



**SEMINAR ON ENVIRONMENTAL SERVICES AND FINANCING FOR THE PROTECTION AND SUSTAINABLE USE OF ECOSYSTEMS**

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**NATIONAL REPORT ON ENVIRONMENTAL SERVICES AND FINANCING FOR THE PROTECTION AND SUSTAINABLE USE OF WATER RELATED ECOSYSTEMS IN BOSNIA AND HERZEGOVINA**

**CASE STUDY WATERFALL SKAKAVAC**

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**1. EVALUATION OF ECOSYSTEM SERVICES**

**A. DETERMINATION OF FACTORS FOR USING PAYMENT OF ECOSYSTEM SERVICES**

Mechanism of ecosystem services payment in Bosnia and Herzegovina hasn't been established, due to many reasons among which are:

- lack of financial support and good will to protect ecosystems within catchment area
- inadequate legal framework for water's ecosystem protection
- poorly developed and inadequate system of physical planning
- lack of system for integrated management
- low level of CBD implementation without possibility to implement ecosystem's approach
- very intense anthropogenous pressures onto river and lake's ecosystem that are result of :
  - A. unsolved issues of waste and industrial water disposal
  - B. poorly developed system of solid waste management
  - C. poorly developed system of control and surveillance
  - D. insufficiently developed penalty system

**B. CHARACTERISTICS OF RIVER BASINS**

Total length of BiH borders amounts 1537 km, of which 762,5 are land border, 751 km are river borders and 23,5 are sea borders.

Bosnia and Herzegovina is contained within the Black Sea catchment and the Adriatic Sea catchment. Within these two there are seven river catchment areas: Una, Vrbas, bosna, Drina, Sava, Neretva with Trebišnjica and Cetina. The rivers from first four flows into Sava river, a tributary of Danube. Neretva, Trebišnjica and Cetina drain into the Adriatic Sea.

The annual precipitation in BiH (1250 l/m<sup>2</sup>) is high when compared with the European average, but this is unevenly distributed, with a good proportion falling in the winter months.

Although rivers are characterised by relatively high runoff, there is a great variation in flow and much of this (57 %) leaves the territory unused. In spite of apparent wealth of water resources, this

significant spatial and time variation results in areas that experience heavy flooding in winter months and suffer from drought in summer.

Natural lakes in B&H can be classified as constant and periodical. Constant are classified as river lakes (Pliva and Una rivers) and mountain lakes. Periodical lakes formed by flooding of Karst fields, can be found near the tributaries of the Adriatic Sea.

Ground water in BiH can be found in three geographically separated areas:

- In northern part within alluvial sediments
- In central part in caves and cavities of limestone massifs
- In southern part as groundwater streams.

The Sava river forms the border with Croatia and Yugoslavia and traffic is possible along its whole length of 332 km.

Bosnia i Hercegovina has a number of mineral water springs. Mineral and thermal water resources have good economic potential, especially in areas of eco-tourism and health care. Some investments were made in this sector before the war.

### **C. MEASURING ECOSYSTEM SERVICES**

Until now in Bosnia and Herzegovina haven't been present intentions to establish direct mechanism of ecosystem services payment, thus it isn't possible to talk about true evaluation of ecosystem's services.

Moreover, here will be discussed one of the positive experiences regarding nature management, based on evaluation study of natural values. Study is related to the area whose framework is Skakavac waterfall, which along with surrounding ecosystems makes a core of newly protected area designated as nature monument. In order to establish this protected area, applied was methodology of indicator values for biocoenosis regarding specific parameters.

According to this methodology, for parameters were used multiple criteria – richness, rarity, uniqueness, threat's level, and together with analysis of ecological processes and impacts assists in definition of program tasks. Ecosystems, as the most complex biological systems, include processes and interactions, which represent vital aspect of biodiversity.

This approach is based, in the first place, on biological information. The process involves also certain social and economic issues, which could be discussed only after identification of biological priorities. The advantage of this approach is possibility to explicit link biodiversity to other natural resources and social values.

Protected area Skakavac is situated in Kanton Sarajevo, Bosnia and Herzegovina and covers an area of 1434.2 ha. Skakavac area with Mt. Ozren (1453 m) makes unique geomorphological complex, with basic Dinaric orientation NW-SE. Dominant role play formations from lower and middle Triassic

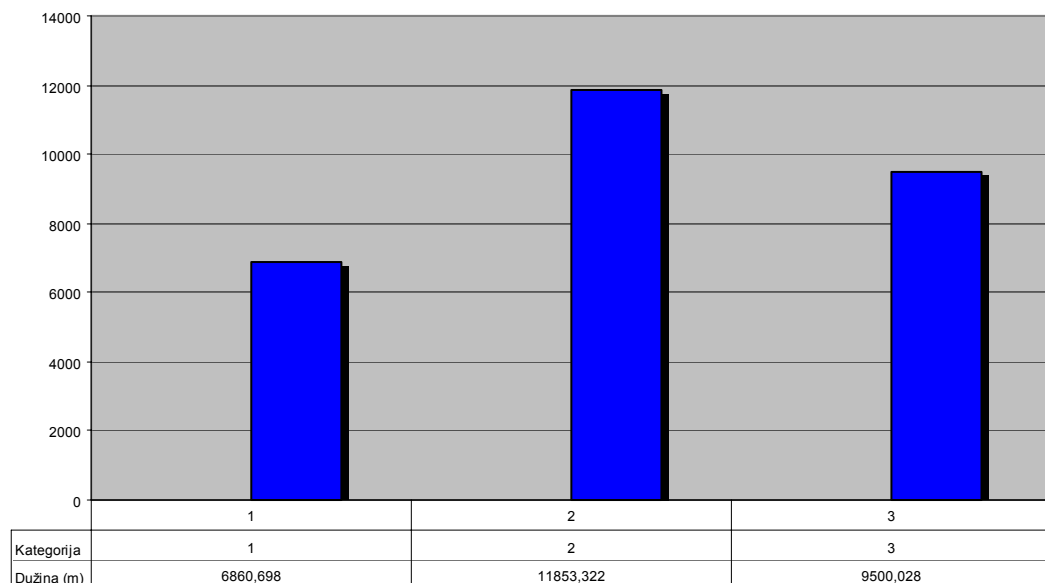
Depending on the development stage and way of moisturing, the soil types could be differentiated into two classes – automorphic (lithosol, regosol, colluvium, calcomelanosol, rendzine, ranker, calcocambisol, dystic cambisol, luvisol, podsol) and hydromorphic soil types (pseudogley, alluvial soil, semigley, eugley, histosol).

Climate of this area belongs to moderate continental climate type with strong influence of certain forms of mountain climate.

Considering phytogeographical position, this region belongs to the continental Dinaric Alps.

Protected area bursts of surface watercourses. There are many springs that are active over entire year, mountain torrents, of which the largest one is Perački potok, which downstreams, along with other torrents, builds up small river named Vogošća. Waterfall Skakavac, along with all its ambient values, represents priceless and unique worth of hydrological and geo-ecological diversity within this area.

Graf 1. Watercourses of the protected area Skakavac – numerical determinants



Network of watercourses is well developed and made of three types : small rivers, persistent torrents and occasionally torrents (Graf 1).

Main objective of mentioned methodology was to develop an effective plan for protected area management, which is to establish a system that would offer efficient solutions for potential conflicts.

Recently assessment of ecosystem's state has been accomplished through evaluation of ecosystems according to following parameters:

- general state of ecosystem
- Relation to the intensity and spectrum of human impacts
- Assessment of the carrying capacity of ecosystems
- Assessment of the threat's level for each community

For distinct parameters applied was scale as shown in Table 1

Table 1 – Carrying capacity of ecosystems

| Degree of capacity | Carrying capacity of ecosystems   |
|--------------------|---|
| 0                  | Ecosystem without possibilities for additional acceptance. A very sensitive to any changes in the structure and impacts of environmental factors.   |
| 1                  | Ecosystem without significant or with a very small carrying capacity. A very sensitive to human impacts and rapid changes in structure and dynamics. There is a danger to be completely destroyed or to become other type of ecosystem. |
| 2                  | Ecosystem with a small carrying capacity. There is no danger to have any significant changes in its structure and dynamics.   |
| 3                  | Ecosystem without significant carrying capacity. It has wider ecological amplitude and possibilities to absorb human impacts. It has stable structure of edificators.   |
| 4                  | Ecosystem with a very high carrying capacity. A very stable structure of edificators, and a high resilience.  |
| 5                  | Ecosystem with maximal level of acceptance of waste materials (entropy) and with stable mechanism of energy flow and material cycling, extraordinary vitality of edificators.   |

Second group of parameters are the one for determination of conservation's status, and here they are:

- Species richness (R)
- Level of rarity of communities (RA)
- Level of uniqueness of community (U)
- Endemism of plant community (E)
- Function of communities (F)

For certain parameters inside of group applied was scale as shown in Table 2

Table 2 – Endemism of plant community:

| Level of endemism | Characteristics and forms of endemism                   |
|-------------------|---|
| 1                 | Community with exceptional number of endemic taxa       |
| 2                 | Community with a relatively high number of endemic taxa |
| 3                 | Community with moderate number of endemic taxa          |
| 4                 | Community with a small number of endemic taxa           |
| 5                 | Community without presence of endemic taxa              |

On the basis of assessment that has been done for certain parameter's indices, created were following spectres (Table contains ecosystem's groups that are closely syndynamical related with watercourse and waterfall):

Table 3. Assessment of the state, carrying capacity, level of threat and parameters for conservation of plant communities in investigated area

| IV | PLANT COMMUNITY                   | Current state |                  |                 | Conservation parameters |     |     |     |     |
|----|-----------------------------------|---------------|------------------|-----------------|-------------------------|-----|-----|-----|-----|
|    |                                   | state         | Current capacity | Level of threat | R<br>A                  | U   | RE  | E   | F   |
| P  | Ulmo-Aceretum illyricum           | 2             | 2                | 3/4             | 4/5                     | 4   | 2   | 3/4 | 3   |
| P  | Aceri-Fraxinetum illyricum        | 2             | 2                | 3/4             | 3                       | 3   | 2   | 2/3 | 2   |
| PS | Populetum tremulae                | 3             | 3/2              | 4/3             | 4                       | 4   | 4   | 3   | 3/4 |
| P  | Alnetum glutinoso - incanae       | 2             | 2/1              | 2               | 4                       | 4   | 4/5 | 3   | 3/4 |
| P  | Alnetum incanae                   | 2             | 1/2              | 2               | 4/5                     | 4   | 3   | 3   | 3   |
| P  | Salicetum albae - fragilis        | 2/3           | 2                | 2/3             | 2                       | 2   | 2   | 2   | 1/2 |
| P  | Alnetum glutinosae montanum       | 3/2           | 2                | 3               | 3                       | 3   | 2   | 3   | 3   |
| P  | Saponario-Salicetum purpureae     | 2/3           | 2                | 3               | 2                       | 2   | 1   | 2   | 2   |
| SP | Adenostylo - Doronicetum          | 2/3           | 2                | 3               | 3/4                     | 2   | 3   | 3   | 2   |
| SP | Carduo - Aconietum                | 2             | 2                | 3               | 2                       | 2   | 2/3 | 2   | 2   |
| SP | Cirsietum waldsteinii             | 1/2           | 1/2              | 2/3             | 2                       | 2   | 3   | 3   | 2   |
| SP | Salvio glutinosae - Adenostyletum | 2/1           | 2                | 2/3             | 2                       | 2   | 2   | 2   | 2   |
| SP | Telekietum speciosae              | 2             | 2                | 3/2             | 2/3                     | 2/3 | 2/3 | 2   | 2   |
| SP | Senecio - Telekietum speciosae    | 2             | 2                | 3               | 3                       | 3   | 3   | 3   | 3   |
| S  | Caricetum gracilis                | 2             | 2/1              | 2/1             | 2/3                     | 2   | 1/2 | 2   | 2   |
| SP | Cardamino - Montion               | 2/1           | 1                | 1               | 1                       | 1   | 1   | 1   | 1   |
| SP | Cratoneurion commutati            | 1/2           | 1                | 1               | 1                       | 1   | 1   | 1   | 1   |
| PS | Dryopteris - Phyllitidetum        | 1/0           | 1/0              | 2               | 2                       | 1/2 | 3   | 2   | 2   |
| S  | Molinietum coeruleae              | 3             | 2                | 2/3             | 4                       | 2/3 | 2   | 2   | 2   |
| S  | Epilobio - Juncetum effusi        | 3             | 2                | 3/1             | 4                       | 3   | 3   | 3   | 3   |
| S  | Calthetum palustris               | 1/2           | 1                | 2               | 2                       | 2   | 3   | 2   | 2/3 |
| S  | Lysimachietum vulgaris            | 1/2           | 1/2              | 2/3             | 4/5                     | 4   | 3   | 3/4 | 4   |
| S  | Succiselletum inflexae            | 2             | 2                | 2               | 4/5                     | 4   | 3   | 3/4 | 3   |
| S  | Menthetum aquatica                | 2/3           | 1/2              | 3               | 4/5                     | 4   | 4   | 4   | 4   |
| S  | Filipenduletum ulmariae           | 2             | 2                | 2/3             | 3                       | 3   | 3   | 3   | 3   |
| SP | Aegopodio - Petasitetum hybridi   | 2             | 2/3              | 3               | 4/5                     | 4   | 4   | 4   | 4   |
| S  | Deschampsion caespitosae          | 2             | 2                | 3               | 4                       | 3   | 4   | 4   | 4   |
| T  | Petasitetum hybridi               | 2             | 2                | 2/3             | 5                       | 5   | 5   | 4   | 5   |
| T  | Pulicario - Menthetum longifoliae | 3             | 3/2              | 3               | 4                       | 4   | 5   | 4   | 5   |
| T  | Polygonetum persicariae           | 4/5           | 4/5              | 4               | 5                       | 5   | 5   | 4   | 5   |

The results of GIS analysis of conservation criteria in investigated area have shown that considering:

- richness (R):
 

| <b>% belong to</b> | <b>category</b> | <b>description of category</b>                                      |
|--------------------|-----------------|---|
| 51                 | 2               | Community with high number of species (between 71 and 100 taxa)     |
| 49                 | 3               | Community with moderate number of species (between 26 and 50 taxa); |
- rarity (RA)
 

| <b>% belong to</b> | <b>category</b> | <b>description of category</b>   |
|--------------------|-----------------|--|
| 13                 | 1               | A very rare community, with a very narrow range of distribution (stenotopic)           |
| 38                 | 3               | Moderate rare community, distributed at small number of habitats in region (mesotopic) |
| 49                 | 4               | Community with wider distribution in climate region                                    |
- uniqueness (U):
 

| <b>% belong to</b> | <b>category</b> | <b>description of category</b>                                   |
|--------------------|-----------------|--|
| 1                  | 1               | Community contributes to a very high uniqueness of the region    |
| 22                 | 2               | Community contributes to high uniqueness of the region           |
| 63                 | 3               | Community contributes to moderate uniqueness of the region       |
| 14                 | 4               | Community contributes to relatively low uniqueness of the region |
- endemism of plant communities (E):
 

| <b>% belong to</b> | <b>category</b> | <b>description of category</b>                          |
|--------------------|-----------------|---|
| 5                  | 1               | Community with exceptional number of endemic taxa       |
| 18                 | 2               | Community with a relatively high number of endemic taxa |
| 59                 | 3               | Community with moderate number of endemic taxa          |
| 18                 | 4               | Community with a small number of endemic taxa           |
- functionality (F):
 

| <b>% belong to</b> | <b>category</b> | <b>description of category</b>  |
|--------------------|-----------------|---|
| 1                  | 1               | Community has a very important role in survival of the system of ecosystems - landscape   |
| 55                 | 2               | Community has an important role in survival of the system of ecosystems - landscape       |
| 42                 | 3               | Community has a moderate role in survival of the system of ecosystems - landscape         |
| 2                  | 4               | Community has a relatively small role in survival of the system of ecosystems - landscape |

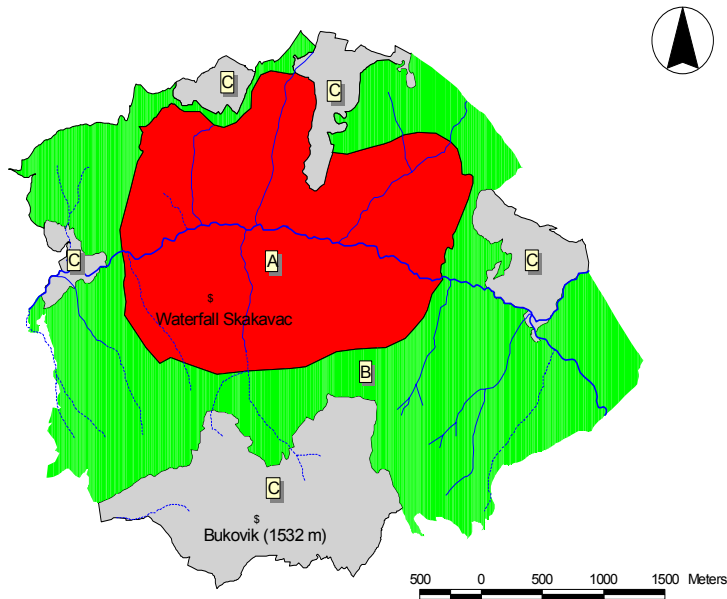


Fig. 2. Zonation of protected area Skakavac (A - core, B - buffer zone, C - transition zone)

On the basis of the complex results analysis referring to the all elements of spatial and temporal organization of ecosystems in study area, it was proposed to protect this area as Nature monument – IUCN category III protected area.

#### **D SOCIAL AND ECONOMIC ASPECTS**

Protected area is planned to be placed in service of local community with all of its capacities and beauties. With primary task to protect whole natural values of the protected area, it is possible to develop sustainable eco- or, so-called, open tourism. This area, according to its own natural capacities, degree of assessed sensitivity and suitability for different kind of human activities isn't meant to be for massive tourism. This area is suitable for limited tourism, which is so called responsible tourism. It is estimated that realistic and ecological acceptable burden is 50 000 visitors a year, having in mind assessed values of carrying capacities for some zones within the protected area, relatively to equivalent inhabitants number (EBS).

This sort of tourism includes recreation, rehabilitation, spiritual relaxation and educative tourism. By consideration of the establishment schedule for eco-tourism area, determined were following advantages:

Table 4. Potential advantages resulting from tourism within protected area

| <b>Advantages</b>                                     |  |
|---|--|
| <b>Improvement of economical options</b>              | <ul style="list-style-type: none"> <li>▪ employment of local population,</li> <li>▪ increase of income,</li> <li>▪ stimulation of new tourist activities and diversification of local economy,</li> <li>▪ encouraging local production,</li> <li>▪ gain of new markets,</li> <li>▪ improve standard of living,</li> <li>▪ generate income through taxes,</li> <li>▪ perfection of employees,</li> <li>▪ increase of financial support for the protected area and local community</li> </ul>  |
| <b>Protection of natural and cultural inheritance</b> | <ul style="list-style-type: none"> <li>▪ protect circles within ecosystem,</li> <li>▪ conserve biological diversity (including genes, species and ecosystems),</li> <li>▪ protect, conserve and evaluate cultural inheritance,</li> <li>▪ create economical values and protect resources that don't possess any kind of value for local population, that even might represent economical loss,</li> <li>▪ wide spreading of conservation values by education and interpretation,</li> <li>▪ help to communicate and explain values of natural inheritance to the visitors and inhabitants, and to create new generation of responsible consumers,</li> <li>▪ support exploration and establishment of suitable ecological management system, which will influence tourism, as well as behaviour of visitors,</li> <li>▪ Improve quality of accommodation, transportation and communication;</li> <li>▪ help to establish mechanisms of self – financing in the protected area</li> </ul> |
| <b>Improvement of life quality</b>                    | <ul style="list-style-type: none"> <li>▪ promote aesthetic, spiritual and other values;</li> <li>▪ support and promote ecological education for visitors;</li> <li>▪ arrange attractive locations, both for inhabitants and visitors, which will support activities that are compatible with sustainable use of nature, ranging from walks to industry based on natural products;</li> <li>▪ encouraging development of culture, craftwork and art;</li> <li>▪ improve education level by local population;</li> <li>▪ encouraging inhabitants to respect and cherish values of natural and cultural inheritance.</li> </ul>   |



## **E. COST-BENEFIT ANALYSIS OF LAND USE, ALTERNATIVES AND THEIR IMPACT ON ECOSYSTEM SERVICES**

Cost-benefit analysis of plan for the establishment of protected area hasn't been done yet. Management plan names some of the foreseen eco-marketing activities that would be acceptable for certain zones within protected area. Moreover, having in mind that cost-benefit analysis hasn't been done, it is unknown neither which of the proposed activities could provide the greatest gain nor which impacts they would have onto sustainability of ecosystem services.

## **II LEGAL AND CONTRACT'S ASPECT**

### **A. LEGAL AND REGULATORY FRAMEWORKS THAT CAN HELP TO ESTABLISH PAYMENTS FOR ECOSYSTEM'S SERVICES**

Legislative on environmental issues in Bosnia and Herzegovina isn't based on state's level, but on entity's level. The legislative on entity's level, beside existence of new set of environmental laws, doesn't support mechanisms for ecosystem service's payment. In some of the laws, such as Law on Water

(« Official Gazett of FB&H» 03/33) there are articles that name only penalty measures in case of stronger impact onto watercourses.

Law on ecological Fonds («Official Gazett of FB&H» 03/33) is referring to the process of issuing environmental permission on the basis of Environmental Impact Assessment. We believe that mechanism of ecosystem service's payment should start through the creation of sub-law documents in the framework of this law.

### **B. CONTRACTING ARRANGEMENTS**

Mechanism is not established.

### **C. SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACT OF PES**

Mechanism is not established.

## **III IMPLEMENTATION CHALLENGES**

Basic prerequisite for the establishment of mechanism for ecosystem service's payment is to develop preliminary strategy referring to the protection of biodiversity in Bosnia and Herzegovina. Due to the fact that state authorities until this moment didn't have chance to take strategic stand on afore said national values, there isn't public awareness of ecosystem's economic value, based on ecosystem's services, ecosystem's diversity natural and economic values.

Special issue of this process is private sector. Considering the fact that Bosnia and Herzegovina is country, which has been going through the transition process, special care at this point should be given to the encouragement of small and middle-sized private undertakers. But, being aware that environmental values in B&H society are poorly investigated and unknown to the public, we can only notice that there isn't neither will, knowledge nor awareness for starting the firms that would base and make their gain thanks to the ecosystem's services.

On the other hand, it should keep in mind that in Bosnia and Herzegovina exists an old practice of collecting and selling natural products. We believe that from these simple models on should start creating relationships between private sector and ecosystem's services.

### **C. CHALLENGES FOR THE PRIVATE SECTOR**

There is no any experience.

#### **D. CHALLENGES FOR RESEARCH AND CAPACITY BUILDING INITIATIVE**

Due to the lack of public awareness in Bosnia and Herzegovina doesn't exist trend that would promote establishment of mechanisms for ecosystem service's payment, in that manner there are no ongoing research and capacity building programmes.