i>	allowing limited changes in landscape
	[It is exceptionally allowed, pending approval of the Minister, when necessary for the development needs of the park and inhabitants of the park] ... <i>to reconstruct existing road sections or construction of smaller new road sections or construction of new tourist pedestrian paths;</i>	allowing limited changes in landscape
	[Within the territory of the park, it is prohibited] ... <i>to throw away or dispose of waste of all kinds outside the locations that are specifically designed and adequately equipped for this purpose;</i>	conserving cultural landscape, preventing pollution
	[Within the territory of the park, it is prohibited] ... <i>to build facilities designed for military use or to use the area for military activities;</i>	conserving cultural landscape, preserving tranquillity
	[Within the territory of the park, it is prohibited] ... <i>to camp, park or leave motor vehicles or camping trailers outside the areas that are specifically designed for this purpose;</i>	preserving tranquillity
	[Within the territory of natural monuments, it is prohibited] ... <i>to produce noise exceeding 45 Leq</i>	preserving tranquillity

	<i>(dBA), except when carrying out regular maintenance activities in the park;</i>	
<b>Cultural heritage values</b>	[Within the territory of the park, it is prohibited] ... <i>to perform activities that alter the appearance of the characteristic cultural landscape and change the purposed land use, except within the areas of settlements;</i>	conserving cultural landscape
	[It is exceptionally allowed, pending approval of the Minister, when necessary for the development needs of the park and inhabitants of the park] ... <i>to renovate or replace existing buildings</i>	allowing limited changes in the appearance of villages
	[Within the area of cultural monuments referred to in Article 6, it should be taken into account that] ... <i>within the Škocjan and Betanja areas of settlement monuments, buildings and other structures shall be renovated in the traditional style, in compliance with zoning plans and conservation guidelines;</i>	conserving cultural heritage
	[Within the area of cultural monuments referred to in Article 6 ,it should be taken into account that] ... <i>within the area of archaeological sites, only systematic archaeological research of a limited extent shall be carried out, provided that prior to any such activity the following conditions are met:</i> - <i>to carry out a preliminary protective archaeological research on the basis of which guidelines are made for further land use;</i> - <i>to ensure accompanying archaeological supervision with a possibility of carrying out protection research studies in cases of major archaeological finds;</i>	conserving archaeological cultural heritage
	[Within the area of cultural monuments referred to in Article 6, it should be taken into account that] ... <i>architectural monuments and shrines shall be preserved in their original appearance, with interventions being designed primarily for conservation and restoration of a cultural monument or alteration of inadequate construction work;</i>	conserving cultural heritage
	[Within the area of cultural monuments referred to in Article 6, it should be taken into account that] ... <i>shrines shall be preserved on existing locations with a possibility of inclusion in a museum index.</i>	
<b>Recreation and tourism</b>	[Within the territory of the park, it is prohibited] ... <i>to pay unsupervised visits to the caves.</i>	conserving special features of caves
<b>SUPPORTING SERVICES</b>		
<b>Soil formation</b>		
<b>Photosynthesis</b>		
<b>Primary production</b>		
<b>Nutrient cycling</b>		
<b>Water cycling</b>		

Where cells are blank, no provisions relating to those ES could be found in the Act

## 6. ECOSYSTEM SERVICES VALUATION IN THE REGIONAL PARK

### 6.1. Introduction to ecosystem services valuation

A valuation is the process of expressing a value for a particular ecosystem service in a certain context (e.g., of decision making), usually in terms of something that can be counted, often money, but also through methods and measures from other disciplines (sociology, ecology, and so on) (Kumar et al., 2010).

A valuation of ecosystem services has been developed in the context of environmental economics, which is the study of efficient use of limited natural resources to meet human needs. It is a valuation of the full range of ES provided by a certain area, assessing the influence of an existing policy or a planning decision on the value of those services. It enables decision-makers to look at the full impact of their decisions and not just focus on profit received by one or two individuals (adapted after Graves et al., 2009).

A valuation of ecosystem services is useful to (Managing Marine Protected Areas, 2010):

- Demonstrate and quantify the value of ES in protected areas;
- Integrate business and economic concerns into conservation planning and practice;
- Identify and develop potential financing mechanisms and economic incentives for management;
- Obtain funding from insurance companies for mitigation measures;
- Strengthen Environmental Impact Assessment (EIA);
- Develop mechanisms to ensure that costs and benefits of a protected area are more equally shared.

### 6.2. Ecosystem services valuation methods

A detailed overview of methodologies that can be used for ecosystem services valuation is shown in the table below.

*Table 6: Summary of methods for ecosystem services valuation*

Ecosystem services	Method of Valuation
<b>Provisioning services valuation methods: market prices, replacement costs, gross value added and market related estimates of opportunity</b>	
<b>Food</b>	Market prices, transaction costs and replacement costs can be used. Often data is available at national or regional level and needs to convert to price per hectare based on stocking densities or yields.
<b>Fibre</b>	Use market prices, replacement costs (opportunity costs) for alternatives to timber, etc.
<b>Fuel / energy</b>	Replacement costs with other fuel sources and market costs can be used.
<b>Genetic resources</b>	Current market prices are available, but need to be disaggregated so that new market opportunity can be estimated. Genetic resources may also have non-consumptive values under scientific services or biodiversity.

<b>Biochemicals, natural medicines and pharmaceuticals</b>	Current and future market prices, e.g. for crops grown, for pharmaceuticals, replacement costs, i.e. drug production from alternative sources. Can also look at losses forgone, i.e. avoidance of costs from death and illness due to drugs derived from plants, and their prices of derived drugs (unit costs) multiplied by the amounts sold can both potentially be used to estimate gross value of the originating species, net benefits would be harder to calculate. Potential value of a site for future biochemicals and pharmaceuticals is more difficult to estimate. Some have linked an increased likelihood of such benefits to increased biodiversity (based on simple probability).
<b>Ornamental resources</b>	Current and future market prices or replacement costs.
<b>Fresh water</b>	Market prices can be used; these are linked to water supply (see water regulation service below) and demand – number and type of beneficiaries. Estimates will vary depending on water uses, but could include: price per cubic metre for water supply value in terms of increased crop yields derived from irrigation and hydroelectric prices. There may be additional benefits derived from not having to construct water supplies (losses forgone). Often government subsidies and price fixing can modify these prices. EU funding for drought prone areas also provides an indication of monetary value in these areas.
<b>Saline water</b>	Values may include market charges for cooling waters for example.
<b>New environmental products</b>	Estimates of opportunity/potential markets.
<b>Regulating Services valuation methods: Losses avoided, welfare values, willingness to pay and hedonic pricing and values derived from meta-analyses</b>	
<b>Air quality regulation</b>	Losses forgone and damages avoided (i.e. reduction in illness / death due to poor air quality and respiratory diseases – using transfer medical cost values, other values may include reduction in crop damage and are measured in yield per ha.).
<b>Climate regulation Including carbon sequestration</b>	Climate regulation can be linked to issues similar to air quality regulation. Carbon sequestration – use of standard costs based on carbon equivalent or alternatively being willing to pay. Losses forgone have been estimated based on modelling. There are issues relating to timescale and discounting.
<b>Water regulation Including flood regulation</b>	Can be estimated locally via losses forgone due to preventing flooding, ensuring water supply to farming, industry etc. during dry periods, etc. Market values can also be calculated using replacement costs with hard engineering. Such values cannot currently be done at national and sub-national scales.
<b>Buffer, Including connectivity</b>	A range of methods can be used, including replacement and reintroduction costs, if natural corridors are lost and human intervention is needed to reintroduce lost species. Losses forgone can be used with buffers, e.g. benefit of buffer zone in preventing agricultural spray from harming sensitive sites. Buffers may also be linked to pest control and pollination as sources (refugia) for beneficial species. Please note that there are also potential costs linked to buffer areas harbouring pest species.
<b>Erosion control</b>	Replacement costs – e.g. replacing coastal marsh with engineering solutions to erosion.
<b>Water quality regulation Including purification / waste treatment</b>	Can be done locally via replacement costs, e.g. cost of primary secondary and possibly tertiary treatment of sewage treatment of diffuse agricultural runoff, etc. Losses forgone can also be estimated. Cannot currently be measured at national and sub-national scales.
<b>Disease control</b>	Losses forgone – using health costs and relevant predictions in death and disease rate. May be double counting, linked to air quality, water quality, etc. Transfer costs can be used from medical and health sectors. See also the air quality regulation.
<b>Pest control</b>	Replacement costs with chemical control measures and losses forgone. Note that habitats may also be sources of pest species and there therefore may also be economic costs as well as benefits.
<b>Pollination</b>	Impacts of the benefit of pollinating species on some crop and ornamental species are available – note that these are not measures of gross value added and may therefore be estimated.

<b>Natural hazard regulation</b>	Losses forgone – based on estimates in decreased infrequency and extent of hazard / harm – will be linked to the number and type of properties that are protected from hazards – property and land values will need to be considered in calculations. Please note that with losses forgone, it is generally only possible to measure possible benefit and not actual benefit, as valuations are being made of something that did not happen. Estimates have been made for various hazards, including: storms, avalanches.
<b>Fire</b>	See natural hazards above – note that some habitats, e.g. heathlands, may be at a greater risk of natural and human created fires and may therefore be a potential cost.
<b>Cultural Services valuation methods: stated preferences, willingness to pay. There is some debate as to whether economic values should be applied to some cultural services.</b>	
<b>Cultural heritage</b>	Stated preference can be used, e.g. willingness to pay. It may be better to consider this on the community level rather than on an individual level. Market values can be used in some cases, e.g. entry fees to protected sites. Designation of an area of nationally or internationally important cultural heritage sites implies a high ‘normative’ societal value on such sites. A descriptive valuation of significance may be more successful in capturing a wider extent and type of cultural service values.
<b>Recreation and tourism</b>	There is a well-established body of literature and methodologies for estimating monetary benefits of recreation tourism with some values linked to specific habitat types, e.g. woodland. Valuation can include: market data, stated preferences, visitor numbers, stated preferences, contingency values, willingness to pay and travel cost methods.
<b>Aesthetic value</b>	Landscape professions have developed a range of methods for characterising and identifying aesthetic values of land: however, these are not based on monetary values and there is resistance to using such valuations. Stated preferences (willingness to pay) have been used. Hedonic pricing – considering impacts of aesthetic and other values on house prices – has been used, but may be difficult to disaggregate from other influences on property prices. A descriptive valuation of significance may be more successful in capturing the extent and type of service value.
<b>Employment</b>	Employment figures and rates of pay can be used to determine service value. Direct employment figures for sites are easily available, secondary employment generated by land, e.g. additional jobs in tourism, can be more difficult to assess, but such secondary benefits can be high (i.e. multiplier effects).
<b>Scientific value</b>	Some estimates have been made for the value of some protected species and habitats. Stated preferences can be used to generate values, but the worth of monetary values on science has been questioned. Professional opinion has been used to generate market values for species and habitats. Alternatively, it should be noted that species given national or international protection have been allocated such value by society and this value should be noted in valuations.
<b>Spiritual value Including inspiration through contact with nature</b>	The monetary valuation of spiritual value raises a number of issues/concerns. Stated preferences have been used to value the inspiration gained from a site. It should be noted that such values are likely to vary enormously between individuals; a wilderness which some find highly valuable for its wildness may be regarded by others as being of negative value, as being seen to be scary, chaotic, dangerous.
<b>Educational value Including knowledge – traditional and informal</b>	Education value has been measured in terms of the number of formal educational visits and the distance travelled by these. Such measures do not cover informal education or added benefit via increased awareness on future action of individuals. Ethnographic and anthropological approaches have been used to value traditional knowledge; such valuation has tended to relate to goods / provisions. Transfer values can be used. It is argued by some that it is not possible conceptually to value educational services.

<b>Mental and physical health</b>	Some ES frameworks do not refer to health as a benefit. Such benefits are also linked to disease, water and air quality regulation and thus there is a risk of double counting. However, some mental and physical health benefits are not directly covered by these other services types. These can include the benefits of looking at trees / green spaces on the heart rate, mental benefits derived from contact with some animals (e.g. petting farm animals, feeding, ducks, watching wild birds). Health related costs and benefits can potentially be large and there is a well-established body of methods of analysis and data on these. Please note that health is not included in the Millennium Framework as a service, but instead as a cross cultural theme. However, health benefits can be substantial in some areas and may be very important on some sites. It can thus be useful to identify such values / benefits.
<b>Social relations</b>	Social benefits of communal green spaces that allow people to meet are clearly known. Stated preferences have been used to measure social relations and there is a body of research into this; some argue that it is not possible to value such benefits. Losses forgone can be used to measure the benefits of environments in averting negative social behaviour. A descriptive valuation of significance may be more successful in capturing the extent and type of service value.
<b>Sense of place Including sense of community</b>	This service has not been included in many ES lists, but is recognised by landscape professionals and the landscape regulation. The importance of local environments in developing individual and community sense of place, e.g. village commons, parks, woodlands, rivers, lakes, etc., is recognised. Stated preference methods can be used to estimate a relative value of such services. Such an approach is best done at a community level. Such service values are easily ignored by biodiversity specialists, but are often very valuable to locals. Once again, a descriptive valuation of significance may be more successful in capturing the extent and type of service value.
<b>Supporting Services valuation methods: there is debate regarding valuing supporting services; such services support other service types and thus there is a risk of double counting.</b>	
<b>Soil formation</b>	Supporting services support the flow of other service types and as such, monetary valuations are likely to lead to double counting. The important role of supporting services lies in maintain the flow of other services, e.g. the link between supporting services and food production or the link between water cycling and water regulation and natural hazards (flooding) needs to be recognised in any ES audit. Stated professional opinion and modelling using the flow of benefit / services and willingness to pay have been used to generate estimates of benefit. Replacement costs can be used, e.g. costs of replacing natural soil formation with imported soils, fertilisers, etc., or natural primary production with artificial fertilisers, irrigation, etc., or natural cycling of nutrients with engineering solutions. Note that the loss of soil in some habitats, e.g. soil loss in peat-based agricultural landscapes is an important cost which needs to be noted and can be monetised by assessing impacts on primary productions / crop yields, etc.
<b>Primary production</b>	
<b>Nutrient cycling</b>	
<b>Water cycling</b>	
<b>Biodiversity</b>	Biodiversity is not included in the Millennium Assessment Framework, but instead as an overarching theme. Many environmentalists consider biodiversity as a benefit in itself and desire it to be listed as such. Economic valuation of biodiversity can be difficult and controversial – as with scientific value, society has placed a ‘normative’ value on biodiversity at national and international levels by protecting designated species, habitat types and sites.

*Source: Glaves, 2011*

### 6.3. Conducting an ecosystem service evaluation study

The ecosystem service evaluation process can be broken down into nine practical steps (adapted after Barbier, E. B. et al., 1997: 81–93 and De Groot et al., 2006: 8):

#### 6.3.1. **Choosing the appropriate ecosystem services valuation approach**

There are three approaches that can be used, depending on the purpose of the ecosystem service valuation study:

- Impact valuation approach – when examining a specific external impact;
- Partial valuation approach – when examining the need to select a single use option among all the protected areas use options; and
- Total valuation approach – when the problem is more general

#### 6.3.2. **Identifying key stakeholders and their involvement**

Early in the process, the main stakeholders should be identified, since the involvement of stakeholders is essential in almost all steps of the valuation procedure.

#### 6.3.3. **Defining protected areas**

Define the analysed protected area and specify the system boundaries between this area and the surrounding region.

#### 6.3.4. **Identifying and prioritising ecosystem services**

This step involves using various data sources, including scientific studies, consultancy reports and national resource inventories, to produce a more definitive list of ES present in the analysed protected area and then place them in order of importance.

#### 6.3.5. **Quantification of the capacity of protected area to provide ecosystem services on a sustainable basis**

At this step, the magnitude of the actual and potential availability of main ES should be determined based on sustainable use levels.

#### 6.3.6. **Identifying and obtaining information required for the ecosystem services valuation**

Various data are required, depending on the values that are to be assessed and the methodology for collecting and analysing the data must be specified. The range of data to be collected can be extremely diverse.

Information on the extent and rate of various human uses of the protected area must also be collected.

Data collection should begin with:

- Literature survey – available statistics, existing studies and their analysis for the region;
- Site survey of specific economic activities should be undertaken;
- Rapid rural appraisal based on brief farmer or producer interviews and group participation for collecting basic information on human uses and economic data;
- More detailed baseline surveys for in-depth data collection for actual valuation purposes.

### 6.3.7. Ecosystem services quantification

At this step, the appropriate ES valuation techniques should be selected and implemented (see Chapter 6.2.: “Ecosystem service valuation methods”).

Economists typically value ES according to how they are used (Pagiola et al., 2004: 9).

#### Use value

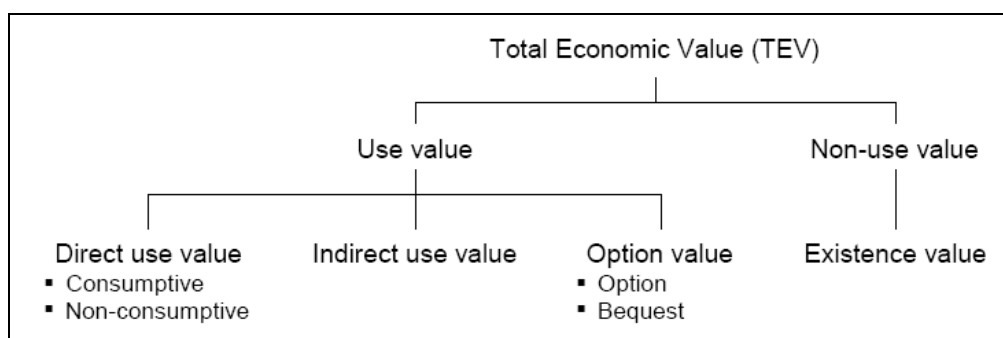
Benefits of consuming ES:

- **Direct use value** – direct consumption of ES:
  - Provisioning services (food, fibre and fuel, ornamental resources, fresh water and genetic resources);
  - Cultural services (cultural heritage, recreation and tourism, aesthetic value, employment, scientific, spiritual, education, mental and physical health, social relation and sense of place);
- **Indirect use value** – indirect consumption of ES:
  - Regulating services (air quality regulation, climate regulation, water regulation, buffer, erosion control and water quality regulation);
- **Option value** – our future possible use (option value) and future generation possible use (bequest value):
  - All services, including supporting services.

#### Non-Use value

Non-use value represents the existential value or satisfaction of individuals due to the mere existence of ES, even though they might never use it, like for instance existence of the Proteus anguinus.

Figure 1: Typologies of ecosystem services: Total Economic Value



Source: Pagiola et al, 2004: 9

Following various perceptions, three main values of ES can be defined: ecological, socio-cultural and economic values, which together determine the total value or significance of a certain ecosystem. Each value has its own set of criteria that determine current strategic significance of ES (adapted after De Groot et al., 2006).

### 1. Ecological value

Different ecosystems and species play their own roles in conserving the vital essential processes, such as energy conversion, biogeochemical cycles and evolution. The indicators for measuring the ecological value are listed in the following table.

*Table 7: Ecological valuation criteria and measurement indicators*

Criteria	Short description	Measurement units / indicators
Naturalness / Integrity (Representativeness)	The level of human presence in terms of physical, chemical and biological interference	- Quality of air, water and soil
		-% key species present
		-% of min. critical ecosystem size
Diversity	Variety of life in all its forms, including ecosystems, species and genetic diversity	- Number of ecosystems / geographical units - Number of species / surface areas
Uniqueness / Rarity	Local, national or global rarity of ecosystems and species	- Number of endemic species and subspecies
Fragility / vulnerability (resilience/resistance)	Sensitivity of ecosystems to human disturbance	- Energy budget (GPP / NPP) - Carrying capacity
Renewability / recreatability	The possibility for spontaneous renewability of human-aided restoration of ecosystems	- Complexity and diversity - Succession stage /-time / NPP - (Restoration costs)

*Source: Adapted after De Groot et al., 2006: 21*

### 2. Socio-cultural value

For many people ecosystems are crucial sources of non-material wellbeing due to their influence on physical and mental health as well as on historical, national, ethical, religious and spiritual values. The main types of values are listed in Table 8. The last column lists indicators expressing the significance of ES. To some extent, these values can be captured by economic valuation methods. However, although some ES are essential to people's very identity and existence, they are not fully captured by such techniques. To obtain a certain measure of significance, it may be approximated by using participatory assessment techniques like questionnaires, judgments, interviews with important stakeholders etc. (Campbell & Luckert, 2002) or group valuation which qualifies the importance that is attributed to ecosystems by individuals (Jacobs, 1997; Wilson & Howarth, 2002).

Table 8: Socio-cultural valuation criteria and measurement indicators

Criteria	Short description	Measure unit / indicator
Therapeutic value	The provision of medicines, clean air, water and soil, space for recreation space and outdoor sports, and general therapeutic effects of nature on peoples mental and psychic and physical well-being	- Suitability and capacity of natural systems to provide "health services" - Restorative and regenerative effects on Peoples performance - Socio-economic benefits from reduced health costs and conditions
Amenity value	Importance of nature for cognitive development, mental relaxation, artistic inspiration, aesthetic enjoyment and recreational benefits	- Aesthetic quality of landscape - Recreational features and use - Artistic features and use - Preference studies
Heritage value	Importance of nature as reference to personal or collective history and cultural identity	- Historic sites, features and artefacts - Designated cultural landscapes - Cultural traditions and knowledge
Spiritual value	Importance of nature in symbols and elements with sacred, religious and spiritual significance	- Presence of sacred sites or features - Role of ecosystems and / or species in religious ceremonies and sacred texts
Existence value	The importance people ascribe to nature for ethical reasons (intrinsic value) and inter-generational equity (bequest value)	-Expressed (through e.g. donations and voluntary work) or stated preference for nature protection for ethical reasons

Source: Adapted after De Groot et al., 2006: 21

### 3. Economic value

In practice, the economic value is limited to the analysis of efficacy and cost-effectiveness analysis and is usually measured in monetary units, but not considering the importance of the other two groups of values.

The Total System Value (hereinafter referred to as TSV) is the total value in wellbeing that the society receives from different types of ES within a year. Unfortunately, TSV is often not possible to estimate, so we have to make some compromises. The inability to calculate TSV could be due to insufficient data on benefits arising from some ES, lack of data on quantity or scale of these benefits, incomplete data sets or absence of a market, which makes it impossible to ascribe monetary value to ES. Furthermore, some compromises often have to be made because of financial constraints and time available for performing such studies.

In particular, for those ES, the value of which is highly dependent on personal or societal perceptions, it may be difficult to ascribe monetary value. In these cases, we can use various qualitative descriptions, which can show the importance of these ES for humans. This is also the case for the Škocjan Caves – by having received several designations of international and national importance (UNESCO's World Heritage Site, Ramsar Site, Natura 2000 Site, Regional Park).

Since services like aesthetic, scientific, spiritual and mental, physical health services, which have major strategic importance and are not economically valued, contribute to the TSV to a large extent, the TSV is higher than Total Economic Value (hereinafter referred to as TEV) (O’Gorman et al., 2008).

### **6.3.8. Implementing the appropriate appraisal method**

At this step, the economic analysis of the protected area should be placed into an appropriate framework as selected during the planning of the study. An example is a Cost-benefit analysis (CBA), which usually involves calculating on an annual basis the benefit and costs of conserving the natural ES over a selected period. The three most common methods for comparing costs and benefits are:

- Net present value;
- Internal rate of return; and
- Benefit-cost ratio.

Any valuation should be subject to a sensitivity analysis, which defines the variation in results arising from different assumptions or benchmark values used in the study, such as discounted rates.

There are also other frameworks that can be used: Environmental impact assessment, Multi-criteria analysis and Risk assessment.

### **6.3.9. Communicating protected area values**

The final step is to make the results of the valuation fully accessible to all stakeholders and relevant decision-makers; communication and dissemination activities are essential.

## 6.4. Ecosystem service evaluation process and methods used in this study

### 6.4.1. Ecosystem services valuation approach

This study adopted an ecosystem service based approach, which makes it feasible to attempt to estimate the TEV of the Škocjan Caves Regional Park.

The valuation is based on the TEV framework, closely relating the list of services and benefits to the Millennium Ecosystem Assessment (MA). TEV is equal to market value (hereinafter referred to as MV) plus consumer surplus. Consumer surplus is the difference between what an individual is willing to pay for an ES and what he or she actually pays. The concept of consumer surplus is particularly important when estimating the benefits of ES with a low, or no market price; these are referred to as non-market benefits. Where an ES has no market price, the consumer surplus effectively represents the TEV of the good. An estimate of TEV is often built up by considering the direct benefits, the indirect benefits, and the non-use benefits provided by an ES (O'Gorman & Bann, 2008).

While the focus of this study is to provide estimates of the TEV, information on the economic impact of ES is also presented where possible, to provide important contextual data on the contribution of ES to the economy. Indicators of net economic contribution to society presented within this study are the gross value added (hereinafter referred to as GVA) figures, which net out producer costs from MV.

As some estimates in this study could only be made descriptively, while some could not be calculated for various reasons, the figures presented here are most likely to be lower bound estimates of the benefits received by society.

### 6.4.2. Stakeholders analysis and involvement

Identification of those who could and should have a stake in a planning and management process in the RP was conducted in January 2011 (see Appendix 1, List of stakeholders).

### 6.4.3. Areas considered in this study

Appendix 2 includes a map of the protected areas, habitat types, Natura 2000 Sites, EIA, protected forests and special purpose forests, hunting areas and other basic site specific information on the analysed area obtained through various sources.

#### Site specific data was obtained through:

##### Literature survey:

- Promotional material of the RP obtained by the Public Agency;
- Other documents of the RP obtained by the Public Agency "Park Škocjanske jame, Slovenija", 2011 (a list of all properties owned by the park, register of fixed assets, product

prices of the RP, balance sheet of the RP, income statement of the RP for the 2005 – 2009 period, a list of natural heritage sites, a list of rare and endangered endemic species, other promotional material);

- Maps of the RP (protected area and buffer zone of the RP, habitat types in the RP, protection forests and forests reserves in the RP, average rainfall in the RP, protected areas in the RP, hunting and non-hunting areas in the RP) obtained by the Public Agency, by hunting association, by the Institute of the Republic of Slovenia for Nature Conservation – Nova Gorica Regional Unit and by Institute Symbiosis);
- Pictures of the RP obtained by the Public Agency and by <http://kraji.eu/>;
- Various internet sources: (<http://www.park-skocjanske-jame.si/eng/caves.shtml>, <http://www.razvojkrasa.si/si/relief/145/article.html>; [http://sl.wikipedia.org/wiki/Habitat\\_\(ekologija\)](http://sl.wikipedia.org/wiki/Habitat_(ekologija)));
- Various literature: Jakopič et al., 2005; Public Agency "Park Škocjanske jame, Slovenija", 2011; Pipan, 2005; Zagmajster, 2007; Culiberg, 2011; Perko et al., 1998 – 1999;
- Data on agro-environmental measures was obtained by the Ministry of Agriculture, Forestry and Food – Agency for Agricultural Markets and Rural Development, delivered by the Institute of the Republic of Slovenia for Nature Conservation.

#### Interviews with:

Andrej Mihevc from the Karst Research Institute, personnel of the Škocjan Caves Regional Park (Rosana Cerkvenik, Jana Martinčič, Gordana Beltram, Borut Peric, Vanja Debevec, Borut Lozej and Edi Polh), Andrej Sila, huntsman, a paid employer of the Slovenia Forest Service in Sežana, Branka Gasparič of the Slovenia Forest Service, Franetič Jože, Director of the Anglers Association Ilirska Bistrica, Alenka Petrinjak at the Slovenian Association for Bat Research and Conservation, Katja Fedrigo at the Škocjan Tourist Society, Špela Petelin and Elizabeta Gabrijelčič at the Institute for Water of the Republic of Slovenia, Mateja Žvikart at the Institute for Nature Conservation of the Republic of Slovenia.

#### 6.4.4. Ecosystem services in the Škocjan Caves Regional Park

The data about main ES in the RP was obtained by implementing the workshop "Ecosystem Services of the Škocjan Caves Regional Park" (see Appendix 3) held in May 2011, which was attended by local inhabitants and site experts. Specific data on ES was obtained by conducting interviews with the relevant stakeholders and through literature study.

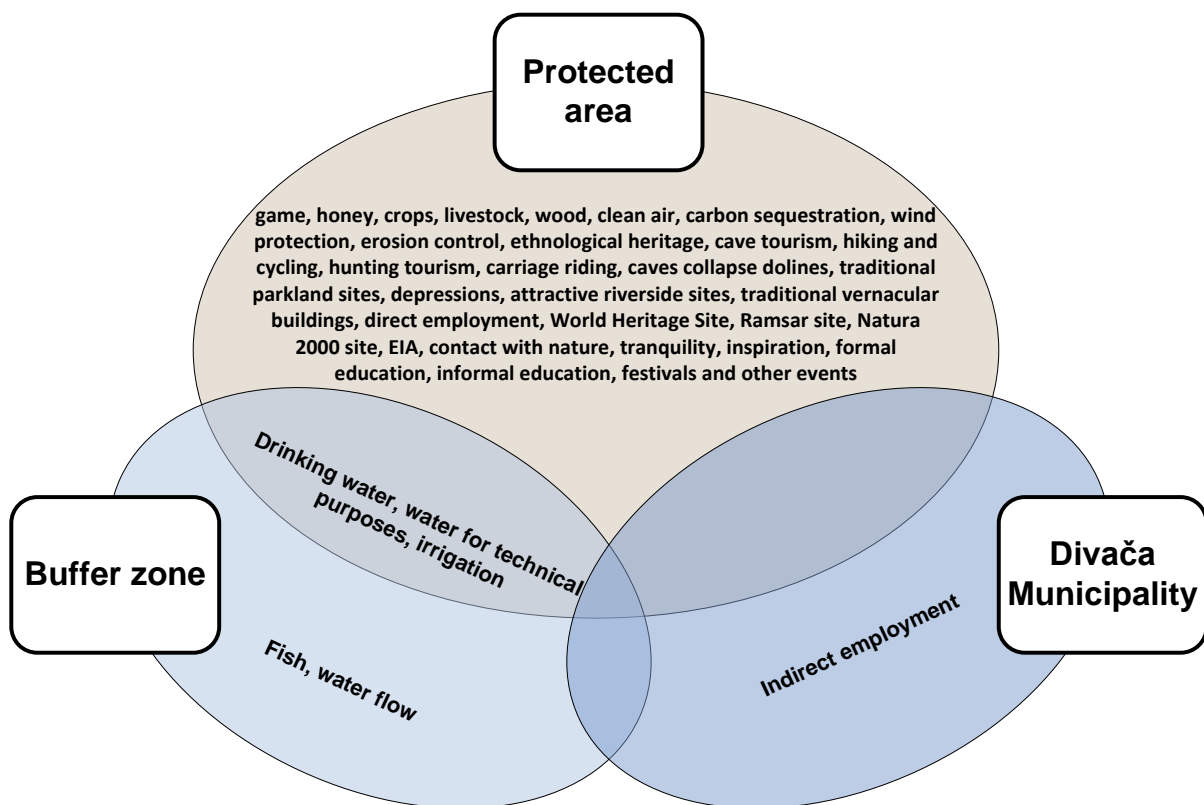
On the basis of the MAE / TEEB classification, all strategically most important ES were identified. A set of all identified ES is shown in Chapter 5.3. ("Overview of ecosystem services in the Regional Park and their significance") and in Table 3 ("Overview of ecosystem services in the analysed area of the Škocjan Caves Regional Park by the habitat types").

As can also be seen in Table 9 and in Figure 2, the ES valuation was carried out with regard to several different areas, depending on the type of services offered in each area (see Appendix 2, Table 6: Protected area, buffer zone and transitional area of the RP for boundaries of protected areas):

- In the protected area, we valued the provisioning services (except for fresh water and fisheries), cultural services (except for indirect employment), and the possibility of an additional offer like renting bikes, carriage rides and tasting of traditional karst dishes;
- Water-related regulating and provisioning services like fisheries, water quality regulation and fresh water were valued in the protected area and in the Buffer zone;
- Services related to indirect employment were valued in the Divača Municipality;
- Caves in the vicinity of the RP were examined for their potential regarding the surrounding caves

The picture below is just a support to further understanding of the ES distribution in particular areas<sup>3</sup>.

Figure 2: Areas considered in the study



T

he reason for integrating different areas with different ES is the RP impact:

- The Buffer zone of the RP was determined by law in order to prevent all the activities that could alter the existing water regime of the Reka river and the quality of water, thus endangering the protected area of the RP. Therefore, if the park would not exist, the

<sup>3</sup> Note that the entire protected area of the RP is in the Divača Municipality.

activities would not be controlled, which would result in a dirty river that would not provide all the above-mentioned ES;

- The existence of the RP enables different employment opportunities by providing various tourism services, not only in the RP, but also in a wider area. The study focuses on the Divača Municipality only;
- Since the area of the RP is rather small, it cannot afford to limit itself to only selling products stemming from the protected area. Therefore, in evaluating the potential of the park, also related to the trademark of the RP, we considered products that are made either in the park or somewhere in the buffer zone and are sold in the RP;
- In the case of considering the possibility of broadening tourism offer and including the caves in the vicinity of the RP, data about the additional income that would potentially be provided by those caves was considered.

*Table 9: Protected areas considered in the study*

ECOSYSTEM SERVICES		Analysed area with current use of ES of the RP	Analysed area with potential use of ES of the RP	Habitat type
<b>PROVISIONING SERVICES</b>				
<b>Food</b>	Game	PA of the RP	PA of the RP	Woodland
	Fish	Buffer zone	PA and Buffer zone	Inland waters
	Non-timber forest products	PA of the RP	PA of the RP	Cultivated land
	Honey	PA of the RP	PA of the RP <sup>4</sup>	Grassland
	Crops	PA of the RP	PA of the RP	Cultivated land
	Livestock production	PA of the RP	PA of the RP	Grassland
<b>Fibre and fuel</b>	Wood	PA of the RP	PA of the RP	Woodland
	Unwashed sheep wool	PA of the RP	PA of the RP	Cultivated land
	Water flow	Buffer zone	Buffer zone	Inland waters
<b>Ornamental resources</b>	Game trophy	PA of the RP	PA of the RP	Woodland
	Wool products	PA of the RP <sup>3</sup>	PA of the RP <sup>3</sup>	Human made habitats
<b>Fresh water</b>	Drinking water	PA of the RP and Buffer zone	PA of the RP and Buffer zone	Inland waters
	Bathing waters	PA of the RP and Buffer zone	PA of the RP and Buffer zone	Inland waters
	Irrigation	PA of the RP and Buffer zone	PA of the RP and Buffer zone	Inland waters
	Water for technological purposes	Buffer zone	Buffer zone	Inland waters
<b>Genetic resources</b>	Nursery fruit trees	PA of the RP <sup>3</sup>	PA of the RP <sup>3</sup>	Cultivated land
<b>REGULATING SERVICES</b>				
<b>Air-quality</b>	Clean air	PA of the RP	PA of the RP	All habitats
<b>Climate regulation</b>	Carbon sequestration	PA of the RP	PA of the RP	Woodland
<b>Buffer</b>	Wind protection	PA of the RP	PA of the RP	Cultivated land, Woodland
<b>Erosion regulation</b>	Erosion control	PA of the RP	PA of the RP	Woodland
<b>Water quality regulation</b>	Clean water	PA of the RP and Buffer zone	PA of the RP and Buffer zone	Inland waters
<b>Pollination</b>	Pollination	PA of the RP	PA of the RP	

<sup>4</sup> Provisioning services produced in the RP or in the buffer zone and sold under the trademark of the RP in the RP.

CULTURAL SERVICES				
<b>Cultural heritage</b>	Ethnological heritage	PA of the RP	PA of the RP	Human made habitats
<b>Recreation &amp; tourism</b>	Cave tourism	PA of the RP	PA of the RP and Caves in the vicinity of the RP	Caves
	Hiking and cycling	PA of the RP	PA and Buffer zone	Grassland
	Hunting tourism	PA of the RP	PA of the RP	Woodland
	Carriage riding	PA of the RP	PA and Buffer zone	Human made habitats
<b>Aesthetic value</b>	Caves, collapse dolines, traditional parkland sites, depressions, attractive riverside sites, traditional vernacular buildings	PA of the RP	PA of the RP	All habitats
<b>Employment</b>	Direct employment	PA of the RP	PA of the RP	Caves
	Indirect employment	Divača Municipality	Divača Municipality	Human made habitats
<b>Scientific value</b>	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA	PA of the RP	PA of the RP	All habitats
<b>Spiritual value</b>	Contact with nature, tranquillity, Inspiration	PA of the RP	PA of the RP	All habitats
<b>Education</b>	Formal education	PA of the RP	PA of the RP	All habitats
	Informal education	PA of the RP	PA of the RP	Human made habitats
<b>Social relations</b>	Festivals and other events	PA of the RP	PA of the RP	Human made habitats

#### 6.4.5. The capacity of the Škocjan Caves Regional Park to provide ecosystem services on a sustainable basis

As a potential the following services were considered:

- Possibility of extending the park's offer to the caves in the vicinity of the RP, where caves with controlled access are located (the Divača Cave, Cave in Sokolak, the Kačna Cave and Mejame);
- Possibility of visiting Hanke's Channel, part of the Škocjan Caves' underground canyon;
- Sale of honey, products from spun sheep fibres, indigenous nursery species of apple and plums as well as unwashed sheep wool under the trademark of the RP; and
- Cycling, carriage riding and tasting traditional karst food.

#### 6.4.6. Information on economic activities

##### Visitor data was gathered through:

###### Literature survey:

- Visitor statistics from previous years obtained by the RP (data on the total number of visitors in the period between 1999 and 2010, statistics about the number of foreign visitors, the number of visitors of museum collections and trails, prices of various programs conducted by the park, the number of visitors in the survey period, the number of respondents in the survey period);
- Statistical Office of the Republic of Slovenia (data on arrivals and overnight stays in the Divača Municipality annually by countries, the average daily expenditure of foreign tourists in the hotel by resorts, the average expenditure for transport of foreign tourists, who travel from the country of residence to Slovenia and back, examined by countries);
- Karlton, 1983.

###### Visitor survey designed specifically for this study:

A sample of 512 questionnaires was distributed to visitors in the mid-May to mid-August 2011 period, thus obtaining the current data on the number of visitors, their travelling costs, their characteristics and their preferences (see Appendix 4). The next step in assessing the total cost per visitor was the desk study (see Chapter 6.5.3.: "Cultural service")

##### Data on economic activities was gathered through

###### Interviews with:

Personnel of the Škocjan Caves Regional Park (Rosana Cerkvnik, Jana Martinčič, Gordana Beltram, Borut Peric, Vanja Debevec, Borut Lozej and Edi Polh), Andrej Sila, *hunter, a paid employer of the Slovenia Forest Service in Sežana*, Branka Gasparič at the Slovenia Forest Service, Jože Smrdelj, Head of Sales for the forestry sector, a paid employer of Gozdno gospodarstvo Postojna, Franetič Jože, Director of the Anglers Association Ilirska Bistrica, Slava Sosič, Marketing Director at the company Kraške poti Ltd., Ivan Ateljšek, President of the Beekeepers Association of Sežana, Primož Presetnik, President of the Cave Exploration Society of Ljubljana, Matjaž Pogačnik, former president of the Cave Exploration Society of Ljubljana, Davorin Preisinger at the Cave Exploration Society of Ljubljana, Borut Lozej at the Caving Club Gregor Žiberna Divača, Bogdan Gerzej at the Climbing Club Divača, Alenka Petrinjak of the Slovenian Association for Bat Research and Conservation, Nevenka Pfajfar of the Bird Watching and Bird Study Association of Slovenia, Tjaša Pogačnik at the Biological Society of Slovenia, Sandi Fedrigo, livestock owner, owners of restaurants in the Škocjan Caves Regional Park and in the Divača Municipality, Alojzij Dremelj, Coordinator of Transportation at Slovenian Railways, Ltd., Katja Fedrigo at the Škocjan Tourist Society, Iztok Osojnik, President of the Literary Association IA, Joško Valečič at the Tourist, Cultural and Sports Association Dane and Kačič-Pared, Mirjam Frankovič Franetič at the Tourist, Cultural and Sports Association Urbanščica, Damjana Gustinčič, Headmaster of Dr. Bogomir Magajna Primary School in Divača, Špela Petelin and Elizabeta Gabrijelčič at the Institute for Water of the Republic of Slovenia;

### **Data on salaries:**

#### **Literature survey:**

- AJPES Agency of the Republic of Slovenia for Public Legal Records and Related Services – an indispensable primary source of business information;
- International Labour Organisation (average monthly gross salary rate per country).

#### **6.4.7. Ecosystem services quantification**

The Škocjan Caves Regional Park provides important ES that, through their use, either directly or indirectly satisfy some prominent human needs. The value of an ES in the eyes of visitors can for example be seen from the amount of money that people are willing to pay for the satisfaction of their needs. And it is usually the case that the rarer, the more unique, the more fragile, etc., the ES, the higher its value is going to be.

In order to establish the economic value of all of the ES provided by the RP, the following economic techniques were used (see Chapter 6.5.: “Ecosystem services valuation of the Škocjan Caves Regional Park”):

- Market prices approaches;
- Avoid damage cost approach;
- Zonal travel costs method; and
- Descriptive approach.

Since one of the important objectives of the study was to identify the number of currently used ES provided by the Škocjan Caves Regional Park and the number of ES that could be used in a sustainable manner, we decided to value both of the two scenarios.

Thus, the value with the current use of ES and the value of the potential use of ES provided by the RP is presented in Chapter 6.5. entitled “Ecosystem service valuation”.

#### **6.4.8. Appraisal method**

The result of economic evaluation is the net present value (hereinafter referred to as NPV) of ecosystem, which is the sum of time series of the present or discounted Gross economic values of ES. It is recommended that the ES valuation be made for a longer period of time e.g. 30 years or more.

#### **6.4.9. Dissemination of results**

On 21 of October 2011, the results of our study were already presented in Albania.

There are two more presentation planned in Slovenia, one for the workshop participants, which will be held in the RP, and the second one for the managers of protected areas, which

will be held in Ljubljana.

## 6.5. Ecosystem services valuation

### 6.5.1. Provisioning services

#### 6.5.1.1. Food

##### *Game*

There are two hunting districts (hereinafter referred to as the HD) within the area of the RP, i.e. the Gaberk Divača and the Timav Vreme HDs; they extend beyond the area of the RP and cover 10,461 ha. Allowed annual game culling in each HD is regulated through the Annual Game Management Plan.

Since hunting in the park is not prohibited, we assessed both the value of game and the revenue from hunting membership fees, according to the proportion of the park in both HDs. It should, however, be pointed out that the park also contributes significantly to the regional value as its presence provides a refuge for animals.

However it has to be pointed out that hunting in the RP is usually not exercised and it is also not encouraged by personnel of the RP.

The area in question	Protected area of the RP
Used Method	Market price approach
Data source	Interview with huntsman Andrej Sila, Hunting Association of Slovenia
Assumptions in calculating net present value	Intensity of hunting and number of members stays the same, there is only an annual increase of meat prices and of membership fees due to inflation

1. Market value of game sold in 2011 is estimated at 1,000 €.

Average allowed annual game culling in the RP was calculated using size of the RP, 413 ha or nearly 4% of both HDs.

The annual game culling of individual game species in the two HDs and the average annual game culling in the RP is shown in the tables below.

*Table 10: Market value of game in 2011*

<b>GAME</b>	<b>Average weight of game (in kg)</b>	<b>Average annual culling in HDs (number of animals)</b>	<b>Average annual culling of game in the RP (number of animals)</b>	<b>Game prices (in €/kg of unboned meat in skin)</b>	<b>Market value of game (in €)</b>
Roe deer ( <i>Capreolus capreolus</i> )	9.61	180	8	35	269
Red deer ( <i>Cervus elaphus</i> )	67.63	24	1	35	237
Wild boar ( <i>Sus scrofa</i> )	28.55	118	5	25	357
<b>TOTAL</b>					<b>863</b>

Table 11: Market value of small game in 2011

SMALL GAME	Average annual culling in HDs in 2011 (number of animals)	Average annual culling in the RP (number of animals)	Small game prices (in €/animal)	Market value of small game (in €)
Hare ( <i>Lepus europaeus</i> )	8	1	50	50
Fox ( <i>Vulpes vulpes</i> )	40	2		0
Badger ( <i>Meles meles</i> )	8	1		0
Stone marten ( <i>Martes foina</i> )	5	1		0
Mallard ( <i>Anas platyrhynchos</i> )	4	4	10	40
Magpie ( <i>Pica pica</i> )	2	1		0
Hooded crow ( <i>Corvus corone cornix</i> )	1	1		0
Jay ( <i>Garrulus glandarius</i> )	115	5		0
Pheasant ( <i>Phasianus colchicus</i> )	35	2	11	22
Grey partridge ( <i>Perdix perdix</i> )	5	1	20	20
<b>TOTAL</b>				<b>132</b>

The meat of roe deer, red deer and wild boar is generally sold in kilograms, while the meat of small game, for instance hare, mallard, pheasant and grey partridge, is sold in pieces. Other small game like fox, badger, magpie, hooded crow and jay are considered pests and their meat is not used for food.

2. Membership fees' market value in 2011 was estimated at 400 €

There are 95 members currently active in the two hunting districts, Gaberk Divača and Timav Vreme, 4 within the RP.

Current annual membership fee is 100 € per member.

3. Costs in 2011 are estimated at 1,100 €.

Meat sales revenues cover 75% of the operating costs, while the rest is returned to the hunting district. The returned 25% are provided as compensation for land owner's damage caused by game, for the forage and maintenance of hunting facility and devices.

4. Gross value added of game in 2011 is estimated at 300 € and is of minor importance.

## *Fish*

Fishing in the RP is regulated through Fisheries Management Plans. Fishing in the park and the Reka as its only stream is not allowed, but is, however, allowed in some streams and accumulation lakes in the buffer zone.

Despite the fact that it is not possible to fish within the park boundaries, the PA contributes to the conservation of the water regime and maintaining a favourable ecological and chemical status through the protection regime in the buffer zone. The latter is therefore essential for all fishing activities.

The area in question	Buffer zone
Used Method	Market price approach
Data source	Interview with Jože Franetič of the Anglers' Association Ilirska Bistrica
Assumptions in calculating net present value	Unchanged fishing intensity and number of members, annual increase in membership fees and the price of daily tickets due to inflation

1. Market value of the fish sold is estimated at 700.

According to Jože Franetič, there is about 100 kg of fish caught in the buffer zone annually, while the average price stands at 7€ / kg.

2. Market value from membership fees and daily tickets are estimated at 4,500 €.

Anglers Association Ilirska Bistrica currently counts 23 members and annually sells approximately 100 daily sport fishing tickets.

Annual membership fee per person is 120 €, while the daily sport fishing ticket is estimated at cost an average of 17.5 €.

3. Costs in 2011 are estimated at 4,200 €.

There is around 600 kg of trout stocked in the Reka river annually.

4. Gross value added of fisheries in 2011 is estimated at 1,000 €.

### ***Non-timber forest products***

Non-timber forest products like mushrooms, juniper berries in the area of the RP are occasionally in very small amount collected by local inhabitants for their own use. Monetary value of these non-timber forest products is therefore insignificant and further calculations have not been carried out.

The area in question	Protected area of the RP
Used Method	Descriptive value of significance
Data source	Interviews with local inhabitants and with the Public Agency personnel

**Non-timber forest products in the area of the RP are of insignificant value.**

### ***Honey***

The area in question	Protected area of the RP
Used Method	Market price approach
Data sources	Quantity – Public Agency personnel; Prices – Interview with Ivan Ateljšek, beekeeper in the Divača Municipality Costs – Ministry of Agriculture, Forestry and Food, 2010
Assumptions in calculating net present value	Unchanged quantity of produced honey, an annual increase in the price of honey due to inflation

1. Market value of honey sold in 2011 is estimated at 1,750 €.

There are 22 bee colonies in the park, annually producing about 250 kg of honey. Honey is used for promotional purposes only, and is not sold on the local market.

Karst honey is highly valued, but its market price does not exceed prices of honey from other areas. The Karst area honey thus cost on average of 7 € / kg in 2011.

2. Costs in 2011 are estimated at 1,400 €.

In 2009, the cost price of honey was 5.4 € / kg (while in 2011 it rose to 5.6 €), and thus beekeeping in Slovenia is not a profitable activity (Ministry of Agriculture, Forestry and Food, 2010). Furthermore, it is evident from average beekeepers' published income statements (Income Statement from Agency of the Republic of Slovenia for Public Legal Records, 2010) that the cost of honey production is almost 88% of all sales revenues of honey.

3. Gross value added of honey production in 2011 is estimated at 350 €.

### **Honey as a potential**

<i>The area in question</i>	<i>Protected area of the RP</i>
<i>Used Method</i>	<i>Market price approach</i>
<i>Assumptions in calculating net present value</i>	<i>Quantity of sold honey slightly increases during the year due to increased interest in natural products, there is also an annual increase of honey prices due to inflation</i>
<i>Data sources</i>	<i>The Public Agency personnel Cost price – Ministry of Agriculture, Forestry and Food, 2010 and AJPES</i>

1. *MV of honey sold in 2011 is estimated at 3,800 €.*

*Honey produced in the RP and in the buffer zone and is sold in the RP under the trademark of the RP.*

*It is assumed that the sale prices of honey sold under the trademark of the RP would be about 20% higher. Apart from the honey used for promotional purposes, which would continue to be produced in the Park, an additional 200 kg of honey would be sold to tourists.*

2. *Costs in 2011 are estimated at 2,550 €.*

*In our calculations, we considered the same cost price as with the current use of the ES.*

3. *Gross value added of honey production in 2011 is estimated at 1,250 €.*

### **Crops**

Škocjan Karst surface is rocky with no real possibilities for agriculture. The only appropriate areas for agriculture can be found in the foot of the slopes. On a slope karst surface, where the permeability is very slow and water cannot penetrate into the parent material, the water runs down the slope – towards depressions and collapse dolines. The feet of the slopes are therefore more humid, the dissolution of carbonate being stronger there and the soil thicker (Hrovat, 1953).

Data on agri-environmental subsidies for the year 2009 show that the farmers participated in the scheme with merely 0.34 ha of extensive orchards and 14.58 ha of organic farms. As the park has a very low agriculture potential, the importance of RP for agriculture is low as well and further calculations of this ES were not carried out.

<i>The area in question</i>	<i>Protected area of the RP</i>
<i>Used Method</i>	<i>Descriptive value of significance</i>
<i>Data source</i>	<i>Ministry of Agriculture, Forestry and Food - Agency for Agricultural markets and Rural Development</i>

Crops in the area of the RP are of insignificant value.

### **Livestock production**

There are only 5.34 ha of hay meadows appropriate for livestock farming in the analysed area; the value is thus insignificant. Nevertheless, we provide a rough estimate of the value of meat sales below.

The area in question	Protected area of the RP
Used Method	Market price approach
Data sources	Quantity – a single person with an official farmer status (Matavun) Price sources – Ministry of Agriculture, Forestry and Food – Agency of the RS for Agricultural Markets and Rural Development; “Kmečki glas” magazine Costs – Stanje na kmetijskih trgih z žiti in mesom, 2008
Assumptions in calculating net present value	Unchanged quantity of livestock sold, an annual increase in meat prices due to inflation

1. Market value of meat sold in 2011 is estimated at 5,250 €.

There is a single person with an official farmer status in the area of the RP (he lives in Matavun). The farmer’s livestock is listed in the table below. The only income from livestock is the sale of meat, and livestock is consequently not milked.

It is assumed that approximately 60% of livestock is sold for meat, while the rest is used for reproduction.

*Table 12: Market value of meat sold in 2011*

LIVESTOCK	Number of livestock	Average annual sale of livestock (in numbers)	Average live weight of livestock (in kg)	Average livestock prices (in €/kg of unboned meat in the skin)	Market value of livestock (in €)
Sheep	90	54	17	3.99	3,663
Goat	10	6	17	4.20	428
Donkey	3	1	20	3.99	80
Horse	1	0	400	1.80	0
Cow/bull	3	1	400	2.70	1,080
<b>TOTAL</b>					<b>5,251</b>

2. Cost of meat production in 2011 is estimated at 3,550 €.

To estimate the cost of meat production we use the same economy coefficient for all animals; in August 2008 the coefficient for young fattened cattle was 67.2 %, according to the Ministry of Agriculture, 2008.

3. Gross value added of livestock production in 2011 is estimated at 1,700 €.

### 6.5.1.2. Fibre and fuel

#### *Wood*

Economic value of forests in the RP is low. Deciduous trees are mainly used for firewood, conifers for cellulose. The forests, however, play an important role in protecting the area from erosion and wind.

According to the Forest Management Plan Karst II, the total surface of the forest in the RP is 128.6 ha with approximately 71 % of deciduous trees.

The intensity of forest management in the RP was low in the past, but lately it is increasing due to high energy prices; forest is mainly cut for firewood.

The area east of the viewing point and Betanja and the northern part of Sokolak are classified as protected forests, where deforestation is not permitted. There is another part of the RP with a status of forests with a special purpose, where deforestation is generally also not permitted.

According to the Forest Management Plan, no plans are being made to increase logging.

The area in question	Protected area of the RP
Used Method	Market price approach
Data sources	Quantity - Forest Management Plan, Forest Management Unit Karst II, Slovenian Forest Service Prices - Gozdno gospodarstvo Postojna, Ltd.
Assumptions in calculating net present value	Unchanged realised annual felling, an annual increase in wood product prices due to inflation

1. Market value of wood chips and conifer trees sold in 2011 is estimated at 500 €.

*Table 13: Market value of wood sold in 2011*

WOOD	Quantity	Unit	Wood product prices (in €/unit)	Market value of wood (in €)
Total surface of conifer trees	37.3	ha		
Total surface of deciduous trees	91.3	ha		
Current annual growing stock of conifers (pine)	3.5	m <sup>3</sup> /ha		
Current annual growing stock of deciduous	2.4	m <sup>3</sup> /ha		
Possible annual felling	1.9	m <sup>3</sup> /ha		
Possible annual felling in the area	249	m <sup>3</sup>		
Realized annual felling of conifer trees	7.2	m <sup>3</sup>	20	144.4
Realized annual felling of deciduous trees	17.7	m <sup>3</sup>		
Deciduous trees in small wood chips	44.2	nm <sup>3</sup>	8	353.6
<b>TOTAL in 2010</b>				<b>498.0</b>

Annual felling currently realized represents 10% of the possible annual felling in the area or 24.9 m<sup>3</sup> of wood (7.2 m<sup>3</sup> of conifer trees and 17.7 m<sup>3</sup> of deciduous trees).

If one m<sup>3</sup> of deciduous trees is 2.5 nm<sup>3</sup> in small wood chips, than 17.7 m<sup>3</sup> of deciduous trees is 44.2 nm<sup>3</sup> in small wood chips (nm<sup>3</sup> stands for normal cubic meter).

The average sale price of log in bark (cellulose wood) cut and brought to the nearest forest road is 20 € / m<sup>3</sup>.

The average sale price for wood chips is 8 € / nm<sup>3</sup>.

2. Cost of wood production in 2011 is estimated at 450 €.

According to the published financial statements provided by different forestry companies (Income Statement from Agency of the Republic of Slovenia for Public Legal Records, 2010), costs of wood production reach an average of 90% of MV.

3. Gross value added of wood in 2011 is estimated at 50 €.

### **Wool**

The one farmer and sheep-owner in the area neither uses nor sells unwashed wool.

#### **Wool as a potential**

*Our calculations consider unwashed wool gathered in the area of the RP, which is then sold on the market.*

<i>The area in question</i>	<i>Protected area of the RP</i>
<i>Used Method</i>	<i>Market price approach</i>
<i>Data sources</i>	<i>Quantity – A single farmer from Matavun Prices - Soven Ltd., 2011</i>
<i>Assumptions in calculating net present value</i>	<i>Unchanged quantity of the unwashed wool sold, an annual increase of unwashed wool prices, due to the inflation</i>

1. *Market value of unwashed wool sold in 2011 is estimated at 100 €.*

*One sheep annually provides approximately 15 kg of unwashed wool.*

*Price of unwashed sheep wool in 2011 was 0.7 € / kg.*

*Gross economic value of unwashed wool amounts to 100 €.*

2. *Costs in 2011 are estimated at 0 €.*

*The costs were not considered at this point, as they were already considered in the framework of livestock production costs.*

3. *Gross value added of in 2011 is estimated at 100 € and is of minor importance.*

## *Water flow*

The fundamental principle and objective of the Water Act (Official Gazette of the Republic of Slovenia, No. 67/02) is to maintain and regulate the quantity of water. Excessive water intake can strongly affect the flow of water, especially in dry periods, when there is little water, which can threaten the living organisms in the caves. Therefore, a prior consent of the Slovenian Environment Agency needs to be obtained before any water use of the Reka river requiring special equipment (like water pumps, stretching, etc.), as well as a water permit or water concession.

In the RP and buffer zone 3, there were three water concessions issued. One was for the production of electricity in small-scale hydropower plants (producing up to 10 MW), while 2 water concessions were issued for the needs of mills and sawmills.

The area in question	Protected area and buffer zone
Used Method	Market price approach
Data sources	Investment cost and other costs – interview with concession recipients; Water concessions – Slovenian Environment Agency; Guaranteed price for electricity – Official Gazette of the RS, No. 106/2010;
Assumptions in calculating net present value	Unchanged consumption of water and electricity prices

1. Investment costs are estimated at 348.500 €.

Investment costs were estimated through interviews with the recipients of concession. Since we were unable to get precise data, the estimation is very rough.

2. Market value from the use of water flow is estimated at 48,050 €.

Water concessions issued provided us with the data for calculating total annual consumption of water flows (see Appendix 18: Water Permits and Water Concessions).

3. Costs in 2011 are estimated to 7,300 €.

Maintenance costs of hydropower plants and mills / sawmills were considered in our calculations.

4. Gross value added of 2011 water flow is estimated at 40,750 €.

### 6.5.1.3. Ornamental resources

#### *Game trophy*

The annual quantity of game trophy depends on allowed annual game culling in the Gaberk Divača and the Timav Vreme HDs that extend beyond the area of the RP and cover 10,461 ha.

Since hunting in the park is not prohibited, we assessed the value of game trophy in the two HDs in the park.

However it has to be pointed out that hunting in the RP is usually not exercised and it is also not encouraged by personnel of the RP.

The area in question	Protected area of the RP
Used Method	Market price approach
Data source	Hunting Association of Slovenia
Assumptions in calculating net present value	Unchanged number of male animals, an annual increase in the prices of game trophies due to inflation

5. Market value of game trophy sold in 2011 is estimated at 2,600 €.

Usually, only parts of male animals are kept as game trophies, not sold, but instead remain with the hunters as a compensation for their services.

*Table 14: Market value of game trophy sold in 2011*

<b>GAME TROPHY</b>	<b>Average number of males</b>	<b>Game trophy prices (in €/number of animals)</b>	<b>Market value of game trophy (in €)</b>
Roe deer ( <i>Capreolus capreolus</i> )	3	270	810
Red deer ( <i>Cervus elaphus</i> )	1	800	800
Wild boar ( <i>Sus scrofa</i> )	2	500	1,000
<b>TOTAL</b>			<b>2,610</b>

6. Costs in 2011 are estimated at 0 €.

Costs of hunting have already been considered in Chapter 6.5.1.1 Food – Game.

7. Gross value added of game trophies in 2011 is estimated at 2,600 €.

## **Wool products**

Currently, no wool products are sold in the RP.

### **Wool products as a potential**

*Our calculations included wool products produced in the RP as well as in the buffer zone. These products could be sold under the trademark of the RP in the park.*

*Wool products from the area, like hand knitted woollen socks, gloves, caps, sweaters, scarves, slippers, bed covers, bed covers and pillows filled with wool fibres ..., could be sold in the souvenir shop under the trademark of the RP.*

<i>The area in question</i>	<i>Protected area of the RP</i>
<i>Used Method</i>	<i>Market price approach</i>
<i>Data source</i>	<i>Soven Ltd. Rokodelstvo Art &amp; Craft Slovenia, 2011</i>
<i>Assumptions in calculating net present value</i>	<i>An annual increase in the quantity of wool products sold, as well as an annual increase in prices of wool products due to inflation Costs – Income Statement for Company Soven Ltd. from Agency of the Republic of Slovenia for Public Legal Records, 2010</i>

1. *Market value of wool products sold in 2011 is estimated at 37,850 €.*

*Table 15: Market value of potential wool products' sold in 2011*

<b>WOOL PRODUCTS</b>	<b>Estimated number of sold wool products</b>	<b>Average wool product prices (in €)</b>	<b>Market value of wool products (in €)</b>
Socks	100	11.5	1,150
Gloves	100	11.5	1,150
Hats	100	17.5	1,750
Sweaters	100	90	9,000
Scarves	200	21.5	4,300
Slippers	100	15	1,500
Handmade bed covers	100	138	13,800
Bed covers filled with wool fibres	30	140.8	4,224
Pillows filled with wool fibres	30	33	990
<b>TOTAL</b>			<b>37,864</b>

2. *Costs in 2011 are estimated at 27,450 €.*

*The relationship between production costs and revenues was obtained from the Income Statement of the company Soven Ltd., published on the pages of Agency of the Republic of Slovenia for Public Legal Records, 2010.*

3. *If the expected quantity of wool products is sold annually, then the estimated gross value added of wool products for 2011 would amount to 10,400 €.*

#### 6.5.1.4. Fresh water

The fundamental principle and objective of the Water Act (Official Gazette of the Republic of Slovenia, No. 67/02) is to maintain and regulate the quantity of water. Excessive water intake strongly affects the flow of water, especially in dry periods, when there is little water, which can threaten living organisms in the caves. Therefore, a prior consent of the Slovenian Environment Agency needs to be obtained before any water use of the Reka river, such as, for instance: water use for drinking water supply; water use for irrigation and watering; and using water for technological purposes. In all those cases also water permit is required.

#### *Drinking water*

The Reka river is the only permanent river in the area of the RP. The Reka river is one of the major inflows into the aquifer of karst. Its waters again appear on the surface as a number of springs in the northwest of Italian Karst, the most famous being the springs of Timavo. There are also some springs, the so-called “brojnice”, that rise to the surface below the sea level.

It needs to be mentioned that the Reka river only supplies the springs of Timavo at high water. The local Italian population, therefore, uses the water from the springs very rarely – the springs only act as the fourth backup source for drinking water. Due to lack of data on the consumption of drinking water there, we can thus only assess the value of water that is used either as a drinking water supply by the Ilirska Bistrica Municipality or by the Slovene local population as individual drinking water supply.

The area in question	Protected area and buffer zone
Used Method	Market price approach
Data sources	Škocjan Caves Park Public Service Agency, Slovenia, 2011: 16; Water permits – Slovenian Environment Agency; Water price for Divača Municipality – Kraški vodovod Sežana d.o.o.;
Assumptions in calculating net present value	Unchanged consumption of drinking water and an annual increase in water prices due to inflation

1. Savings in 2011 are estimated at 208,850 €.

Total annual consumption of drinking water was assessed based on the data regarding the number of issued water permits (see Appendix 18: Water Permits and Water Concessions). Altogether, 44 water permits for drinking water supply were issued for the area of the RP and the buffer zone.

Total annual water consumption on the Reka river is 126.350 m<sup>3</sup>.

The price for one m<sup>3</sup> of water in the Divača Municipality is 1.6529 €. This price includes water, water refund, environmental tax and discharges of waste water.

Since we were unable to obtain data about whether this is the only source of water for individuals, it was not possible for us to assess how much they could save by building their own water reservoirs. Therefore, the calculated value may be underestimated.

2. Costs in 2011 are estimated at 0 €.

Costs were not taken into account, since we only assessed individuals' savings due to their obtained water permits.

3. Gross value added of drinking water in 2011 is estimated at 208,850 €.

### *Bathing waters*

There are no official swimming beaches along the river, although local inhabitants do sometimes swim in the Reka river in the summer.

The area in question	Buffer zone
Used Method	Descriptive value of significance
Data source	Local inhabitants and Water Management Plan for the Danube River Basin and the Adriatic Sea 2009 – 2015

Bathing waters in the area of the RP are of insignificant value.

### *Irrigation and watering*

In the following passage, we examine the value of irrigation and watering. Given that there was only one water permit issued allowing the use of water for irrigation, the purpose thus being of minor importance, we decided to focus only on the purpose of watering.

The area in question	Protected area and buffer zone
Used Method	Market price approach
Data sources	Interviews with local inhabitants; Water permits – Slovenian Environment Agency Price of water in the Divača Municipality – Kraški vodovod Sežana d.o.o.
Assumptions in calculating net present value	Unchanged watering and an annual increase in water prices due to inflation

1. Savings in 2011 are estimated at 3,350 €.

Total annual consumption of water for the purpose of watering was assessed based on the issued water permits (see Appendix 18: Water Permits and Water Concessions). There were 22 water permits issued for the use of water in the RP and buffer zone for watering purposes.

Total annual Reka river water consumption is 2,030 m<sup>3</sup>.

The price for one m<sup>3</sup> of water in the Divača Municipality is 1.6529 €. This price includes water, water refund, environmental tax and discharges of waste water.

2. Costs in 2011 are estimated at 0 €.

Costs were not taken into account, since we only assessed individuals' savings due to their obtained water permit.

**3.** Gross value added of drinking water in 2011 is estimated at 3,350 €.

### *Water used for technological purposes*

Lesonit, Ltd. a Slovenian company, founded in 1944, is located in the buffer zone. The company is one of Europe's leading names in the dry-process production of fibreboard.

The area in question	Buffer zone
Used Method	Market price approach
Data source	Water permits – Slovenian Environment Agency Price of water in the Divača Municipality – Kraški vodovod Sežana d.o.o.
Assumptions in calculating net present value	Unchanged consumption of water, an annual increase in water prices due to inflation

1. Savings in 2011 are estimated at 214,900 €.

Total annual consumption of water for technological purposes was assessed based on the data about the number of issued water permits (see Appendix 18: Water Permits and Water concessions). Altogether, there were 22 water permits issued, allowing water use for technological purposes in the RP and the buffer zone.

Total annual Reka river water consumption is 130,000 m<sup>3</sup>.

The price for one m<sup>3</sup> of water in the Divača Municipality is 1.6529 €. This price includes water, water refund, environmental tax and discharges of waste water.

2. Costs in 2011 are estimated at 0 €.

Costs were not taken into account, since we have calculated savings that individuals have due to obtained water permit.

3. Gross value added of drinking water in 2011 is estimated at 214,900 €.

### 6.5.1.5. Genetic resources

#### **Nursery fruit trees**

Currently, no nursery fruit trees are sold in the RP.

#### **Nursery fruit trees as a potential**

*Our calculations provide an assessment of the potential offered by the indigenous nursery species of apple and plum trees that grow in the Brkini region and could be sold in the park under the trademark of the RP.*

<i>The area in question</i>	<i>Protected area of the RP</i>
<i>Used Method</i>	<i>Market price approach</i>
<i>Data source</i>	<i>The Public Agency "Park Škocjanske jame, Slovenija"; Prices and quantities ...Interview with Adrijan Černelč at Kozjanski park, 2011</i>
<i>Assumptions in calculating net present value</i>	<i>Annual increase in quantity of sold nursery fruit trees and an annual increase in nursery fruit trees prices due to inflation</i>

1. *Market value of nursery fruit trees sold in 2011 is estimated at 13,000 €*

*Data on old varieties of apples and prices sold were obtained from the Kozjanski park, where the average annual sale is about 2.500 varieties of old apple trees.*

*Table 16: Market value of nursery fruit trees sold in 2011*

<b>NURSERY FRUIT TREES</b>	<b>Estimated quantity of sold fruit trees (in pieces)</b>	<b>Average fruit trees prices (in €)</b>	<b>Market value of nursery fruit trees (in €)</b>
Apples	1,000	6	6,000
Plums	1,000	7	7,000
<b>TOTAL</b>			<b>13,000</b>

2. *Costs in 2011 are estimated to 10,450 €.*

*According to the published income statements of different nurseries (Income Statement from Agency of the Republic of Slovenia for Public Legal Records, 2010), costs of nursery fruit production on average amount to 80% of the MV.*

3. *If expected quantity of nursery fruit trees was sold annually, gross value added of nursery fruit trees would be an estimated 2,550 €.*

## 6.5.2. Regulating services

### 6.5.2.1. Air quality regulation

Today, the majority of the population in European cities, especially in Western European countries, for instance in France, Austria and Switzerland, are continuously or intermittently exposed to air pollution (breathing in an increasing amount of dust particles, ozone and nitrous oxide). Breathing air of poor quality can cause respiratory diseases, a major cause of medical conditions and mortality in the world. 6 % of the annual number of deaths can be attributed to the exposure to air pollution – twice the number of road accident victims (Otorepec, 2009).

An analysis conducted in 10 European cities (including Ljubljana) by Aphekom found that life near heavy roads may cause as much as 15% – 30 % of all asthma cases in children and a similar proportion of chronic diseases, such as cardiovascular diseases and chronic obstructive pulmonary diseases in adults, 65 years of age and older.

Treatment costs for respiratory diseases in 25 cities (Stockholm, Dublin, Malaga, London, Toulouse, Le Havre, Rouen, Bilbao, Bordeaux, Strasbourg, Lyon, Paris, Lille, Brussels, Marseille, Vienna, Granada, Valencia, Sevilla, Rome, Athens, Barcelona, Ljubljana, Budapest, Bucharest) with 39 million inhabitants were estimated by Aphekom at around 300 million € per year or 7.6 € per inhabitant.

The air in the area of RP is very clean, despite of the highway that runs near the park border. The reasons for clean air are:

- No major industry;
- Low population density – only 70 inhabitants live in the RP (less traffic) and
- Strong winds.

The area in question	Protected area of the RP
Used Method	Avoid damage cost approach
Data sources	Treatment costs – Summary report of the Aphekom project 2008 – 2011 Reasons for clean air – Interview with Andrej Mihevc of the Karst Research Institute
Assumptions in calculating net present value	Unchanged number of inhabitants and an annual increase of treatment costs due to inflation

The value of clean air preventing health problems and thus lowering service costs is estimated at 550 €.

### 6.5.2.2. Climate regulation

Climate regulation services, such as, for instance, the regulation of greenhouse gases, temperatures, precipitations and other climatic processes as well as the chemical composition of the atmosphere, are largely performed by trees. With these services forests help reduce harmful emissions, such as noise, dust, aerosols, gases and radiation.

Climate regulation services of trees can have the following positive impacts:

- Pure air;
- Reduced wind speed;
- Influence on the distribution of rainfalls;
- Influence on dry and wet deposition measurements on vegetation;
- CO<sub>2</sub> binding in biomass peat moss and forest soil (Mavsar 2005).

To avoid any overlap with other services and benefits, only those benefits from carbon sequestration have been considered.

A carbon credit is a generic term for any tradable certificate or permit representing the right to emit one ton of carbon dioxide or the mass of another greenhouse gas with a carbon dioxide equivalent (t CO<sub>2</sub>e) equivalent to one ton of carbon dioxide.

By signing the Kyoto protocol, Slovenia committed itself to reducing total greenhouse gas emissions in the period 2008 – 2012 by 8% compared to the base year of 1986. In this period, Slovenia should not exceed the allowed annual emissions of 18.726 kt CO<sub>2</sub> e with no CO<sub>2</sub> sinks included or 20.046 kt CO<sub>2</sub> e with CO<sub>2</sub> sinks included (Slovenian Environment Agency, 2008).

Average annual accumulation of CO<sub>2</sub> in Slovenian forests in the period 1990 – 2005 (without taking into account annual cleaning) amounted to 9.867 kt CO<sub>2</sub> e per year which exceeds the allowed quota for annual accumulation of CO<sub>2</sub> 1.320 kt CO<sub>2</sub> e (Slovenian Environment Agency, 2008).

Purchasing the right to exceed the amount of releases set as target value by the Kyoto protocol (18.726 kt CO<sub>2</sub> e) is possible for 15 € / t CO<sub>2</sub>.

The area in question	Protected area of the RP
Used Method	Avoid damage cost approach
Data source	Slovenian Environment Agency, 2008
Assumptions in calculating net present value	Annual increase of purchase price for the exceeding right, due to inflation

During formation 1 m<sup>3</sup> of wood binds 0.9 ton of CO<sub>2</sub> in the process of photosynthesis (Pohleven, 2009).

According to data of the Slovenian Environment Agency, the current total annual growing stock in the RP is 350 m<sup>3</sup>, while the realised total annual felling in the RP amounts to 32 m<sup>3</sup>. Thus, it can be said that Slovenia will annually save approximately 4,300 € due to the existence of the RP.

Table 17: Value of savings in 2011

	Quantity	Binding (CO <sub>2</sub> / t)
Current annual growing stock (in m <sup>3</sup> )	350	315
Realised annual felling (in m <sup>3</sup> )	32	29
Difference (in m <sup>3</sup> )	318	286
Value of savings (in €)		4,287

Avoidance of cost in health services due to carbon sequestration in 2011 is estimated at 4,300€.

### 6.5.2.3. Water regulation, including flood regulation

Underground floods are a typical karst phenomenon. During heavy rains, karst caves are filled with water relatively quickly, but water also drains rapidly, causing a constant fluctuation of the water flow (min. water flow is 10 m<sup>3</sup>/s, average 30 m<sup>3</sup>/s and max. 400 m<sup>3</sup>/s) (Mihevc, 2001: 52).

After the Reka river flows underground for 41 km, it re-emerges in Štivan as a spring of Timavo (Civita et al., 1995: 171). There are three main sources of Timavo, which after 350 m join into a 42 m wide river, flowing into the sea after additional 550 m (Boegan, 1938: 91.97). The average flow rate of Timavo is 30.2 m<sup>3</sup>/s, the minimum 9.1 m<sup>3</sup>/s and maximum 127 m<sup>3</sup>/s. However, the fluctuation of Timavo is not influenced only by water from the Reka river, but also by the whole karst aquifer. The waters of the Vipava and Soča rivers also carry an important role (Kranjc, 1998: 29).

Given the above findings, it would be difficult to isolate only the effects of the underground Reka river on the water flow in Italy. In addition, Timavo is the shortest river in Italy and therefore not very significant.

Due to lack of data and the negligible importance of regulation functions, further calculations have not been carried out.

The area in question	Protected area and buffer zone
Used Method	Descriptive value of significance
Data source	Interview with Peric at the Public Agency about importance of water regulation function

**Water regulation, including flood regulation, in the RP has low strategic significance.**

#### 6.5.2.4. Buffer

After a cold front, large differences are generated in the air temperature by the sea and on the cold mountain plateaus. Cold air is denser and heavier than warm, so it is displaced and falls from the mountains across the Karst to the sea. Sometimes wind gusts reach hurricane speeds.

In the winter time, when the wind is strongest, the temperature at the karst peaks is, due to height, lower than in the valleys. As the soil is frozen, plants cannot absorb enough moisture. Grassland plants, with their vital organs hidden in the soil, are not affected, while trees are more exposed to wind and can dry out. Consequently, trees and bushes grow mainly in sinkholes, where there is more soil and moisture.

The cultivated areas in the RP are situated in depressions, where they are sheltered in from the bora wind. Since the RP area includes relatively few cultivated areas where the damage could occur, further calculations of the buffer service have not been carried out.

The area in question	Protected area
Used Method	Descriptive value of significance
Data source	Kras, 2011

**The buffer in the area of the RP is of low strategic significance.**

#### 6.5.2.5. Erosion control

The lower parts of the Karst are already heavily overgrown, while the karst peaks are still grassy, at least partially, due to strong wind. Rocky mountain meadows only have a thin layer of soil, which is very dry and not suitable for trees to grow due to strong wind. Trees are therefore located mainly in depressions and collapse dolinas, where rocky edges protect them from the north wind.

As the settlements in the RP are located directly above the collapse dolinas at the altitude of around 400 m, the erosion in the area is not a threat and cannot cause any serious damage to property. For that reason, the economic value of this service is negligible and further calculations have not been carried out.

The area in question	Protected area of the RP
Used Method	Descriptive value of significance
Data source	Kras, 2011

**Erosion control in the area of the RP is of low strategic significance.**

### 6.5.2.6. Water quality regulation

In the process of implementing the EU Water Framework Directive, surface and ground waters in Slovenia were divided into geographical units. The smallest units are called water bodies, which is a coherent sub-unit in the river basin (district) to which the environmental objectives of the directive must apply. The main purpose of identifying water bodies is to enable the status to be accurately described and compared to environmental objectives (Water Framework Directive).

The Reka river is divided to three water bodies (see Appendix 7):

- SI52VT11 VT Reka mejni odsek – Koseze;
- SI52VT15 VT Reka Koseze – Bridovec;
- SI52VT19VT.

The chemical and ecological status of these three stretches of river is summarised in the table below. For the SI52VT19VT Reka Bridovec – Škocjan Caves water body, running through the park before sinking into the cave, the following data on status is known:

- There are no hydromorphological pressures;
- Emissions from point sources of all types of pollution (nutrients, organic pollutants, specific pollutants, dangerous or priority substances) do not have an impact or the impact is low;
- There is a moderate impact due to danger of potential spills (of PS and pollutants);
- There is large impact due to diffused pollution from agriculture (nutrients);
- Diffused pollution from inhabited areas, which do not have collection and treatment of urban waste water, is estimated not to have any impact or the impact is low.

*Table 18: Status of surface water bodies in the Reka river*

WATER BODY	State
SI52VT11 VT Reka mejni odsek - Koseze	ASSESSMENT OF THE CHEMICAL STATE
	good (high level of confidence)
	TOTAL ASSESSMENT OF ECOLOGICAL STATUS
	good (low level of confidence)
SI52VT15 VT Reka Koseze Bridovec	ASSESSMENT OF THE CHEMICAL STATE
	good (medium level of confidence P) when the assessment of the chemical status is in a middle level of confidence only because of the frequency of sampling of pesticides, the label P is attached
	TOTAL ASSESSMENT OF ECOLOGICAL STATUS
	good (low level of confidence)
SI52VT19 VT Reka Bridovec Škocjan caves	ASSESSMENT OF THE CHEMICAL STATE
	good (high level of confidence)
	TOTAL ASSESSMENT OF ECOLOGICAL STATUS
	good (low level of confidence)

*Source: Water management plan for the Danube river basin and the Adriatic Sea 2009 - 2015*

Until 1990, the Reka river was one of the most polluted rivers in Slovenia, mainly due to the factory of organic acids in Ilirska Bistrica. Currently, the water quality is at a relatively high level due to its self-cleaning capability and reduction of pollution (factory closure), as evidenced by the large number of different underground species, which quickly react to any contamination. The karst waterbed is in fact an extremely fragile system and any contamination or development of environmentally unfriendly industries in the basin of the river and the Karst could have catastrophic consequences (Rismal: 19).

Since monitoring stations of the Reka river are placed only in two places (by Cerkevnikov mlin and Škocjan), any discharges into the river between those places are not recorded. This is the reason why the self-cleaning ability of water cannot be determined precisely. Further calculations were thus not carried out.

The area in question	Protected area and buffer zone
Used Method	Descriptive value of significance
Data sources	Water Management Plan for the Danube River Basin and the Adriatic Sea 2009 – 2015 Rismal: 22

**Water quality regulation in the RP and in the buffer zone is moderately strategically significant.**

#### 6.5.2.7. Pollination

Pollination is basically one of the regulating services but is categorized as a supporting service and is therefore valued in conjunction with other ES which it supports, for example the production of food, raw materials and aesthetic values.

The area in question	Protected area of the RP
Used Method	Descriptive value of significance

**Pollination in the RP is moderately strategically significant.**

### 6.5.3. Cultural services

The MAE (2005) defines ‘cultural services’ as “The nonmaterial benefits people obtained from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience, including, e.g., knowledge systems, social relations, and aesthetic values.”

For the purpose of estimating the total travel cost to the RP and back and other costs per visitor the following steps were carried out:

#### 1. Survey data collection:

Primary data was collected through the visitor survey carried out from mid-May to mid-August 2011 (sample size of 512 visitors). Sampling of visitors was done throughout the day in order to cover various visitors by country of residence at different times of the day, during week days and weekends – random sampling (see Appendices 4, 5 and 6).

#### 2. Actual data

Cultural services are valued according to the actual number of tickets sold, which means that the total number of visitors in the table below includes only those visitors who bought the ticket and not those visitors who decide to see the park on their own, without a guide. This is the reason why the value of cultural services is underestimated.

*Table 19: Actual tickets sold*

VISITORS	2003	2004	2005	2006	2007	2008	2009	2010	2011 until 31/08
Jan.	535	869	1,153	587	1,176	967	866	735	1,463
Feb.	429	439	689	1,019	1,095	1,432	966	970	1,119
Mar.	1,090	1,727	2,819	1,628	2,062	3,775	2,316	2,735	2,300
Apr.	5,299	7,104	6,770	7,975	8,178	7,026	7,311	7,528	9,234
May	8,333	9,488	9,535	10,199	11,829	13,947	10,883	9,877	10,975
June	9,000	11,841	10,881	11,905	12,936	11,147	12,302	11,924	13,052
July	13,111	14,838	15,769	14,746	16,410	17,525	15,393	17,163	20,091
Avg.	17,468	21,587	20,886	20,523	22,058	20,685	22,093	23,122	22,584
Sept.	11,213	12,708	12,550	12,091	14,036	12,955	12,070	12,166	?
Oct.	6,430	6,577	7,907	7,114	6,816	7,595	6,559	7,031	?
Nov.	1,535	1,561	1,794	1,901	1,873	1,990	1,603	2,186	?
Dec.	952	956	690	880	986	1,305	887	908	?
<b>TOTAL</b>	<b>75,395</b>	<b>89,695</b>	<b>91,443</b>	<b>90,568</b>	<b>99,455</b>	<b>100,349</b>	<b>93,249</b>	<b>96,345</b>	<b>97,308<sup>5</sup></b>

In recent years, RP has had approximately 100,000 visitors annually. In the period 2003 – 2011, the total number of visitors increased steadily. The only years with a lower number of visitors than the year before were 2006 and 2009. The latter drop can be explained by the global economic crisis.

<sup>5</sup> Estimation for the year 2011

The seasonal dynamics of visitors is significant. Most visitors visit the park in the period from spring to autumn.

Data on visitor statistics show that RP is visited by approximately 70% of foreign and 30% of Slovenian guests. Most guests are English speaking guests. Considering the nationality of foreign guests, guests from Great Britain are the most numerous, followed by guests from Italia and Germany. In recent years, there has been an increase in the number of guests from Eastern European countries (Poland, Hungary and Czech Republic) (statistics obtained by the Public Agency "Park Škocjanske jame, Slovenija").

In the RP, tourists can choose various tourism and recreational programs, such as:

- The Škocjan Caves – classical tour;
- The Mahorčič and the Martinič Cave – the new part opened in 2010;
- Educational trail;
- Ethnological collection;
- Karstological and archaeological collection;
- Viewpoint;
- Karst villages.

*Table 20: Actual number of park visitors by various options*

VISITORS	Year 2010	Distribution of visitors	Year 2011 until 31/08	Estimation for the year 2011
Caves	98.77%	98.77%	80,160	96,109
Educational trail + Velika dolina	0.91%	0.91%	657	886
Museum collections	0.32%	0.32%	1 <sup>6</sup>	314
<b>TOTAL</b>	<b>100%</b>	<b>100%</b>	<b>80,818</b>	<b>97,308</b>

### 3. Zonal Travel Cost Method

The calculation of the travel cost was done according to the Zonal travel cost method. Visitors were divided into four zones (see Appendix 4), according to the travelling distance from the country of residence.

*Table 21: Zone division*

Zone	Country
Zone 1	Visitors from Slovenia
Zone 2	Visitors from countries bordering Slovenia
Zone 3	Visitors from other European countries
Zone 4	Visitors from other countries around the world

### 4. Weighting

<sup>6</sup> Only one ticket was bought in 2011 until 31st August, because tickets for visiting the Škocjan Caves include visiting of museum collections until 30th September.

Weighting is an adaption of survey sampling calculations to minimize harmful effects of no coverage, non-response or unequal probability in sample selection (Groves et al. 2007: 305). Weights assigned to a certain sample give elements higher relative importance (Kalton 1983: 69).

The average proportion of visitors by country of residence in 2011 was calculated from data on the country of visitor residence obtained by the visitor survey and corrected by comparing the actual number of sold tickets in the period between June and August 2010. In cases where the visitors' sample by individual country was large enough, the weights were calculated on the basis of the same country, but where the sample of visitors was small and some errors might occur, weights were calculated on the basis of four zones: Zone 1, Zone 2, Zone 3 and Zone 4 (see Appendix 4).

*Table 22: Visitors by zones in 2010*

Zone	Number of visitors in 2010	Average share of visitors in 2010 (% of total)
Zone 1	24,766	26 %
Zone 2	35,349	37 %
Zone 3	30,008	31 %
Zone 4	6,222	6 %
<b>TOTAL</b>	<b>96,345</b>	<b>100 %</b>

#### 5. Description of variables required to calculate the total average costs per visitor

Distance costs (K) for each visitor depend on the travelling distance from the country of residence and back:

- Distance costs for visitors from Zone 1 and 2 were calculated by using the operating cost of a vehicle per km (a common Slovene value is 0.37 €/km for cars and 1.1 €/km for the bus or the cheapest train ticket) divided by the number of people in vehicle (e.g. survey data shows that approximately 3 people arrive in one car and approximately 60 people in a bus);
- Distance costs for visitors from Zone 3 and 4 are calculated by the average price of the flight ticket (the cheapest price among different airlines companies was found on the skyscanner.com website and represents ticket prices in the full season - summer 2011) and by using the operating cost of a vehicle per km (Zone 3: 147 € and zone 4: 1,131 €);
- Distance costs and travel time costs for visitors stopping in the RP from/on their way from/to another holiday destination were divided by 14 (average holiday length). One-day trip visitors were considered as a whole.

*Table 23: Variables required for calculating the value of time*

Zone	Flying time - both ways (in hours)	Distance from the country of residence/or place of staying to the site and back (in km)	Driving time - both ways (in hours)	Average time spent in the RP (in hours)
	T	K	T	Ts
Zone 1	0	220	2	4
Zone 2	0	1,181	10	4
Zone 3	4	159	2	4
Zone 4	29	138	1	3

Table 24: Average monthly gross salary

Zone	Average monthly gross salary (in €)	Gross salary rate per hour (in €/h)
Zone 1	1,634	10
Zone 2	2,779	17
Zone 3	2,475	15
Zone 4	1,918	12
<b>TOTAL</b>	<b>2,394</b>	<b>15</b>

Source: International Labour organisation, 2011

An average number of working hours per month in the EU (160 hours per month) is used for calculating the Gross salary rate per hour (Eironline, 2011).

Time costs include the time spent travelling to the site and back (travel time costs - T), time spent at the site (Ts) and the value of an individual's time (average gross salary per country).

Other costs include the money spent for food, beverage, accommodation, souvenirs and other.

#### 6. Results - calculation of the total costs per visitor

The average value of travel and other costs per visitor (V) for visitors who visit the RP from Zone 1 or 2 can be calculated with the following function:

$$V_{(\text{zone 1 and 2})} = (((K * p) + (T * w) + (Ts * w) + C) \times Va)$$

Where:

K ... Distance from visitor hometown to the site and back home (in km)

p ... Marginal vehicle operating cost

T ... Average travel time (in hours, 100 km = 1 h, round tour)

w ... Average salary rate (€ / hour)

Ts ... Time spent in the RP (in hours)

C ... Other costs (food, beverages, souvenirs and accommodation)

Va ... Actual number of visitors per year

**K \* p... Distance costs per visitor depending on the distance from their hometown to the site (and back) and the cost per km of travelling**

**T \* w... Time costs which include the time spent in travelling to the site (and back to hometown) and the value of an individual's time.**

The value of travel and other costs per visitor (V) for visitors from Zone 3 or 4 can be calculated using the following function:

$$V_{(\text{zone 3 and 4})} = ((F + (K * p) + (T * w) + (Ts * w) + C) \times Va)$$

Where:

F ... Average flight ticket cost (return ticket) for each visitor depending on their country of origin

K ... Distance travelled in coming to the site and back (in km)

p ... Marginal vehicle operating cost

T ... Average travel time (in hours, 100 km = 1 h, round tour)

w ... Average salary rate (€/hour)

Ts... Time spent in the RP (in hours)

C ... Other costs (food, beverages, souvenirs and accommodation)

Va ... Actual number of visitors per year

**K \* p ... Distance costs per visitor depending on the distance travelled to get to the site that day and the cost per km of travelling**

**T \* w ... Time costs which include the time spent in travelling (average flight time including return flight) to the site and the value of an individual's time.**

Table 25: Total costs per visitor in 2011

Zone	Visitors in 2010		Distance costs €	Travel time costs €	Food and beverages €	Souvenirs €	Accommodation €	Other €	Time spent in the RP €	Total cost per visitor in 2011 €
	n	%								
	Va	Va	K * p	T * w	partly C	partly C	partly C	partly C	Ts*V	
Zone 1	24,766	26%	13.0	11.3	11.4	2.6	1.8	0.7	37.1	<b>78</b>
Zone 2	35,349	37%	14.0	19.4	7.5	2.7	4.4	2.4	69.6	<b>120</b>
Zone 3	30,008	31%	11.6	7.4 <sup>7</sup>	7.9	2.7	7.8	1.0	56.2	<b>95</b>
Zone 4	6,222	6%	82.4	26.7	7.0	3.6	5.1	1.3	36.5	<b>163</b>
<b>TOTAL</b>	<b>96,345</b>	<b>100%</b>								

Total average value of travel and other costs per visitor for the services and attributes of RP can be calculated using the following function:

$$V_{\text{total}} = V_{\text{zone 1}} + V_{\text{zone 2}} + V_{\text{zone 3}} + V_{\text{zone 4}}$$

All further cultural service value assessments are derived from the total value per visitor calculated in this section.

<sup>7</sup> Travel time costs are lower due to a relatively low average income in some countries in Zone 3, for instance Hungary, Serbia, Croatia

### 6.5.3.1. Cultural heritage

#### *Ethnological heritage*

Ethnological heritage in the park encompasses museum collections and archaeological findings, traditional vernacular buildings, icehouses, karst ponds, the Školj castle, the church, memorials and other cultural monuments (see Appendix 2).

The park is a site of international significance, its value officially recognized by the ratified Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention) – UNESCO as well as other international conventions pertaining to landscape and cultural heritage protection, such as:

- Convention for the Protection of the Architectural Heritage of Europe (Official Gazette of the SFRY – International Treaties, No. 4/91 – Granada Convention for the Protection of the Architectural Heritage of Europe);
- European Convention on the Protection of the Archaeological Heritage, revised (the Malta Convention) (Official Gazette of the Republic of Slovenia – International Treaties, No. 7/99) (Official Gazette of the Republic of Slovenia, No. 24/99);
- European Landscape Convention (Official Gazette of the Republic of Slovenia – IT, No. 19/03).

The Škocjan Caves were designated as a UNESCO World Heritage Site both for its natural significance and the region's great cultural and historical significance. The region has been inhabited since the Mesolithic period. The long-term coexistence between nature and people is reflected in the typical karst cultural landscape, including the particular pattern of settlement and structural karst heritage. The region has further been historically important due to the fact that some of the fundamental research of the Karst and karstic phenomena has been done here from the 17th century on (Valvasor). The role of the Škocjan Caves with regard to organizing paths for tourists is also very important. (Decree on the Programme for Protection and Development of the Škocjan Caves Park for the period 2006 – 2010) (All scientific criteria for World Heritage Sites in the field of nature can be found in Appendix 2).

Since 1996, the following structures have been declared **ethnological cultural monuments** due to their special value and irreplaceability: Matavun 8 and 10, Škocjan 4, 5, and 7, the former curacy and communal stone well, Betanja 2. The ethnological heritage value is therefore beyond economic value.

Museum collections are open to individual guests in the main season from May to October. From 1st April to 30th September a visit to the museum collections is included in the ticket bought for visiting the Škocjan Caves, so the number of visitors to museum collections is actually much higher than it is considered in the calculations (314 expected visitors to museum collections in 2011). It can thus be concluded that the economic value of the ethnological heritage of the park is underestimated.

The area in question	Protected area of the RP
Used Method	Zonal travel cost method, Descriptive value of significance
Data sources	Decree on the Programme for Protection and Development of the Škocjan Caves Park for the period 2006–2010, The Public Agency "Park Škocjanske jame, Slovenija"
Assumptions in calculating net present value	Annual increase in the number of visitors due to the increasing interest in cultural values and an annual increase in admission fees due to inflation

1. Market value of ethnological heritage in 2011 is estimated at approximately 35,850 € (underestimated value).

*Table 26: Number of visitors to museum collections (ticket bought)*

MUSEUM COLLECTIONS	2010	2011 until 31/08	Estimation for the year 2011
Zone 1	80		81
Zone 2	114		115
Zone 3	97		98
Zone 4	20		20
<b>TOTAL</b>	<b>311</b>	<b>1<sup>8</sup></b>	<b>314</b>

Distribution of museum collections visitors by zones was based on the average proportion of visitors by country of residence in 2010 (see Table 19 "Average proportion of visitors" and Appendix 4) as well as on the actual number of the sold museum tickets in 2010.

*Table 27: Actual number of visitors of museum collections*

MUSEUM COLLECTIONS	2010	2011 until 31/08
J' kopinov skedenj	11,252	10,403
Natural science centre	10,308	9,133

The table above shows the actual number of visitors to each museum collection.

It should be noted that local inhabitants can sometimes see cultural heritage as an obstacle due to higher costs of maintenance and restoration of their properties (Kranjc, 2006), however, it is in fact the RP that covers most of these costs (from 1999 to 2010, the Park contributed 403.428 €).

### **The "true" value of ethnological heritage in the RP exceeds its economic value and is of a great strategical significance**

#### **2. Costs and gross value added**

As costs of ethnological heritage, caves, education and social relations are related to the business of the RP, they cannot be divided by an individual ES. Costs and GVA of these ES is shown with a total figure in Chapter 6.6 "Results of ecosystem service valuation in the Škocjan Caves Regional Park".

<sup>8</sup> In 2011 (until the 30th September) visitors who bought the ticket for visiting the Škocjan Caves could also visit the museum collections for free and thus, there was only one ticket sold from the beginning of the year until 31st August 2011.

### 6.5.3.2. Recreation and tourism

#### *Cave tourism*

The area in question	Protected area of the RP
Used Method	Zonal travel cost method
Data source	The Public Agency "Park Škocjanske jame, Slovenija"
Assumptions in calculating net present value	Annual increase in number of visitors due to increasing interest in the caves and an annual increase in entrance fees due to inflation

1. Estimated Market value of recreation and tourism in 2011 is estimated at 10,908,850 €.

The number of all visitors to the cave is presented in the table below. The ticket visitors buy for visiting the Škocjan Caves from 1st April to 30th September gives them free access to the museum collections and thus, the economic value of caves can be said to be overestimated.

*Table 28: Number of visitors to Škocjan Caves (ticket bought)*

ŠKOCJAN CAVES	2010	2011 until 31/08	Estimation for the year 2011
Underground canyon of the Škocjan Caves	95,157	70,159	
The Marinič and the Mohorčič Cave <sup>9</sup>	0	3,155	
Both caves	0	6,846	
<b>TOTAL</b>	<b>95,157</b>	<b>80,160</b>	<b>96,109</b>

*Table 29: Number of visitors to Škocjan Caves (sold tickets)*

ŠKOCJAN CAVES	2010	Average share of visitors	2011 until 31/08	Estimation for the year 2011
Zone 1	24,461	26 %		24,705
Zone 2	34,913	37 %		35,262
Zone 3	29,638	31 %		29,935
Zone 4	6,145	6 %		6,207
<b>TOTAL</b>	<b>95,157</b>	<b>100 %</b>	<b>80,160</b>	<b>96,109</b>

Distribution of Škocjan Caves visitors by zones was based on the average proportion of visitors by country of residence in 2010 (see Table 19 "Average proportion of visitors" and Appendix 4) as well as on the actual number of the tickets sold for the visit of the Škocjan Caves in 2010.

#### 2. Costs and gross value added

As costs of ethnological heritage, caves, education and social relations are related to the management of the RP, they cannot be divided by individual ES. The costs and GVA of these ES are presented in Chapter 6.6 "Results of ecosystem service valuation in the Škocjan Caves Regional Park".

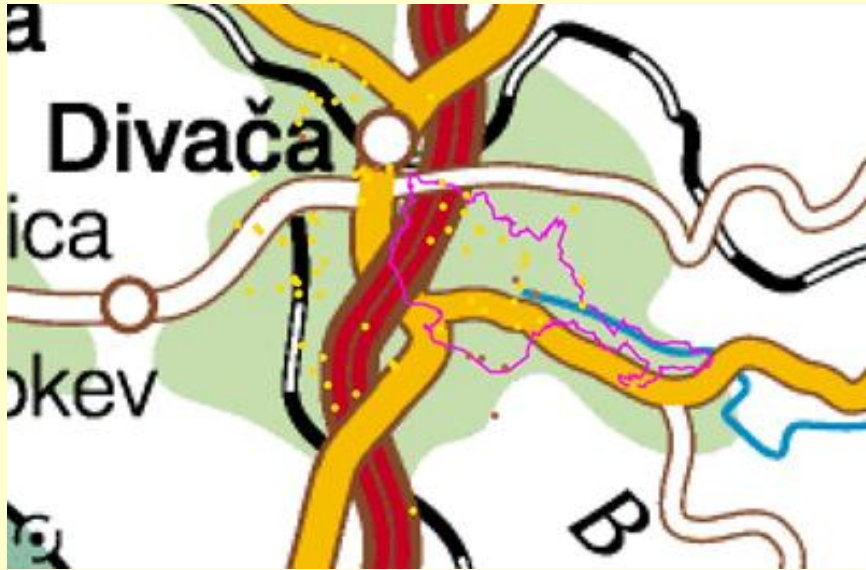
<sup>9</sup>The Marinič and the Mohorčič cave are opened from 01.04.2011

### **Cave tourism as a potential**

The RP potential offer would be to:

- Allow the cavers to visit Hanke’s Channel, a part of the Škocjan Caves underground canyon and
- Enable visits to four other caves of national importance (the Divača Cave, Cave in Sokolak, Kačna cave and Med jamah/Mejame Cave) located in the vicinity of the RP.

Figure 3: Locations of caves in the Divača Municipality



According to the regulation determining the protection regime pertaining to the caves, controlled access is allowed to the caves in question – visits to the caves are allowed only with a guide and therefore it would be possible to collect entrance fees.

By expanding and enriching tourist offer in the RP, the current problem of exceeded daily carrying capacity could also partly be solved. Thus daily visitors could, for instance, be provided with alternative options, especially if there are no more tickets for Škocjan Caves available.

The area in question	Caves in the vicinity of the RP and Hanke’s Channel within the RP
Used Method	Zonal travel cost method
Data source	The Public Agency "Park Škocjanske jame, Slovenija"
Assumptions in calculating net present value	Annual increase in number of visitors due to increasing interest in the caves and an annual increase in entrance fees due to inflation

1. With the expected number of cave visitors, the market value of cave tourism would be around 11,151,970 € (estimate for the year 2011)

Based on the current number of visitors to the caves in question and interviews with the local guides, it is estimated that annually approximately 2,000 more visitors would come to visit the caves. The majority of potential caves in the area are aimed at more experienced cavers, which could be an opportunity for product differentiation. One option would be to create “adrenaline experience packages” with slightly higher entrance fees (15 € per visitor) than the entrance fees of the currently opened caves.

*Table 30: Expected number of visitors to caves*

<b>CAVES</b>	<b>Additional cavers in 2010</b>	<b>Total number of cavers in 2010</b>	<b>Total number of cavers in 2011</b>
Zone 1	514	24,975	25,224
Zone 2	734	35,647	36,003
Zone 3	623	30,261	30,564
Zone 4	129	6,274	6,337
<b>TOTAL</b>	<b>2,000</b>	<b>97,157</b>	<b>98,129</b>

*Distribution of visitors by zones was based on the average proportion of visitors by country of residence in 2010 (see Table 19 “Average proportion of visitors” and Appendix 4), expected number of cave visitors as well as on the actual number of the tickets sold for the visit of the caves in 2010.*

## *2. Costs and gross value added*

*As costs of ethnological heritage, caves and education are related to the management of the RP, they cannot be divided by an individual ES. The costs and GVA of these ES are presented in Chapter 6.6 “Results of ES valuation in the Škocjan Caves Regional Park”.*

## *Hiking and cycling*

Favourable climate conditions in the area (mild winters) allow tourists to hike and cycle throughout the year. Two of the more prominent hiking paths (the traditional walking expedition along the Reka river sinkhole and the Path of Aquatic Treasures) are valued below. Other paths of national and international importance passing through the RP (Slovenian Mountain Transversal, Via Alpina, The European Walkway, Cycling paths – the Divača Circle and cycling in the Karst Park as well as other walking trails along the right bank of the Reka river to Školj and Škofelj) have not been valued due to lack of data.

The area in question	Protected area of the RP
Used Method	Zonal travel cost method
Data sources	Interview with Katja Fedrigo of the Škocjan Tourist Society regarding the traditional walking expedition along the Reka river sinkhole; Interview with Mirjam Frankovič of the Urbanščica Tourist, Cultural and Sports Association and Joško Valečič of the Tourist, Cultural and Sports Associations Dane and Kačič – Pared regarding the Path of Aquatic Treasures
Assumptions in calculating net present value	Annual increase in number of visitors due to increasing interest in the recreation and an annual increase in excursion fees due to inflation

1. Market value of hiking in 2011 is estimated at 84,300 €.

### **Traditional walking expedition along the Reka river sinkhole**

The traditional walking expedition Sokolak – Naklo – The Mahorčič Cave – Školj – Brežec – Gradišče – Škocjan is held every third Sunday in April. The entire path is 11 km long, however, only 5 km of the path passes through the RP.

The walkway is usually attended by around 1,000 walkers, mainly from Slovenia (70% of adults and 30% of children). On that day visitors are able to see all of the museum collections and the Church of St. Kancijan in Škocjan. Excursion fees are 2€ for adults and 1€ for children.

### **The Path of Aquatic Treasures**

The Path of Aquatic Treasures follows the water route between Famlje and Dane and is aimed at visitors who wish to explore a unique treasury of water – such as, for instance, karst ponds, water reservoirs, springs, icehouse, the beauties of the Reka river and the streams. The entire path is 12 km long, 4 km of it passing through the park.

The walkway is attended by around 60 walkers (70% adult walkers and 30% children). Excursion fee for hiking is 5 € per adult and 3 € per child.

*Table 31: Number of hikers (ticket bought)*

HIKING	Number of hikers in 2010	Average share of visitors	Estimation for the year 2011
Zone 1	1,000	100%	1,010

Since there are no actual data about the hikers' country of residence, our estimation is based on the assumption that all visitors came from Slovenia. It is thus likely that the value of hiking is underestimated.

The average cost for accommodation, food, beverage and souvenirs per hiker is estimated at 75 €.

2. Costs in 2011 are estimated at 900 €.

Walking expeditions are organized by volunteers, the money received from entrance fees spent on beverages.

3. Gross value added of hiking is estimated at 83.400 €.

### **Cycling as a potential**

*A visitor survey carried out from mid-May to mid-August 2011 shows that 22% of all tourists (21,055 tourists) would stay in the RP longer, if they were able to rent bikes.*

<i>The area in question</i>	<i>Protected area of the RP and the buffer zone</i>
<i>Used Method</i>	<i>Zonal travel cost method</i>
<i>Data sources</i>	<i>Quantity of visitors – visitor survey carried out from mid-May to mid-August 2011; Prices of bikes and helmets – Bike centre, 2011</i>
<i>Assumptions in calculating net present value</i>	<i>Annual increase in the number of cyclists and hikers due to increasing interest in recreation and an annual increase in prices for renting bikes due to inflation</i>

1. Investment costs are estimated at 3,810 €.

*Based on the number of visitors, who answered they would rent a bike if the service was available, the RP would have to buy approximately 10 mountain bikes and 10 helmets. The investment of approximately 3,800 € is considered in the calculation of the net present value.*

2. Market value of hiking and cycling for 2011 is estimated at 457,600 €.

*Table 32: Expected number of hikers and cyclists*

<b>HIKING AND CYCLING</b>	<b>Additional cyclists in 2010</b>	<b>Number of hikers and cyclists in 2010</b>	<b>Number of hikers and cyclists in 2011</b>
Zone 1	6,439	7,439	7,514
Zone 2	5,302	5,302	5,355
Zone 3	9,002	9,002	9,092
Zone 4	311	311	314
<b>TOTAL</b>	<b>21,055</b>	<b>22,055</b>	<b>22,276</b>

*Distribution of additional cyclist visitors by zones was based on the number of visitors by country of residence in 2010 and the proportion of tourists by zones interested in cycling according to the visitor survey carried out from mid-May to mid-August 2011.*

*We assume that each of the visitors who would rent a bike would spend an additional hour in the RP. Our assessment includes the costs for renting a bike and additional time spent in the RP, while any other costs to visitors might have been neglected.*

*The price of renting a bike is approximately 3 € / h.*

3. Costs in 2011 are estimated at 950 € (costs of organisation included).

*Our calculations also include additional bicycle and cycling equipment maintenance costs.*

4. *Gross value added of hiking and cycling in 2011 is estimated at 456,650 €.*

### **Hunting tourism**

There are two HD within the area of the RP, i.e. the Gaberk Divača and the Timav Vreme HDs; they extend beyond the area of the RP and cover 10,461 ha. Allowed annual game culling in each HD is regulated through the Annual Game Management Plan.

Since hunting in the park is not prohibited, we assessed the value of hunting tourism, according to the proportion of the park in both HDs.

However it has to be pointed out that hunting in the RP is usually not exercised and it is also not encouraged by personnel of the RP.

Our calculations of hunting tourism assume that hunting tourists come from around the world.

The area in question	Protected area of the RP
Used Method	Zonal travel cost method
Data source	Hunting Association of Slovenia
Assumptions in calculating net present value	Unchanged number of hunting tourists and an annual increase in the price of hunting permits due to inflation

1. Market value of hunting tourism in 2011 is estimated at 600 €.

Number of annual hunting tourists in the RP was calculated using size of the RP, 413 ha or nearly 4 % of both HDs.

The area of the RP is visited by approx. 4 hunting tourists per year. If visitors would like to hunt in the area of Gaberk Divača and Timav Vreme HDs, they need to apply for a hunting permit. When a hunting permit is obtained, the client is allowed to hunt a selection of animals. The current price of a hunting permit is 50 €.

*Table 33: Number of hunting tourists*

HUNTING TOURISM	Number of hunters in 2010	Average share of visitors	Estimation for the year 2011
Zone 1	1	26%	1
Zone 2	2	37%	2
Zone 3	1	31%	1
Zone 4	0	6%	0
<b>TOTAL</b>	<b>4</b>	<b>100%</b>	<b>4</b>

The distribution of hunting tourists by zones is based on the average proportion of visitors by country of residence in 2010 (see Table 19 “Average proportion of visitors” and Appendix 4) as well as the actual number of sold hunting permits in 2010.

2. Costs in 2011 are estimated at 0 €.

Cost of hunting is already considered in Chapter 6.5.1 “Provisioning Services”, under Subchapter “Game”.

3. Gross value added of hunting is estimated at 600 €.

## **Carriage riding**

Currently, it is not possible to ride in a carriage in the park.

### **Carriage riding as a potential**

A visitor survey conducted from mid-May to mid-August 2011 showed that 10 % of all tourists (10,872 tourists) would stay in the RP longer if they were able to take a ride in a carriage.

The area in question	Protected area of the RP and the buffer zone
Used Method	Zonal travel cost method
Data sources	Quantity of visitors – Visitor survey carried out from mid-May to mid-August 2011; Carriage ride prices – Domačija Boštjančič, 2011; Carriage price – Kufa – Kutschen, 2011; Horse prices – Svet konj, 2011; Horse equipment prices – Shop Promet Požega, 2011).
Assumptions in calculating net present value	Annual increase in the number of carriage rides due to increasing interest in the recreation and an annual increase in carriage ride prices due to inflation.

1. Investment costs are estimated at 10,500 €.

Based on the number of visitors, who answered they would like to experience a carriage ride, the RP would have to buy 1 carriage, 2 carrier horses and horse equipment. The investment of 10,500 € is included in the calculation of the net present value.

2. Market value of carriage rides in 2011 is estimated at 150,000 €.

Table 34: Expected number of carriage rides

CARRIAGE RIDING	Additional visitors in 2010	Number of carriage rides in 2010	Number of carriage rides in 2011
Zone 1	4,706	4,706	4,753
Zone 2	4,242	4,242	4,284
Zone 3	1,800	1,800	1,818
Zone 4	124	124	126
<b>TOTAL</b>	<b>10,872</b>	<b>10,872</b>	<b>10,981</b>

Distribution of additional visitors taking a carriage ride by zones was based on the number of visitors by country of residence in 2010 and the proportion of tourists by zones interested in carriage riding according to the visitor survey carried out from mid-May to mid-August 2011.

We assume that each visitor who would take a ride in a carriage would spend an additional half an hour in the RP. We considered the costs of the additional time spent in the RP in our calculations, all other costs were neglected.

Carriage ride price is 20 €/20 min/2 persons.

3. Costs in 2011 are estimated at 200 €.

The estimate includes the additional carriage maintenance costs, maintenance of carrier horses and horse equipment.

4. *Gross value added of carriage riding in 2011 is estimated at 149,800 €.*

### 6.5.3.3. Aesthetic value

The Škocjan Caves Regional Park comprises a unique landscape that brings together an array of features of great natural value, such as the Škocjan Caves (including the Velika and Mala dolina collapse dolines, sink holes and the underground canyon), the Reka river, etc, (see Table 54 “Natural features in the Škocjan Caves Regional Park” in App. 2) and the karst phenomena as well as significant cultural features (the villages of Škocjan and Betanja, the Church of St. Kancijan, the ruins of Školj Castle, the cemetery and old tombstones in the cemetery ... (see Chapter 12.9 “Cultural heritage” in App. 2).

The Škocjan Caves are part of the UNESCO's list of natural and cultural World Heritage Sites, in part due to the extraordinary natural beauty of Velika and Mala dolina collapse dolines. The sink holes and the underground canyon found in the latter part of the caves are ascribed a great aesthetic value (the scientific criteria for World Heritage Sites pertaining nature can be found in App. 2).

The Park is a site of international significance, its value officially recognized by the ratified Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention) – UNESCO as well as other international conventions pertaining to landscape and cultural heritage protection, such as:

- Convention for the Protection of the Architectural Heritage of Europe (Official Gazette of the SFRY – International Treaties, No. 4/91 – Granada Convention for the Protection of the Architectural Heritage of Europe);
- European Convention on the Protection of the Archaeological Heritage, revised (the Malta Convention) (Official Gazette of the Republic of Slovenia – International Treaties, No. 7/99) (Official Gazette of the Republic of Slovenia, No. 24/99);
- European Landscape Convention (Official Gazette of the Republic of Slovenia – IT, No. 19/03).

The village of Škocjan



Photo: kraji.eu

The village of Betanja



Photo: kraji.eu

It is, indeed, difficult to separate the aesthetic from the scientific and ethnological historical services as the latter overlap and complement each-other. Clean water, furthermore, likewise contributes to the aesthetic value of the RP.

The area in question	Protected area of the RP
Used Method	Descriptive value of significance
Data source	Decree on the Programme for Protection and Development of the RP for the period 2006–2010

**Aesthetic value of the RP is beyond the economic value and is strategically very significant.**

#### 6.5.3.4. Employment

##### *Direct employment*

In the highest season, the Škocjan Caves Regional Park employed 38 employees, of whom 22 were financed from the Ministry of the Environment and Spatial Planning (633.433 €), 14 employees (temporarily employed at high season) were financed from the activities of the Park. 2 employees worked on projects; one of the two employees was financed from the project funds, while the other's was funded through park activities. Students, who also helped at the park, were financed through park activities (12 students helped guiding tourists in the cave and curating in the museum, 1 student was engaged in ancillary works, while 2 students worked in the souvenir shop).

*Table 35: Direct employment in the Škocjan Caves Regional Park in 2010*

<b>DIRECT EMPLOYMENT</b>	<b>Gross salary of employees (in €)</b>	<b>Number of employees</b>	<b>Number of Students</b>
January	54,640	26	1
February	54,499	26	1
March	56,806	27	1
April	61,606	29	1
May	74,951	35	6
June	77,315	38	11
July	76,253	38	14
August	77,124	38	13
September	75,475	37	12
October	77,187	37	5
November	68,959	27	1
December	62,983	27	0
<b>AVERAGE per month</b>	<b>68,150</b>	<b>32</b>	<b>6</b>

According to the Annual Report for 2010, employment costs for 2010 amounted to 833.704 €.

The area in question	Protected area of the RP
Used Method	Market price approach
Data source	The Public Agency "Park Škocjanske jame, Slovenija" AJPES, 2010
Assumptions in calculating net present value	Unchanged number of employees and an annual salary increase due to inflation

**Direct employment value in 2011 is estimated at 849,300 €.**

### Potential direct employment

Expanding and enriching the tourism offer by enabling visits to other caves in the vicinity of the park would mean that additional personnel for managing the park would be needed. It is assumed that two more employees would be needed to cover new working assignments in the extended area of the RP.

The area in question	Protected area of the RP
Used Method	Market Price Approach
Data source	The Public Agency "Park Škocjanske jame, Slovenija"
Assumptions in calculating net present value	Unchanged number of employees and an annual salary increase due to inflation

Potential direct employment value in 2011 is estimated at 893,650 €.

### Indirect employment

The table below shows secondary employments generated by the RP.

In our assessment, all restaurants and accommodations in the Divača Municipality were taken into account.

The second column of the table below ("Number of employees") shows the number of employees related to catering, accommodation and transport providing for the needs of visitors, who decide to stay the night or have a drink or a meal before or after their visit to the RP.

Table 36: Indirect employments in the Divača Municipality

RESTAURANTS AND ACCOMMODATIONS	Number of employees	Annual gross salary of employees (in €)
<b>RESTAURANTS AND ACCOMMODATION IN THE RP</b>		
Gostilna Mahnič v RP	8.00	160
Prenočišča Pr Vncki	0.00	0
Apartmaji Žnidarčič	0.00	0
Turistična kmetija Pr' Betanci	1.00	17,133
<b>RESTAURANTS AND ACCOMMODATION IN THE DIVAČA MUNICIPALITY OUTSIDE THE RP</b>		
Boris Benčič – tourist farm	0.10	1,584
Koritnik Andrej s.p.	0.29	4,812
Gostilna na ravni Matija Doles s.p.	0.00	0
Novak Ana s.p. "Gostilna pri Čotniku"	0.60	6,932
4 M Ltd.	0.24	2,772
Gostilna in mesnica Malovec s.p.	0.91	12,830
Kras Tour Ltd.	0.47	8,062
"Gostilna Godina" Loredana Černigoj s.p.	0.06	1,066
Picerija Etna Igor Peresson s.p.	0.15	2,206
Emil Kač "Jankovi"	0.19	3,102
Emilijana Lipovšek - Dujčeva domačija	0.68	11,220
Domačija Vrbin	0.06	924

RESTAURANTS AND ACCOMMODATIONS	Number of employees	Annual gross salary of employees (in €)
Kmečki turizem Jenezinovi Česnik Gregor s.p.	0.00	0
<b>SNACK BARS AND SIMILAR ESTABLISHMENTS OUTSIDE THE RP</b>		
Picerija pri Bzku Damijan Grželj s.p.	0.18	2,103
Okrepčevalnica Vremščica Franc Gustinčič s.p.	0.03	84
<b>SERVING DRINKS OUTSIDE THE RP</b>		
Famo Rajko Fabjan s.p.	0.00	0
Bar 4x4 Anja Planinšček s.p.	0.02	671
Itak bar Danijel Stjepanović s.p.	0.00	0
<b>HOTELS OUTSIDE THE RP</b>		
Devan Gombač s.p.	0.01	192
<b>TOTAL</b>		<b>75,853</b>

Value of indirect employment is estimated according to data regarding received salaries per employee.

The area in question	Divača Municipality
Used Method	Market price approach
Data sources	Interviews with restaurant owners regarding the number of visitors visiting their restaurant on the way to/from the park; Income Statement from Agency of the Republic of Slovenia for Public Legal Records about salaries per employee.
Assumptions in calculating Net present value	Unchanged number of employees and an annual salary increase due to inflation

**Indirect employment value in 2011 is estimated at 190,500 €.**

### **Potential indirect employment**

*Expanding and enriching the tourism offer of the RP would likely lead to visiting tourists staying in Slovenia longer and increased spending for accommodation and food.*

*It is assumed that two more employees would be needed for catering and other tourist related jobs.*

<i>The area in question</i>	<i>Divača Municipality</i>
<i>Used Method</i>	<i>Market Price Approach</i>
<i>Data source</i>	<i>Interviews with restaurant owners</i>
<i>Assumptions in calculating net present value</i>	<i>Unchanged number of employees and an annual salary increase due to inflation</i>

**Value of the potential indirect employment in 2011 is estimated at 219,500 €.**

### 6.5.3.5. Scientific value

The Škocjan Caves Regional Park was established in 1996 with the aim to conserve and research outstanding geomorphological, geological and hydrological sites, rare and endangered plant and animal species, paleontological and archaeological sites, ethnological and architectural characteristics and cultural landscape, and to provide opportunities for further development. Due to their particular natural, cultural, historical and aesthetical value, individual parts of immovable natural and cultural heritage in the Park are specifically protected by the law.

The Škocjan Caves were designated as UNESCO World Heritage Site with several special features contributing to the significance of the park (Scientific criteria for natural World Heritage Sites can be found in App. 2), for instance:

- The Škocjan Caves are home to the largest known underground canyon in the world;
- an example of contact Karst, formed where flysch meets limestone; when describing collapsed dolines, karstologists based their writings on the Velika and Mala dolina collapse dolines and the term is nowadays used in the international karstic terminology (*collapse dolines*); numerous karst phenomena developed on a small territory (sink holes, natural bridges, gorges, collapse dolines, abysses, underground canyon, passages covered with flowstone deposits, springs...);
- Due to particular microclimatic conditions, a unique ecosystem developed in the Velika and the Mala dolina collapse dolines, enabling co-existence of Mediterranean, Sub-Mediterranean, Central European, Illyrian and Alpine bio-geographical elements. Thus, for instance, different Alpine (e.g. *Prumula auricula*) and Mediterranean species (e.g. *Adiantum Cpillus – Veneris*) grow side by side in the park. Alpine species found shelter in the colder bottom part of the collapsed dolines during warmer periods, which followed ice ages (glacial relics);
- Velika dolina is the typical locality of *Campanula justiniana*, a flower that only grows in the South-Western part of Slovenia (an endemic species). Regarding fauna and endangered animal species, bats and the subterranean cave fauna are the most important.

The Škocjan Caves Regional Park ecosystem services are of international significance, its value officially recognized by the Ramsar Convention, MAB – Man and the Biosphere Programme, The Alpine Convention and Natura 2000 Sites. The park is naturally also significant on the national level (enjoying the status of a protected area and recognized natural as well as cultural monuments).

The area in question	Protected area of the RP
Used Method	Descriptive value of significance
Data source	Decree on the Programme for Protection and Development of the Škocjan Caves Park for the period 2006 – 2010

**Scientific value of the RP is beyond the economic value and is strategically very significant.**

### 6.5.3.6. Spiritual value, including inspiration, through contact with nature

The spiritual value of the RP can be seen through the importance of the place for inspiration gained through the tranquillity provided by direct contact with nature.

Stated preference method can be used, but because data on whether visitors are looking for inspiration in nature has not been collected, further calculations have not been carried out.

The area in question	Protected area of the RP
Used Method	Descriptive value of significance
Data source	The Public Agency "Park Škocjanske jame, Slovenija", 2011: 16

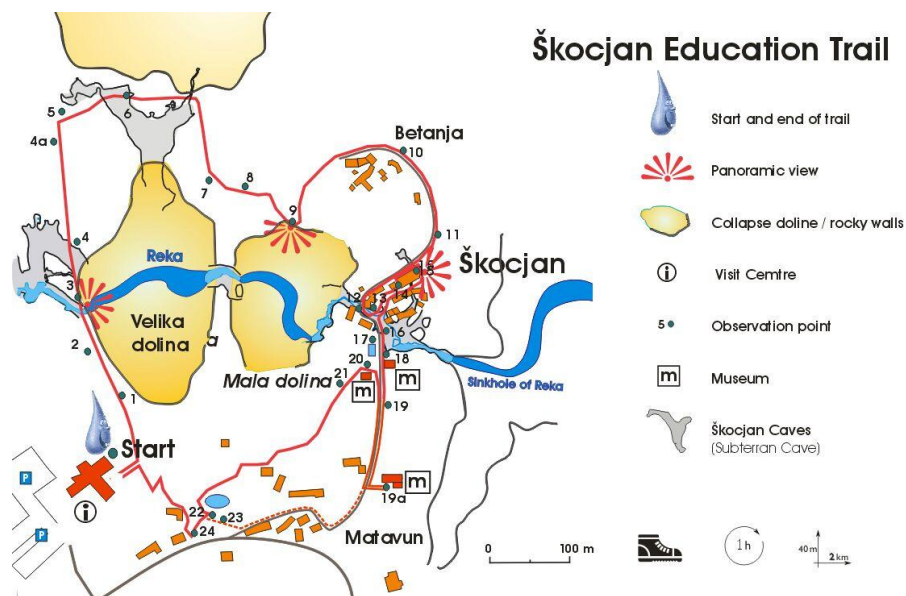
**Spiritual value of the RP is beyond the economic value and is strategically very significant.**

### 6.5.3.7. Environmental education in the Škocjan Caves Regional Park

#### Formal education

The programme offering natural-scientific excursions into the UNESCO World Heritage Site of the Park, was launched in 2003, when a circuit trail “Škocjan Educational Trail” was set up in the heart of the Park. The trail begins and ends in front of the Information Centre in Matavun. About 2 km long, the trail can be completed in less than an hour. It leads visitors around the Velika and Mala dolina, where they can enjoy wonderful views of the deep collapse dolines, steep walls, the disappearing Reka river and the surrounding hills.

Figure 4: Škocjan Educational Trail



Source: The Public Agency "Park Škocjanske jame, Slovenija"

Over 40 Slovenian and foreign educational institutions (primary schools, colleges, secondary schools and faculties) have decided to take part in excursions around the Park and the Škocjan

Education Trail. Moreover, numerous national and foreign delegations visiting the Park also decide to visit the educational trail.

Visitors can walk along this specially designed footpath at any time with or without a guide, i.e. without necessarily purchasing a ticket. Our assessment of the economic value of environmental education only considers those visitors, who decided to buy a ticket for the guided tour of the Škocjan Educational Trail only or for the tour of Velika dolina collapse doline. This means that it excludes those visitors, who opted for the whole package offer as well as those taking a tour without a guide. That is why the number of guests who visited both the Škocjan Educational Trail and the Velika dolina is actually much higher than the number of guests considered in the calculation, thus making the educational value of the Park underestimated (the anticipated number of visitors to the educational trail and the Velika dolina collapse doline in 2011, i.e. 886 visitors, being too low).

The area in question	Protected area of the RP
Used Method	Zonal travel cost method
Data source	The Public Agency "Park Škocjanske jame, Slovenija"
Assumptions in calculating Net present value	Annual increase in the number of visitors due to increasing interest in educational values (statistical prediction) and an annual increase in excursion fees due to inflation

1. Market value from formal education in 2011 is estimated at 100,550 €.

*Table 37: Number of visitors of the Škocjan Educational Trail and the Velika dolina*

THE ŠKOCJAN EDUCATIONAL TRAIL AND THE VELIKA DOLINA	Number of visitors in 2010	2011 till 31.08.	Estimated in 2011
Zone 1	80	225	228
Zone 2	114	322	325
Zone 3	97	273	276
Zone 4	20	57	57
<b>TOTAL<sup>10</sup></b>	<b>311</b>	<b>877</b>	<b>886</b>

Distribution of guests visiting the Škocjan Educational Trail and the Velika dolina by zones is based on the average proportion of visitors by country of residence in 2010 (see Table 19: Average proportion of visitors and Appendix 4) as well as the actual number of sold tickets for the visit of the Škocjan Educational Trail and the Velika dolina collapse doline in 2010.

*Table 38: Actual number of visitors to the Škocjan Educational Trail*

THE ŠKOCJAN EDUCATIONAL TRAIL	2009	2010	2011 until 31/08
Number of groups <sup>9</sup>	54	57	20
Number of visitors <sup>9</sup>	1,272	1,411	867

In the period 2003 – 2010, the education trail was visited by 10,000 visitors (only taking into account pre-booked visitors for guided tours). In 2010, the educational trail was visited by 57 school groups (mostly elementary schools and secondary schools) or 1,411 pupils.

<sup>10</sup> Note that the numbers only include visitors who decided to buy a ticket for the guided tour of the Škocjan Educational Trail or for the tour of the Velika dolina collapse doline, excluding visitors who opted for the whole package or went on a tour without a guide

## 2. Costs in 2011 and gross value added in 2011.

As costs of ethnological heritage, caves, education and social relations are related to the management of the RP, they cannot be divided into individual ES. Costs and GVA of these ES can be found on the figure in Chapter 6.6, i.e. "Results of ecosystem service valuation in the Škocjan Caves Regional Park".

### *Informal education*

Among the informal education we consider:

- Membership in societies (Caving Society Gregor Žiberna Divača, Slovenian Association for Bat Research, Bird Watching and Bird Study Association of Slovenia);
- Importance of RP to society as a place of study and
- Importance of the area for society as it provides an opportunity to learn about different topics related to the RP.

The revenue of brochures and other publications sold was considered within the framework of the money visitors spend on other, miscellaneous products.

#### **1. Importance of the RP to different societies**

An important association operating in Slovenia is the Speleological Association of Slovenia with 45 member caving clubs and around 1,000 members, including: Alter Sport Club, Caving Club Anthron, Caving Club Bakla Letuš, DZRJ Bled, Caving Club Borovnica, Caving Club Črni galeb Prebold, Caving Club Danilo Remškar Ajdovščina, Caving Club Gorenja vas, Caving Club Gregor Žiberna Divača, Sport Club Grmada, Caving Club Ivan Michler Vrhnik, Caving Club Kamnik, Caving Club Karantanja Lozice, Caving Club Karlovica, Caving Club Kostanjevica na Krki, Cave Research Institute Kranj, Caving Club Kraški krti, Caving Club Kraški leopardi Renče, Caving Club of the Križna jama Cave, Caving Club Logatec, Cave Exploration Society Luka Čeč. Luka Čeč Postojna, JS PD Medvode, Caving Club Netopir Ilirska Bistrica, Caving Club Netopir Kočevje, Caving Club Novo mesto, Caving Club Dimnice Koper, Caving Club Peter Krivec, Caving Club Rakek, Cave Exploration Society Ribnica, Caving Club Sežana, Cave Exploration Society Simon Robič Domžale, Caving Club Speleos-Siga Velenje of the Koroška-Šalek Region, Caving Club Srečko Logar Idrija, Šaleški Caving Club Podlasica Topolščica, Nature Science Society Šimdra, Underground Exploration Society Škofja Loka, Caving Club Temnica, Caving Section of the Tolmin Hiking Society, Sport Club Tornado, JO SPD Trst, Caving Club Železničar, Caving Club Carnium Kranj, Društvo Sirena Sub, Caving Club Črnomelj of the Bela Krajina Region, Caving Club Tirski zmaj, Caving Club Krka.

The Slovenian Association for Bat Research currently counts 31 members, while there are around 1,000 members in the Bird Watching and Bird Study Association of Slovenia.

#### **2. Importance of the RP as a study research area**

For the 10th anniversary of the designation of the Škocjan Caves as a UNESCO World Heritage Site, the Slovenian National Commission for UNESCO, in cooperation with The Karst Research

Institute, published a booklet entitled “The Škocjan Caves, a Contribution to Bibliography”. The booklet includes a list of 399 bibliographic units to do with the Škocjan Caves, published from 1599 to 1996. This bibliography contains works accessible in the Karst Research Institute’s library.

Five years later, another booklet was published, listing mostly those works and monographs that were published after 1996 as well as some articles issued before 1996 as a supplement to the 1996 bibliography. It contains 193 bibliographic units by 110 different authors.

Bibliographies, the one from 1996 and this one, containing altogether more than 500 titles related to Škocjan caves clearly prove that this cave is important and well-known all over the world (Kranjc, 2001).

### **3. Importance of the RP for society as an opportunity to learn about different topics related to the RP**

Educational programs with different topics related to RP carried by RP staff mainly aimed at part-time guides and students, but also at local inhabitants. During 2009 there were educational program about:

- Functioning of the park and International agreements, UNESCO World Heritage Convention, Ramsar Convention on Wetlands, MAB, Rete Alpina;
- Speleology;
- Flora and fauna;
- Conservation control;
- Tourism in RP and tourism offer in the Divača Municipality;
- Škocjan educational trail;
- Guide service in the RP;
- Safety at work and fire safety;
- First aid;
- Tourist caves in Slovenia;
- Cultural heritage;
- Protection of visitors and safe handling with a lift;
- Radiation Protection;
- Foreign languages (English, German);
- Rhetoric;
- Presentations of the nearby caves (Divača cave and Grotta Gigante /Velika jama v Briščkih) etc.

The area in question	Protected area of the RP
Used Method	Descriptive value of significance
Data source	Data on societies obtained from various internet sources Data on Study research area from The Public Agency "Park Škocjanske jame, Slovenija"

**Informal educational value of the RP is beyond the economic value and is strategically very significant.**

### **Informal education as a potential – tasting of traditional karst food**

Management of the RP is currently renovating a cultural monument for the purposes of the new information centre aimed at informal education and raising awareness. The new centre is going to be a place, where seminars, presentations and various exhibitions will take place. It could also provide the tourists with the opportunity to learn about other cultures by attending seminars as well as the chance to taste traditional karst dishes.

A survey that was held from mid-May to mid-August shows that 30 % of all tourists (29,228 tourists) would stay in the RP longer, if they were provided with the opportunity to try traditional karst dishes.

The area in question	Protected area of the RP
Used Method	Zonal travel cost method
Data source	Visitor survey conducted from mid-May to mid-August 2011
Assumptions in calculating Net present value	Annual increase in the number of tasters and an annual increase in degustation prices due to inflation

1. Investment costs are estimated at 127,275 €.

The investment needed to enable the renovation of the building for information purposes amounts to 127,275 € and was considered in the calculation of net present value in 2010. Funds for the reconstruction of the building were provided by the project Strengthening the Protection and Development of Natural Values in the Wider Area of the Škocjan Caves Regional Park (Interreg III / a Slovenia – Italy 2000 – 2006.)

2. Market value from informal education in 2011 is estimated at 1,027,150 €.

Table 39: Expected number of tasters

<b>INFORMAL EDUCATION</b>	<b>Additional visitors in 2010</b>	<b>Number of visitors in 2011</b>	<b>Number of visitors in 2011</b>
Zone 1	8,668	8,668	8,755
Zone 2	10,251	10,251	10,354
Zone 3	9,002	9,002	9,092
Zone 4	1,307	1,307	1,320
<b>TOTAL</b>	<b>29,228</b>	<b>29,228</b>	<b>29,521</b>

Distribution of tasters by zones is based on the number of visitors by country of residence in 2010 and the proportion of tourists by zones interested in tasting of traditional karst food according to the visitor survey conducted from mid-May to mid-August 2011.

Visitor value costs considered in our assessment were the costs of degustation and the additional hour spent in the Park, while all other costs spent in the park were neglected. Degustation prices amount to 20 €/visitor.

3. Costs in 2011 are estimated at 129,650 €.

Our calculations considered additional maintenance costs for renovating the building of the new information centre.

4. *Gross value added in 2011 is estimated at 897,500 €.*

#### 6.5.3.8. **Mental and physical health**

Ecosystem services are indispensable to the well-being of people everywhere in the world. Human health and well-being depend on the availability of food and water, regulation of disease vectors, pests, and pathogens provided by the natural environment.

The causal links between environmental change and human health are complex as they are often indirect, displaced in space and time, and depend on a number of modifying forces. Human health ultimately depends on ecosystem products and services (such as availability of fresh water, food and fuel sources), which represent a truly fundamental pre-requisite for human health and productive livelihood. Significant direct human health impacts can occur if ES are no longer able to meet such basic needs. Changes in ES can thus indirectly affect our livelihood, incomes, and result in local migration and, on occasion, may even cause political conflict. The resultant impacts on economic and physical security, freedom, choice and social relations have wide-ranging impacts on the well-being and health, as well as the availability and access to health services and medicines (World Health Organisation, 2011).

It can thus be said that mental and physical health are, indeed, related to the quality of all other ES provided by the RP. The value of mental and physical health can thus be said to be inextricably linked to the value of other services.

The area in question	Protected area of the RP
Used Method	Descriptive value of significance
Data source	World health organisation, 2011

**Mental and physical health is beyond the economic value and is highly strategically significant.**

### 6.5.3.9. Social relations

The area in question	Protected area of the RP
Used Method	Zonal travel cost method
Data sources	Data on festivals provided by the Škocjan Tourist Society Data on international workshops provided by the Literary Association IA Data on other events provided by The Public Agency
Assumptions in calculating net present value	Annual increase in number of visitors due to increasing need for social interaction and an annual increase in fees due to inflation

1. Market value from social relations in 2011 is estimated at 188,800 €.

#### *Traditional cave festival "Belajtnga"*

Cave festival "Belajtnga" is a revival of the festival that was first organized in 1886 and ended in 1946. The festival is organized by the Škocjan Tourist Association, the managing authority of the RP, and the Divača Municipality. On this day all visits to the cave are free of charge. Visitors walk through the cave on their own without a guide, and in the local villages stalls are arranged for the local craftsmen to sell and present their work. The festival attracts some 1,500 visitors each year.

#### *The traditional Škocjan Festival*

The traditional Škocjan Festival is organized by the Škocjan Tourist Society and is a celebration of Midsummer Night and the Slovene National Day. Festivities take place three times in June and July, i.e. every other Friday, in the Škocjan market. Amateur theatre and choir groups participate in the festival and the festival opens on Midsummer's Eve with a musical performance.

Festival is attended by about 80 visitors on each of the three occasions.

Entrance fee to theatre performances amounts to 7 €, while choir group performances are free of charge.

#### *International art workshops*

International art workshops are run by Iztok Osojnik and organized in the Park by the Literary Association IA in cooperation with the [Polica Dubova Cultural and Artistic Association](#), The Škocjan Tourist Association, KUD Vilenica Art Society, Magazine Monitor ZSA, KUD France Prešeren, Alpe-Jadran Regional Community as well as Apokalipsa and Poetikon magazines/publishers. International art workshops in the area of the RP include:

- The Golden Boat International Poetry Translation Workshop - the workshop lasts for a week (14 participants from all over the world; in 2011 the attending participants came from Finland, USA, Ireland, Croatia, Italy, Slovenia, Poland, Germany, the Czech Republic),
- International Poetry Translation (two poetry writers and two translators are invited – each staying as artist in residence for a week and translating Slovenian poetry into his/her language),
- International Literary Symposium, lasting for a week; in 2011 dedicated to the political reality of Srečko Kosovel's poetry (10 literary scientists from the USA, Serbia, Croatia, and Slovenia).

## Other events

Other events in the Park include:

- Cooking courses (dishes with dandelions, home liqueurs ...);
- Cleaning actions, socializing on International Women's Day ...

*Table 40: Actual number of visitors to different events in 2010*

SOCIAL RELATONS	Belajtna	Škocjan festival	Creative workshops	Other events
Zone 1	386	62	7	30
Zone 2	550	88	10	
Zone 3	467	75	8	
Zone 4	97	15	2	
<b>TOTAL:</b>	<b>1,500</b>	<b>240</b>	<b>26</b>	<b>30</b>

### 2. Costs

These costs are already included in the management costs of the RP (see Chapter 6.6 “Results of ecosystem service valuation in the Škocjan Caves Regional Park”).

3. Gross value added in 2011 is estimated at 188,800 €.

#### 6.5.3.10. Sense of place, including sense of community

Cooperation between local people and managers of the caves dates back to the very first discoveries of caves and is still present today. Moreover, it was mainly the local inhabitants who actively engaged in building and maintaining trails as well as in the exploration and the discovering of caves. The local inhabitants were also employed in the park as guides, escorts and workers.

According to the assessment of the current state of the protected area as recorded in the Programme for the Protection and Development of the RP for the period 2006 – 2010, cooperation with inhabitants of the Park is exemplary and is reflected at all levels of social life, especially as regards the joint protection of natural and cultural heritage, joint work activities related to the maintenance and reconstruction of Park infrastructure, the mowing and bringing in of hay and the organization of cultural landscape. Of particular significance to the inhabitants is the assistance provided by the RP regarding the preparation of the necessary documentation related to the activities which affect the environment in the protected area of the RP, a joint commemoration of national holidays and local customs and thus providing local inhabitants with permanent and periodic employment opportunities.

The area in question	Protected area of the RP
Used Method	Descriptive value of significance
Data source	Programme for the Protection and the Development of the RP in the period 2006 – 2010

**Sense of place is beyond the economic value and is strategically highly significant in the RP.**

#### 6.5.4. Supporting services

Supporting services can be defined as services that are necessary for the production of all other ES. They include services such as (O'Gorman & Bann, 2008):

- Microclimate regulation;
- Nutrient cycling Photosynthesis;
- Primary production;
- Soil formation and functioning;
- Water cycling;
- Pollination.

It can therefore be argued that the value of supporting services is infinite as without them there would be no other services or final benefits. These services provide an 'infrastructure' service that is necessary in some way to realise all of the final benefits and any attempt to value supporting services is highly likely to result in double counting of benefits. Supporting services are for these reasons not included within the overall typology presented (O'Gorman & Bann, 2008).

Supporting services (microclimatic regulation, nutrient cycling, photosynthesis, primary production, soil formation and functioning and water cycling) can be defined as services that are necessary for the production of all other ES, so their value is priceless. They provide the basis necessary for understanding the formation of final benefits provided by all other ES, so they are valued in relation to the services they support.

## 6.6. Results of ecosystem services valuation in the Regional Park

### 6.6.1. Audit framework of ecosystem services provided by Škocjan Caves Regional Park

The area of RP is highly significant as a whole and due to the fact that an ES can stem from several ecosystem types, it is rather difficult to provide a separate valuation for each habitat type.

The economic values that were available are noted in the table below, while other economic values are only indicated.

Table 41: Market value of ecosystem services in the Škocjan Caves Regional Park

ECOSYSTEM SERVICES		MV of current use of ES	MV of potential use of ES	Details and source of data	Area considered in the calculation	Habitat type
PROVISIONING SERVICES						
Food	Game	1,400 €	1,400 €	Hunting Association of Slovenia	PA of the RP	Woodland
	Fisheries	5,200	5,200	Anglers Association Ilirska Bistrica	PA and Buffer zone	Inland waters
	Non-timber forest products	Insignificant value	Insignificant value	Local inhabitants	PA of the RP	Cultivated land
	Honey	1,750 €	3,800 €	The Public Agency "Park Škocjanske jame, Slovenija"	PA of the RP; Buffer zone	Grassland
	Crops	Insignificant value	Insignificant value	Ministry of Agriculture, Forestry and Food	PA of the RP	Cultivated land
	Livestock production	5,250 €	5,250 €	The Farmer in Matavun	PA of the RP	Grassland
Fibre and Fuel	Wood	500 €	500 €	Gozdno gospodarstvo Postojna	PA of the RP	Woodland
	Unwashed sheep wool	0 €	100 €	Farmer in Matavun, Soven, Ltd	PA of the RP	Cultivated land
	Water flow	48,050 €	48,050 €	Slovenian Environmental Agency	Buffer zone	Inland waters
Ornamental resources	Game trophy	2,600 €	2,600 €	Hunting Association of Slovenia	PA of the RP	Woodland
	Wool products	0 €	37,850 €	Market analyses, Soven, Ltd	PA of the RP	Human made habitats
Fresh water	Drinking water	208,850 €	208,850 €	The Public Agency "Park Škocjanske jame, Slovenija"	PA and Buffer zone	Inland waters

	Bathing waters	Insignificant value	Insignificant value	Water Management Plan for the Danube river and the Adriatic Sea	PA and Buffer zone	Inland waters
	Watering	3,350 €	3,350 €	Slovenian Environmental Agency	PA and Buffer zone	Inland waters
	Water for technological purposes	214,900 €	214,900 €	Slovenian Environmental Agency	Buffer zone	Inland waters
Genetic resources	Nursery fruit trees	0 €	13,000 €	The Public Agency "Park Škocjanske jame, Slovenija"	PA of the RP	Cultivated land
REGULATING SERVICES						
Air-quality regulation	Clean air	550 €	550 €	Aphecom	PA of the RP	All habitats
Climate regulation	Carbon sequestration	4,700 €	4,700 €	Gozdno gospodarstvo Postojna	PA of the RP	Woodland
Buffer	Wind protection	Law significant	Law significant	Internet sources	PA of the RP	Cultivated land, Woodland
Erosion regulation	Erosion control	Law significant	Law significant	Gozdno gospodarstvo Postojna	PA of the RP	Woodland
Water quality regulation	Clean water	Moderately significant	Moderately significant	Water Management Plan for the Danube river and Adriatic Sea	Buffer zone	Inland waters
Pollination	Pollination	Moderately significant	Moderately significant		PA of the RP	
CULTURAL SERVICES						
Cultural heritage	Ethnological heritage	35,850 €	35,850 €	The Public Agency "Park Škocjanske jame, Slovenija"	PA of the RP	Human made habitats
Recreation & tourism	Cave tourism	10,908,850€	11,151,950 €	The Public Agency "Park Škocjanske jame, Slovenija"	PA of the RP; PA surroundings	Caves
	Hiking and cycling	84,300 €	457,600 €	Škocjan Tourist Association Cultural and Sport Association of Dane and Kačiče – Pared	PA of the RP	Grassland
	Hunting tourism	600€	600 €	Hunting Association of Slovenia	PA of the RP	Woodland
	Carriage riding	0 €	150,000 €	Visitor survey	PA of the RP	Human made habitats
Aesthetic	Underground caves,	Strategically very	Strategically very	The Public Agency "Park Škocjanske jame,	PA of the RP	All habitats

value	collapse dolines, traditional parkland sites, depressions, attractive riverside sites, traditional vernacular buildings	significant	significant	Slovenija"		
Employment	Direct employment	849,300 €	893,650 €	The Public Agency "Park Škocjanske jame, Slovenija"	PA of the RP	Caves
	Indirect employment	190,500 €	219,500 €	Caterers in the Divača Municipality	Divača Municipality	Human made habitats
Scientific value	World Heritage Site, Ramsar Site, Natura 2000 Site, EIA	Strategically very significant	Strategically very significant	The Public Agency "Park Škocjanske jame, Slovenija"	PA of the RP	All habitats
Spiritual value	Contact with nature, tranquillity, Inspiration	Strategically very significant	Strategically very significant		PA of the RP	All habitats
Education	Formal education	100,550 €	100,550 €	The Public Agency "Park Škocjanske jame, Slovenija"	PA of the RP	All habitats
	Informal education	Strategically very significant	1,027,150 €	Visitor survey	PA of the RP	Human made habitats
Social relations	Festivals and other events	188,800 €	188,800 €	Škocjan Tourist Association, Literary Association IA, The Škocjan Caves Park Public Service Agency, Slovenia	PA of the RP	Human made habitats

Table frame: Glaves (2009)

Note: The value of potential ES use is colored red

## 6.6.2. Current use of ecosystem services in the Škocjan Caves Regional Park

An overview of market value and gross value added estimates of the final benefits provided by the Škocjan Caves Regional Park ecosystem services in 2011 is provided in the table below.

*Table 42: Market value and gross value added of a current use of ecosystem services in the Škocjan Caves Regional Park in 2011*

CURRENT USE OF ECOSYSTEM SERVICES	Welfare measures - constituent of TEV (in €)			Contribution to the economy (in €)
	MV	Consumer surplus	Estimation of total WTP (e.g. damage cost avoided)	GVA
<b>PROVISIONING SERVICES</b>	<b>491,830</b>	-	<b>0</b>	<b>473,860</b>
Food	13,586	-	-	3,381
Fibre and fuel	48,559	-	-	40,793
Ornamental	2,610	-	-	2,610
Fresh water	427,076	-	-	427,076
Genetic resources	-	-	-	-
<b>REGULATING SERVICES</b>	<b>0</b>	-	<b>5,259</b>	<b>4,825</b>
Air quality	-	-	538	538
Climate regulation	-	-	4,720	4,287
Buffer	-	-	-	-
Erosion	-	-	-	-
Water quality regulation	-	-	-	-
<b>CULTURAL SERVICES</b>	<b>12,358,749</b>	-	<b>0</b>	<b>11,041,703</b>
Cultural heritage	35,852	-	-	35,852 <sup>11</sup>
Tourism and recreation	10,993,764	-	-	9,676,718 <sup>11</sup>
Aesthetic value	-	-	-	-
Employment	1,039,781	-	-	1,039,781
Scientific value	-	-	-	-
Education	100,540	-	-	100,540 <sup>11</sup>
Mental and physical health	-	-	-	-
Social relations	188,812	-	-	188,812 <sup>11</sup>
Sense of place	-	-	-	-
<b>TOTAL ANNUAL VALUE</b>	<b>12,850,578</b>	-	<b>5,259</b>	<b>11,520,388</b>

As can be seen from the table, benefits received from cultural services appear to be the most significant in value, with benefits arising from the provision of fresh water also providing significant values. However, results in Table 42 need to be interpreted with care.

The value of other benefits, especially regulating services, is very likely to be significantly underestimated due to issues encountered relating to the general approach applied (a total valuation) and to data limitation.

<sup>11</sup> As the costs of ethnological heritage, caves, education and social relations are related to the management of the RP, they can not be divided by individual ES, so they are included only within the tourism and recreational services

Among provisioning services, the highest value is to be found with tourism and recreational services, which could be explained by the fact that it was very difficult to divide ecosystem services into individual ES. The value of an individual ES in the study was associated with the purchase of the ticket. With a ticket to the cave, visitors also obtain access to other ES, for instance, to the museum collections, the viewing point, Škocjan Educational Trail and the Velika dolina. Therefore caves have the highest estimated value, while all other ES are most likely slightly underestimated. The proportion of visits to various parts of the park providing various ES can be found in Appendix 6 "Survey results – Visits to different parts of the Škocjan Caves Regional Park".

Some of ES of the RP can also be visited without purchasing a ticket or without a guide, e.g. the Škocjan Educational Trail, the Velika dolina collapse doline, the viewpoint. Due to data limitations regarding the number of visitors who walk in the park without a guide, this ES are very likely to be significantly underestimated.

It should be noted that the park enables the inhabitants and workers in the wider area of the park to benefit from the ecosystem services that it provides. Thus, the calculated market value and gross value added of the Škocjan Caves Regional Park concerns the benefit of all the people related to the RP and not merely a monetary value obtained by the Škocjan Caves Regional Park.

### **6.6.3. Potential use of ecosystem services in the Škocjan Caves Regional Park**

The area of the RP is an area with an extraordinarily high tourism potential. Part of its potential is due to its location in the Karst region and in the hinterland of important coastal towns. Unfortunately the tourism offer is very moderate, which is why visiting tourists generally only stay for a short period of time.

The present study consequently identifies some of the options for the development of tourism potentials.

In the study, we considered the possibility of extending the parks' tourism offer to four caves with controlled access located in the transitional area of the RP (the Divača Cave, Cave in Sokolak, the Kačna Cave and the Mejame Cave) as well as the possibility of visiting Hanke's Channel, part of the Škocjan Caves underground canyon. Other options, for instance, include selling honey, selling products from spun sheep fibres, indigenous nursery species of apple and plums and unwashed sheep wool under the trademark of the RP, cycling, carriage riding and tasting of traditional karst food.

It needs to be pointed out, however, that in planning to introduce a new ES use, it is crucial to first identify different options for future use of resources that might bring additional benefits. The next step is to identify all the advantages and disadvantages of the potential ES and how it might affect nature and living beings that depend on it daily. Furthermore, it is also essential to assess the carrying capacity of the area as well as general ES limitations.

**Introducing additional use of an ES in the RP should never have harmful consequences on the environment.**

That is why the carrying capacity of the protected area of the RP was also taken into account in the present study and our assessment of the options for the development of tourism potentials.

All potential uses of the ES in the RP and their impact on the environment are overviewed in the following table.

*Table 43: Škocjan Caves Regional Park potentials and possible impact assessment*

	<b>Potentials of the Škocjan Caves Regional Park considered in the valuation</b>	<b>Possible impact on the area of the Škocjan Caves Regional Park</b>
1	Sale of honey under the trademark of the RP	Neutral
2	Sale of products from spun sheep fibres under the trademark of the RP	Neutral
3	Sale of the indigenous nursery species of apple and plum trees from the Brkini region under the trademark of the RP	Neutral
4	Sale of unwashed sheep wool	Neutral
5	Opening of four more new caves of national importance (Divača Cave, Cave in Sokolak, Kačna Cave and the Mejame Cave) located in the transitional area of the RP and Hanke's Channel in the Škocjan Caves system	Traffic increase
		Negative impact on cave capacity if not regulated
		Positive impact on local employment
		Negative impact on drinking water capacity
		Negative impact on wastewater capacity
		Negative impact on parking capacity (additional parking space needed)
6	Cycling	Positive impact on local economy (tourism services)
		Traffic increase
		Negative impact on animals because of noise
		Negative impact on parking capacity (additional parking space needed)
7	Carriage rides	Positive impact on local economy (tourism services)
		Traffic increase
		Negative impact on parking capacity (additional parking space needed)
8	The new information centre	Positive impact on local economy (tourism services)
		Traffic increase
		Negative impact on parking capacity (additional parking space needed)
		Positive impact on local area characteristics (karst, flora and fauna, cultural and historical heritage)

The following table show the final benefits of the potential use of ecosystem services provided by the Škocjan Caves Regional Park in 2011.

Table 44: Market value and gross value added of a potential use of ecosystem services in the Škocjan Caves Regional Park in 2011

POTENTIAL USE OF ECOSYSTEM SERVICES	Welfare measures - constituent of TEV (in €)			Contribution to the economy (in €)
	MV	Consumer surplus	Estimation of total WTP (e.g. damage cost avoided)	GVA
<b>PROVISIONING SERVICES</b>	<b>544,829</b>	-	<b>0</b>	<b>487,860</b>
Food	15,616	-	-	4,291
Fibre and fuel	48,664	-	-	40,898
Ornamental	40,474	-	-	13,030
Fresh water	427,076	-	-	427,076
Genetic resources	13,000	-	-	2,565
<b>REGULATING SERVICES</b>	<b>0</b>	-	<b>5,259</b>	<b>4,825</b>
Air quality	-	-	538	538
Climate regulation	-	-	4,720	4,287
Buffer	-	-	-	-
Erosion	-	-	-	-
Water quality regulation	-	-	-	-
<b>CULTURAL SERVICES</b>	<b>14,225,630</b>	-	<b>0</b>	<b>12,728,660</b>
Cultural heritage	35,852	-	-	35,852 <sup>12</sup>
Tourism and recreation	11,760,205	-	-	10,392,890 <sup>12</sup>
Aesthetic value	-	-	-	-
Employment	1,113,083	-	-	1,113,083
Scientific value	-	-	-	-
Education	1,127,678	-	-	998,023 <sup>12</sup>
Mental and physical health	-	-	-	-
Social relations	188,812	-	-	188,812 <sup>12</sup>
Sense of place	-	-	-	-
<b>TOTAL ANNUAL VALUE</b>	<b>14,770,459</b>	-	<b>5,259</b>	<b>13,221,345</b>

The existence of the park enables people who live or work in the wider area of the park to benefit from ES that the RP provides. So the calculated GVA of the RP is not money that is earned by the RP, but it is the total benefit of all the people that are related to the RP.

<sup>12</sup> As the costs of ethnological heritage, caves, education and social relations are related to the management of the RP, they can not be divided by individual ES, so they are included only within the tourism and recreational services

#### 6.6.4. Results and main conclusions of the ecosystem service valuation in the Škocjan Caves Regional Park

The table below shows comparison of the gross value added in 2011 with current and potential use of ES of the RP.

*Table 45: Gross value added with and without potential use of ecosystem services in the Škocjan Caves Regional Park in 2011*

GROSS VALUE ADDED	CURRENT USE OF ES (in €)	POTENTIAL USE OF ES (in €)	POTENTIAL GAINS (in €)
<b>PROVISIONING SERVICES</b>	<b>473,860</b>	<b>487,860</b>	<b>13,999</b>
Food	3,381	4,291	909
Fibre and fuel	40,793	40,898	105
Ornamental	2,610	13,030	10,420
Fresh water	427,076	427,076	0
Genetic resources	-	2,565	2,565
<b>REGULATING SERVICES</b>	<b>4,825</b>	<b>4,825</b>	<b>0</b>
Air quality	538	538	0
Climate regulation	4,287	4,287	0
Buffer	-	-	0
Erosion	-	-	0
Water quality regulation	-	-	0
<b>CULTURAL SERVICES</b>	<b>11,041,703</b>	<b>12,728,660</b>	<b>1,686,957</b>
Cultural heritage	35,852	35,852	0
Tourism and recreation	9,676,718	10,392,890	716,172
Aesthetic value	-	-	-
Employment	1,039,781	1,113,083	73,302
Scientific value	-	-	-
Education	100,540	998,023	897,483
Mental and physical health	-	-	-
Social relations	188,812	188,812	0
Sense of place	-	-	-
<b>TOTAL ANNUAL VALUE</b>	<b>11,520,388</b>	<b>13,221,345</b>	<b>1,700,957</b>

In calculating the net present value of the current use of ES of the RP we have considered:

- GVA of the ES provided by the RP;
- Maintenance costs;
- Investment of the RP (net book value excluding value of land and investment in public infrastructure);
- Estimated investments of other stakeholders;
- Annual expenditures of the RP except amortization costs (Income statement of the RP); and
- Estimated expenditure of other stakeholders except amortization costs.

Investment and expenditure costs are presented below, in Table 46.

Table 46: Investment with and without potential use of ecosystem services in 2010

INVESTMENTS	With current use of ES	With potential use of ES
Net book value excluding value of land (fixed asset register of the RP)	4,346,719	4,488,304
Investment in public infrastructure	403,428	403,428
<b>Total investment of the RP</b>	<b>4,750,147</b>	<b>4,891,732</b>
Water flow	348,500	348,500
<b>Other stakeholders investment</b>	<b>348,500</b>	<b>348,500</b>
<b>TOTAL INVESTMENT</b>	<b>5,098,647</b>	<b>5,240,232</b>
EXPENDITURE	With current use of ES	With potential use of ES
All expenditure of the RP except amortization (Income statement of the RP)	1,292,000	1,341,060
Other stakeholders expenditure	19,289	194,470
<b>TOTAL EXPENDITURE</b>	<b>1,311,289</b>	<b>1,535,530</b>

Net present value of current use of ES of the RP in the time period of 30 years and discount rate of 5% is estimated at 215,8 million € and net present value of potential use of ES of the RP is estimated at 253,4 million €.

Table 47: Net present value of the Škocjan Caves Regional Park (in €)

NET PRESENT VALUE	Current use	Potential use	Potential gains
Net present value	215,881,485	253,442,542	37,561,057

Main conclusions:

- The RP has a wide range of benefits extending beyond the economic value of the RP (aesthetic value, scientific value, spiritual value and informal education),
- MV of the final benefits provided by the Škocjan Caves Regional Park ES in 2011 is estimated at 12.8 million €, and MV of potential use of ES is estimated at 14.7 million €,
- GVA of the final benefits provided by the Škocjan Caves Regional Park ES in 2011 is estimated at 11.5 million €, and MV of potential use of ES is estimated at 13.2 million €,
- With the potential use of the ES provided by the RP, we could gain additional 1.7 million € per year, which amounts to approximately 37.5 million € in 30 years.

This case suggests that it is essential to consider options for potential use of ES provided by the RP in order to achieve better allocation of resources and greater earnings. However, the ecosystem constraints also need to be taken into account. Excessive tourist activity in the area could result in causing natural imbalance, the area becoming too "touristy", and in the future no longer attracting tourists, who truly value nature. The result of such management can be reflected in lower GVA of the site.

Since the purpose of our study is primarily to raise awareness among key stakeholders about the importance of ES valuation and not decisions about potential uses of ES, the study results are an only estimation. Identification of potential uses of ES was based on opinions of key stakeholder's about the parks opportunities and on visitors desires and no detailed market analyses was carried out. For decisions concerning future use of ES, a more detailed

market analysis is required, which exceeds the objectives of this study.

#### 6.6.5. Usability of the study results

Ecosystem services valuation studies have considerably increased our appreciation of ecosystems' value. Such evaluations are especially valuable as they present the full range of benefits of specific ecosystems for people who benefit from them. Due to its comprehensive holistic nature, the said approach provides an important basis for sustainable planning and enables sustainable development of the region for both present and future. Unfortunately, environmentalists, decision makers, governments and the civil society often reach for impressive, but sometimes unsound valuation results and use them indiscriminately and often inappropriately. Naturally, consequent poor decisions can affect the ability of the natural environment to provide essential benefits and functions in the future.

In order to help make the right decisions that will contribute to the prosperity of all, rather than a few individuals, it is our duty to evaluate each and every ES of specific ecosystems, thus making an important contribution to both our present and future prosperity.

The main aim of this study was to help raise public awareness about the importance of conservation and sustainable exploitation of ES in general. Study results, consequently, do not come as an answer to specific problems encountered by the RP. The results should merely be used as a basis and should be upgraded when deciding about the allocation and management of specific ES.

## 7. SUMMARY

### *Summary*

The subject of the following study is valuation of the ES in the RP to demonstrate the contribution of the Škocjan Caves Regional Park to the local, national and global economy, thus calling for conservation and sustainable use of ecosystem services provided by the RP as well as a stronger local and political support of the latter.

Ecosystem service evaluation is the base for decision making process, because bad decisions can cause environmental degradation and deterioration of living conditions of the individuals. If we want to bring prosperity to people then it is our duty to evaluate each and every ES in order to make right decisions regarding using and managing ES provided by ecosystem.

The Škocjan Caves Regional Park is protected area, located in the south-western Slovenian municipality of Divača on the Karst Plateau. In the buffer zone of the park are located two more protected areas, the doline of the Reka river and protected area of Snežnik-Pivka. The RP is an area of 413 ha of ten habitat types (woodland, inland rocks scree and sands, cultivated land, dry and semi dry grassland, hay meadows, wet meadows, human made habitats, inland waters, tall-herb communities and scrub and areas in succession). Area of the RP is also part of the trans-European network of ecologically important natural areas, Natura 2000 Site and in an ecologically important area. The RP was, during crossing into the new millennium, included in the network of protected areas in Alps, in the Association EUROPARC, in the International show caves Association. Škocjan Caves have been listed in the Ramsar list as the first underground wetland because of the significant natural wetland habitat, which includes highly specialized and often endemic species of terrestrial and aquatic cave fauna – including proteus (*Proteus anguinus*). Škocjan caves are also very important for the world natural heritage. In 1986 they were designated as one of the UNESCO World Heritage Sites. They represent the only natural monument in Slovenia in classical karst region and each year attracts about 100,000 tourists from all over the world.

An educational service is also very important. The Park personnel have prepared for visitors guided tours along the Škocjan educational trail with the learning program about the karst characteristics.

Visitors in addition to purchasing tickets, buy different souvenirs, they spend on food and beverage, night stays, which in addition to direct employment of parks managers also offers indirect employment to caterers and others engaged in tourism.

Protected area of the RP with three villages, Matavun, Betanja and Škocjan is located in the Divača Municipality. Average number of residents is 70. According to the Annual game management plan in the area allowed to hunt, according to the annual Forest Management Plan in the area is allowed the exploitation of timber growth, harvesting of various non-timber forest products and herbs is only in the scope of local population for

their own needs. Annual production of honey in the area of RP is about 250 kg; livestock has only one farmer in the area, agriculture is very low. Villages are supplied with drinking water outside the protected area of the park. An area of the RP has an impact on the quality of Timavo springs in Italian side where the river comes to the surface again. The air, in the area of the park, is clean, since there is no heavy industry. Strong winds dries soil, but also brings clean air.

In the study, we compared and estimated two scenarios; one is current state of management of the park without any changes and one with the use of areas potentials. As a potential was considered the possibility of extending the park on the transitional area of the RP where four more caves with the controlled access are located (Divača Cave, Cave in Sokolak, Kačna cave and Mejame) and the possibility of visiting Hanke's Channel which is a part of the Škocjan caves underground canyon. We also considered use of other services, like sale of honey, products from spun sheep fibres, indigenous nursery species of apple and plums and unwashed sheep wool under the trademark of the RP as well as cycling, carriage riding and tasting of traditional karst food. If we expand the tourist opportunities in the RP, guests could stay in the park for a longer period of time and spend in Slovenia more money.

Considering all the discussed ES provided by the RP were in 2011 best evaluated cultural services (11,041,700 €), which include recreational and tourist services (9,676,700 €), employment (1,039,800 €) and education (100,550 €), followed by provisioning services in a much smaller amount (473,850 €), and finally regulating services (4,800 €).

Supporting services like microclimate regulation, soil formation, primary production, nutrient cycling, water cycling, photosynthesis and pollination are services that support the production of all other ES, so their value is priceless. Supporting services provide the basis necessary for understanding the formations of final benefits provided by all other ES and are therefore evaluated in relation to the services they support.

The estimated market value of the scenario with the current management of the park without any changes in 2011 amounts at 12.8 million € and the scenario with the potential of the park 14.7 million €, which for approximately 2 million € exceeds the scenario with current use of ES of the RP. Calculated NPV of the scenario with the current management of the park without any changes amount at approximately 215.8 million € and of the scenario which consider the potential of the park 253.4 million €.

It should be noted that the park enables the inhabitants and workers in the wider area to benefit from the ecosystem services that it provides. Thus, the calculated market value and gross value added of the Škocjan Caves Regional Park is a benefit of all the people related to the existence of the RP and not merely a profit made by the Škocjan Caves Regional Park.

Based on the results of the study we can conclude that it would be wise to consider the possibility of extending and increase the tourists supply. For the realization of this scenario, it would be necessary to prepare detailed marketing analysis and on this basis a detailed investment program.

## **Povzetek**

*Predmet obravnavane študije je vrednotenje ES Parka Škocjanske jame z namenom opredelitve prispevka Parka Škocjanske jame k lokalni, nacionalni in svetovni ekonomiji in z namenom ustvarjanja lokalne in politične podpore za ohranjanje in trajnostno rabo ES Regijskega Parka.*

*Ekonomsko vrednotenje ES je osnova za procese odločanja, saj lahko slabe odločitve povzročajo degradacijo okolja in poslabšanje življenjskih razmer posameznikov. Če želimo doseči splošno blaginjo vseh ljudi, potem je naša dolžnost, da ekonomsko ovrednotimo vsako ES. Samo na ta način bomo v bodoče lahko sprejemali prave odločitve v zvezi z uporabo in upravljanjem ES, ki jih nudi ekosistem.*

*Analizirano območje RP se nahaja na zavarovanem območju Krasa, na vplivnem območju parka pa sta še dve varstveni območji, dolina Reke in varstveno območje Snežnik-Pivka. Površina zavarovanega ožjega območja RP obsega 413 ha in je sestavljena iz desetih habitatnih tipov (gozdne površine, goličave, obdelane površine, suha in polsuha travišča, gojeni travniki, mokrotni travniki, pozidane površine, vodne površine, visoko steblikovje ter grmovje in zaraščajoče površine). Območje RP spada tudi v vseevropsko omrežje ekološko pomembnih območij narave, Natura 2000 in v ekološko pomembno območje. Park je bil ob prestopu v novo tisočletje vključen v Mrežo zavarovanih območij v Alpah, v organizacijo EUROPARC, v mednarodno jamsko zvezo ter vpisan na Ramsarski seznam pod okriljem Unesca, ki vključuje močvirja, ki imajo mednarodni pomen, zlasti kot prebivališča močvirskih ptic. Škocjanske jame so vanj uvrščene kot prvo podzemno mokrišče zaradi pomembnega naravnega habitata, ki vsebuje visoko specializirane in pogosto endemične vrste kopenskih in vodnih jamskih živali – med njimi tudi človeško ribico (*Proteus anguinus*). Škocjanske jame so izjemnega pomena za svetovno naravno dediščino in so bile leta 1986 vpisane v seznam svetovne dediščine pri Unescu. Predstavljajo edini spomenik v Sloveniji in na klasičnem Krasu in vsako leto privabijo okoli 100.000 turistov iz celega sveta.*

*Zelo pomembna storitev RP je izobraževalna storitev. Upravljalci parka so za obiskovalce pripravili vodene ekskurzije po učni poti s spoznavanjem posebnosti Klasičnega krasa.*

*Obiskovalci poleg nakupov vstopnic, kupujejo tudi razne spominke, porabijo za nočitve in hrano, kar poleg direktnih zaposlitev, RP omogoča tudi indirektno zaposlitve za gostince in ostale, ki se ukvarjajo s turizmom.*

*Zavarovano območje RP s tremi naselji, Matavun, Betanja in Škocjan se nahaja v občini Divača. Povprečno število prebivalcev je 70. Na območju je glede na letni načrt odvzema divjadi dovoljeno loviti divjad, glede na letni plan poseka gozda je dovoljeno izkoriščanje lesnega prirasta, nabiranje različnih gozdnih sadežev in zdravilnih zelišč samo za lastne potrebe lokalnega prebivalstva, letno se pridela okoli 250 kg medu, z živinorejo se na območju ukvarja le en kmet, poljedelstva pa je zelo malo. Naselja se oskrbujejo s pitno vodo zunaj zavarovanega območja parka. Območje parka vpliva na kvaliteto izvirov Timavo na italijanski strani, kjer Reka zopet pride na površje. Na območju parka je zrak zelo čist, saj na območju ni nobene težke industrije, področje je malo poseljeno, močni vetrovi pa poleg izsuševanja zemlje skrbijo tudi za čist zrak.*

*V študiji sta bila primerjana in ocenjevana dva scenarija, in sicer scenarij s sedanjim upravljanjem parka brez sprememb in scenarij, kjer so upoštevani najbolj pomembni potenciali parka. Kot potencial območja je bila upoštevana možnost razširitve parka na tranzicijsko območje Parka, kjer se nahajajo štiri jame z nadzorovanim dostopom (Divaška jama, Jama v Sokolaku, Kačna jama in Mejame), poleg tega pa dati možnost ogleda Henkerjevega kanala, ki je del sistema Škočjanskih jam. Upoštevali smo tudi uporabo drugih storitev kot je: prodaja medu, izdelkov iz ovčje volne, avtohtone sadike jabolk in sliv in prodajo neoprane ovčje volne pod blagovno znamko RP, kakor tudi izposoja koles, najem kočije in preizkušanje tradicionalnih kraških jedi. Če bi razširili ponudbo parka, bi gostje lahko ostali na območju parka dlje časa in tako v Sloveniji zapravili več denarja.*

*Od vseh obravnavanih ES, ki jih zagotavlja RP so bile v letu 2011 najbolj ocenjene kulturne storitve (11.041.700 €), kamor uvrščamo rekreacij in turizem (9.676.700 €), zaposlovanje (1.039.800 €) in izobraževanje (100.550 €), nato v precej manjšem znesku oskrbovalne storitve (473.850 €) in nazadnje uravalne storitve (4.800 €).*

*Podporne storitve kot je mikroklimatsko uravnavanje, nastajanje prsti, primarna produkcija, kroženje hranil, kroženje vode, fotosinteza ter opráševanje so storitve, ki podpirajo proizvodnjo vseh ostalih ES, zato je njihova vrednost neprecenljiva. Zagotavljajo osnovo potrebno za razumevanje nastanka končnih koristi, ki jih zagotavljajo vse ostale ES in so tako vrednotene v povezavi s storitvami, ki jih podpirajo.*

*Ocenjena tržna vrednost scenarija s sedanjim upravljanjem parka brez sprememb v letu 2011 znaša 12,8 milijonov €, scenarija z upoštevanjem potenciala parka pa 14,7 milijonov €, kar za cca 2 milijona € presega ocenjeno tržno vrednost sedanje rabe ES parka. Neto sedanja vrednost scenarija s sedanjim upravljanjem parka brez sprememb znaša 215,8 milijonov €, scenarija z upoštevanjem potenciala parka pa 253,4 milijonov €.*

*Obstoj parka omogoča, da imajo vsi ljudje, ki živijo in delajo na širšem območju koristi od ES, ki jih RP nudi. Torej izračunana tržna in bruto dodana vrednost RP ni denar, ki ga bo zaslužil RP, temveč je to ocenjena skupna korist vseh ljudi, ki so povezani z obstojem RP.*

*Glede na rezultate študije lahko zaključimo, da bi bilo pametno razmisliti o možnosti razširitve ponudbo parka. Če bi se odločili za realizacijo te variante, bi bilo potrebno narediti natančno marketinško analizo na podlagi katere bi bilo potrebno pripraviti še natančen investicijski program.*

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