

THE HARMONY BETWEEN THE NATURAL AND ANTHROPOGENIC ENVIRONMENTS WITHIN THE NATURAL PARKS. CASE STUDY – THE VIȘEU RIVER BASIN

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ABSTRACT:

By definition a natural park is a protected area designed to protect and conserve the natural environment in which the interaction between human activities and nature created a unique area, of significant environmental and cultural value and with great biodiversity. The main purpose of these natural parks is to maintain the harmony between humans and nature by protecting the biological diversity of the habitats and the environment. In recent years both the natural and anthropic areas of the Vișeu Basin have been greatly damaged by extreme hydric phenomenon caused by the chaotic deforestation of the area, increased precipitation, high pluvio-nival regime and the accentuated asymmetry of the basin itself. By developing certain hydrographical installations and conserving the protected areas a balance can be reached between the natural harmony and the strict necessities of the anthropic habitats. The first priority of this developing is the environmental legislation and biodiversity protection.

1. Introduction

Natural parks are those protected areas designed to preserve the landscaping in which the human-environment interaction creates over time a distinctive area, with a significant value, both cultural and landscaping, which often has a high biodiversity.

These parks are designed to maintain the harmony between man and nature through various ways: by protecting the habitats' and the landscape's diversity, by promoting the preservation of traditional land-use, by delimitating and reinforcing the activities, the traditional local cultures and practices and the different ways of providing recreation and tourism practice. This harmony becomes difficult to maintain when a natural phenomenon, "as old as the hills", and sadly, familiar to all of us, shows up – the floods.

This is also the case of the Vișeu River Basin, an area that almost completely overlaps the Maramureș Mountains Nature Park and the Rodnei

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Mountains National Park, where annually, the freshets take place and produce severe damage, affecting the so-called harmony between the natural and the anthropogenic environments.

The main goal of this paper is to raise awareness of the need to reestablish this harmony within the Vișeu River Basin. This harmony can be reestablished only through anthropogenic intervention, more precisely, through a hydrotechnical construction, based on a detailed study and by respecting the actual environmental compliance and the protection of the biodiversity.

2. The Vișeu River Basin – position and natural environment

Located in a cross-border area, the Vișeu River Basin overlaps two major mountain ranges of the Northern Group of Oriental Carpathians, the Maramureș Mountains and the Rodnei Mountains. The peculiarities of these mountains are the predominance of the crystalline schists and of the highest altitudes of the Oriental Carpathians, hence it results a series of alpin features, as the existence of the glacial relief, of the alpine meadows, of the chamois (*Rupicapra rupicapra*), of the marmot (the Alpine Marmot) (Pop G. 2006). The area presents a great natural hydropower capacity due to its big slopes with ridges, rapids and waterfalls (Haidu, 1993).

The Maramureș Mountains lay on a distance of 70 km and are divided into more mountain massifs as Pop Ivan (1973 m), Farcău (1957 m), Pietrosu Bargăului (1850 m), Toroioaga (1930 m), Cearcănu (1847 m). The Rodnei Mountains are more massive, their form being relatively unitary. The most important mountain massifs are: Pietrosu 2303 m, Rebra 2221 m, Puzdrele 2188 m, Ineu 2279 m.

Due to the geographical position and to the specific relief, the mountain ranges represent an important orographic point from which the Vișeu river (82km) and its main tributaries, Ruscova (41 km), Vaser (51.1 km) and Țâșla (20 km) collect their waters (figure 1). Due to the asymmetric shape of the basin and to its expansion on the right waterside, the Vișeu valley often faces alarming increases in the water level. The rivers' flow regim is divided into the high Carpathian type and the Eastern Maramureș type. These types are characterized by a maximum flood level in spring, given by the snowmelt and in summer also, given by the high amount of precipitation that fall in a very short time.

Located in the temperate continental climate with oceanic and Baltic influences, the climate is wet and cool, leading to a rather reach and relatively permanent debit of the rivers, the average annual temperature going down quickly to 7⁰C in the lower areas and to negative values in the alpine areas.

The average annual precipitations range around 1000 mm, reaching 1400-1500 mm in the higher massifs (Farcău, Pop Ivan, Toroioaga, Cearcănu). This aspect is facilitated by the westward position of the Maramureș Mountains. The number of days when the precipitations are higher than 0.1 mm is 160-170. The average thickness of the snow layer is 90 cm in the lower levels while in the higher levels it gets to 1- 2 m. The number of days with a snow layer is 70-100 in the lower regions and 150 in the high ones. (Șerban, Pandi, Sima & Selagea, 2010).

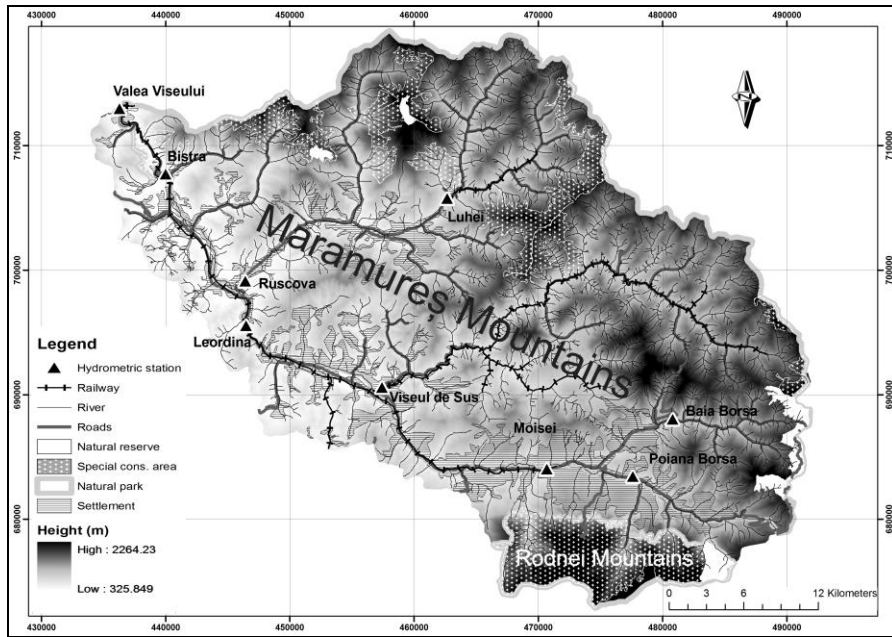


Fig. 1. The Vișeu River Basin (source : Șerban, Pandi, Sima & Selagea, 2010).

Regarding the vegetation, the coniferous and the beech forests are predominant, the fauna being represented by the Carpathian deer stag (*Cervus elaphu*), the brown bear (*Ursus arctos*), the capercaillie and the huck in the mountain rivers.

3. Methodology

The information used for this study comes from reports of Someș-Tisa Water Basin Administration (Administrația Bazinală de Apă Someș-Tisa), including the Systems Management of the Waters (Sisteme de Gospodărire a Apelor) that administrate the Vișeu River Basin, as well as those presented in the reports of the Local and County Authorities that are located in the basin.

The analysed period is 1968-2005, as well as some more recent scenes, that evaluate some freshets with great effects on the territory.

As cartographic support, there have been used various topographic maps and detailed scale plans owned by the faculty and the legislative support also, which had been taken from the websites of the specialised institutions.

After a thorough documentation and analysis of data, by using traditional and computerized methods that allow statistical analyses, classifications, generalizations and development of graphical components and tabular summaries, it is eventually tried to harmonize the natural environment and the anthropogenic one.

By using specific software, frequently used in the practical hydrology and in the specialized studies (Microsoft Office Excel, ArcView, ArcGIS/ArcInfo), there have been created various thematic maps and cartographic components, computer modelling, as well as the simulation of a hypothetical situation.

4. The organisation of the geographic space and the land-use

One can talk about the organisation of the Vişeu River Basin area according to several criteria: administrative, protected areas, the classification and land cover according to Corine Landcover.

From the *administrative* point of view, the unity belongs to the Maramureş County, located in the East-Southeastern part of the county, overlapping the main administrative units from this area. There are three major settlements: two small towns (Vişeu de Sus and Borşa) and a commune (Moisei) with a combined population over 50.000 inhabitants. Both settlements are developed in the meadows of the rivers Vişeu, Vaser and Țâșla. These settlements have a continuous territorial expansion that gives the impression of a single locality. There are also the localities Valea Vişeuului, Bistra, Petrova, Leordina, Vişeu de Jos and Poienile de sub Munte, the last one being located at the highest altitude of 770 m (figure 2).

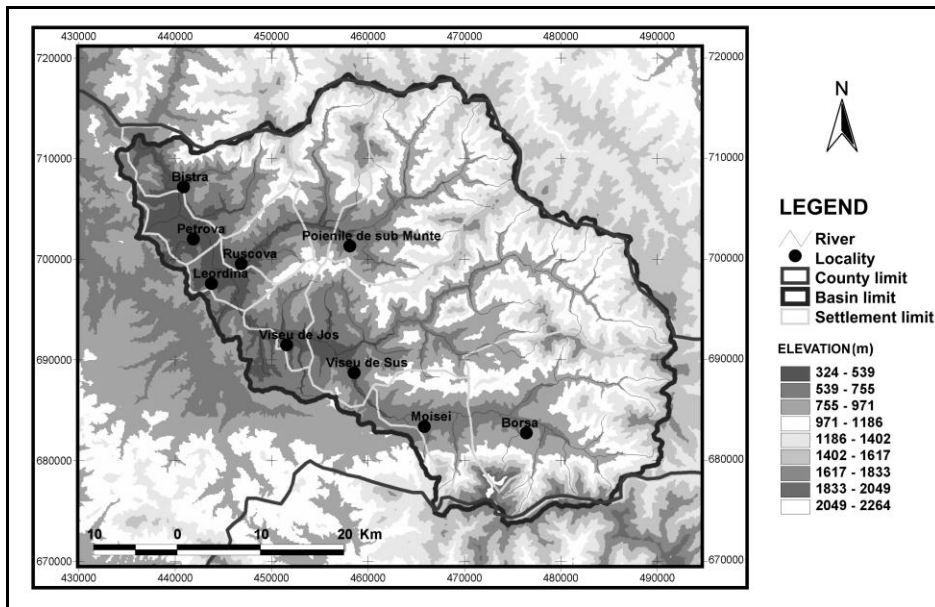


Fig. 2. The administrative division of the Vişeu River Basin.

Within the Vişeu River Basin there are two protected areas of a major importance: the Rodnei Mountains National Park and the Maramureş Mountains

Nature Park. In relation to this study, the Maramureș Mountains Nature Park has a greater relevance. Therefore, this paper will mostly insist on this protected area.

Maramureș Mountains National Park is situated in the Northern part of the Maramureș County. Its boundaries were set up and endorsed by the Governmental Decision no. 2151/2004. *In terms of internal zoning*, according to GEO 57/2007, the Maramureș Mountains National Park area includes three zones (figure 3):

- the full protection zone
- the sustainable management zone
- the sustainable development of human activities zone

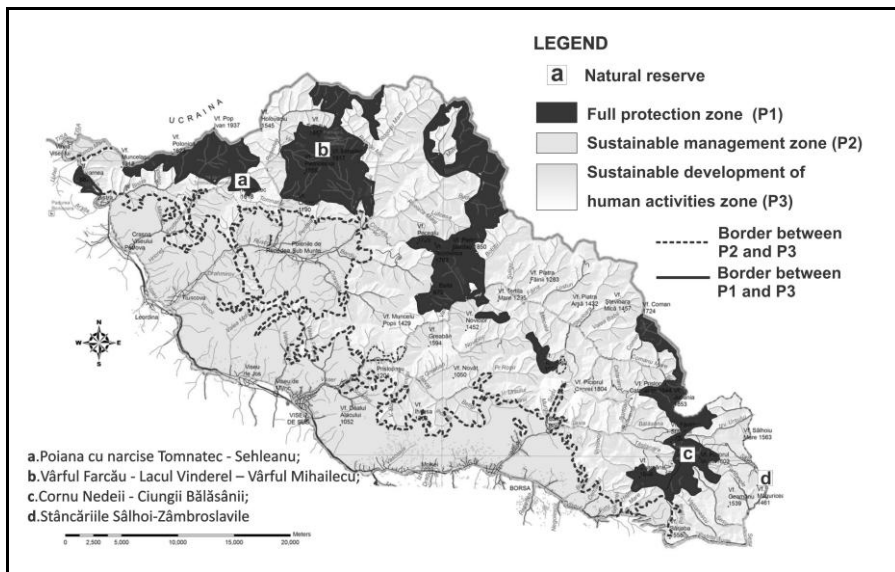


Fig. 3. The zoning of the Maramureș Mountains Nature Park.
(source www.muntimaramuresului.ro)

Within the park, there are also four protected areas endorsed by the Law no. 5/2000:

- Stâncăriile Sâlhoi-Zâmbroslavele (the Sâlhoi-Zâmbroslavele Cliffs) – 5 hectares – category IV IUCV;
- Cornu Nedeii - Ciungii Bălăsânii – 800 hectares – category IV IUCV;
- Farcău Peak - Vinderel Lake – Mihailecu Peak – 100 hectares – category IV IUCV;
- Poiana cu narcise Tomnatec (The narcissus meadow Tomnatec)- Sehleanu – 100 hectares – category IV IUCV.

These protected areas are treated as full protection zones. The areas accepted by law are approximated but they will be mapped accurately in the process of making park maps.

The internal zoning of Maramureş Mountains Nature Park is realised by taking into consideration the need for biodiversity and landscape conservation, but also for the economic development of the area through activities with low impact on the environment.

The full protection zone – 18769 hectares. At the dividing line of full protection zones it was taken into consideration the need for conservation of some representative samples of ecosystems from this biogeographical region, representativeness given mainly by the criterion of the ecosystems’ biological diversity value.

The sustainable management zone – 79585 hectares. It represent the pass between the full protection zones and the sustainable development of human activities zone.

Sustainable development of human activities zone – 35000 hectares. It includes the areas within the localities of the park, the areas occupied by the permanent means of communication (national roads, county roads, village roads, forest highways, railways, forest railways embankments), mountain pastures outside the full protection zone, as well as the areas outside the human settlements that have been modified by people who practiced traditional activities or exploited the non-renewable natural resources, whether or not they were included in the agricultural or forestry cycle.

The vegetal associations on the surface of the basin were identified by using the database *CORINE LandCover 2000*. The human activity performed in this area, had determined a continuous expansion of the agricultural land to the detriment of forests, especially of the beech and mixed ones. Of the agricultural areas, the pastures have the largest extension, followed by the areas with various crops that occupy small plots near the villages and towards their periphery (figure 4). The largest forest areas seen in this zone are the coniferous forests, followed by the mixed and the deciduous ones.

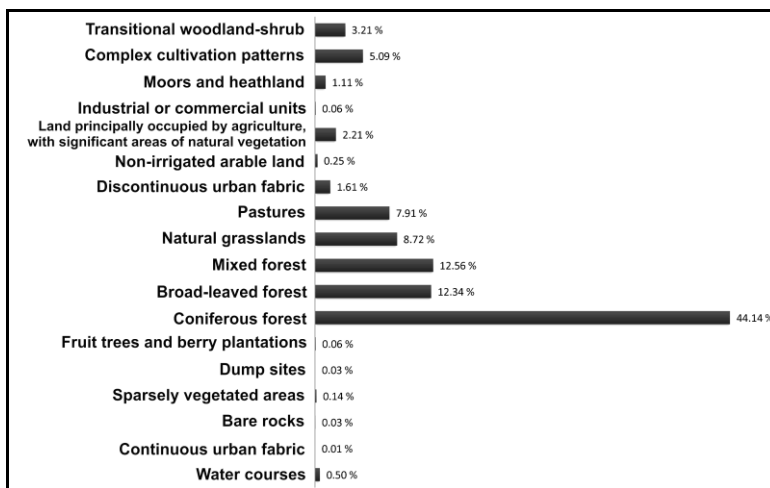


Fig. 4. The land cover in MMNP according to the *CORINE Land Cover*

5. The actual problems within the Vișeu River Basin

The main factors that influence the existing harmony and the good running of things within the Vișeu River Basin are the freshets and the floods that occur in periods with a high flow. The genesis of the freshets on the rivers from the Vișeu River Basin is in most cases (61%) of a rainfall and snowfall pattern. The seasonal frequency of the freshets reaches a maximum level in spring, followed by the freshets' frequency reached in summer, autumn and winter (Cocuț, 2008).

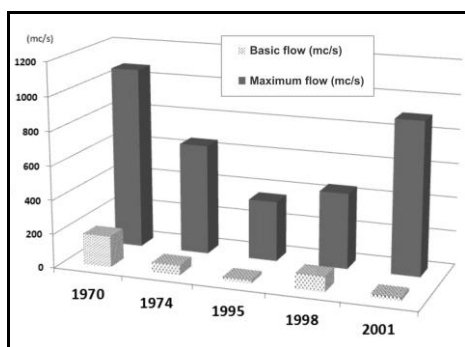


Fig. 5. The basic debits and the maximum flows during the freshets from Bistra station, Vișeu River

In the past 30 years, there were great floods in 1970, 1972, 1975, 1991, 1993, 1995 /1996, 1998, 2001, 2008, which affected large areas of some river basins, freshets of short duration but with large amplitude in the small basins (figure 5, table 1). It has been scientifically proven that the increases of extreme hydric phenomenon and the climate changes occur along with the development of human settlements.

Table 1. The damage done by the great floods between 1995-2005 (*source: Cocuț, 2008*).

Flood wave	Animals (no.)	Houses (no.)		Household annexes (no.)	Agricultural land (ha)	Street net. (km)	Roads (km)		Bridges (no.)	Econ. objectives (no.)	Total Value (\$)
		damaged	destroyed				local	county			
1995 December	-	91	-	261	1069.85	-	48.56	0.1	16	5	180.629
1995 November	-	190	-	209	-	1.12	13	1.3	51	5	2.795.189
2000 March	-	-	-	1133	-	-	40.1	27	15	2	374.579
2000 April	-	-	-	-	1723	-	15.97	-	26	3	779.151
2001 May	90	367	18	475	2181.5	9225	1.5	2245	211	-	849.317
Total	90	648	18	2078	4974.35	93.38	119.13	26.55	319	15	6.633.363

All these are the result of some activities which were, unfortunately, out of control : excessive deforestation and land misuse (overgrazing) resulted once with the development of the settlements in this area.

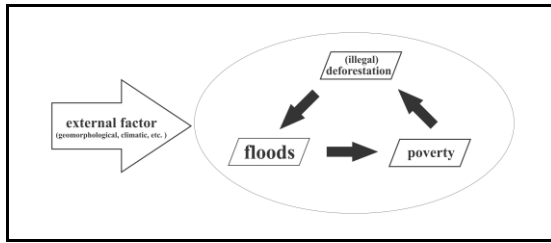


Fig. 6. Deforestation – floods – poverty cycle.

Of all natural phenomena that affect the human activities, the floods are those who have the most serious consequences causing enormous damage, sometimes leading to the poverty of the population and even loss of human

lives.

In such a society, between factors such as deforestation (illegal) – floods – poverty – we can say that there is a cyclical relationship, every factor being the result of the other (figure 6).

The intensification of one factor leads to the intensification of the entire cycle, heading over time to more and more devastating results, as already seen in the last years. In this cycle, there are some external factor that frequently occur, such as severe weather conditions, often presented in our basin.

6. Fixing the problems

As already mentioned in the introduction, these issues would be solved if the hydrotechnical construction took place, more precisely, a design of some reservoirs and the establishment of a special regime for land-use. The reservoirs are the most effective methods to stop the freshets' waves and to regularize the debits, but they are also the hardest ones to build because their construction need a detailed study and a serious investment.

According to Article 3, paragraph 5 g) of the Government Decision 2151/2004 it is allowed the action to stop some calamities in the natural parks:

(4): Until the approval of the management plans for the national and natural parks, which will regulate in detail the protection regime and the detailed zoning, in the special conservation zones, it is prohibited any form of exploitation or use of natural resources, as well as any form of land-use, incompatible with the purpose of protection and/or conservation.

(5) Notwithstanding the provisions of para. (4), in the special conservation zones, outside the scientific reservations perimeters with a strict regime of protection, the following activities may be performed: g) actions to remove the effects of some disasters, based on the approval of public central authorities responsible for the forestry, the public central authority responsible for the environment and the public central authority responsible for waters, if proposed by the scientific council of the park.

It is also known the cohabitation of other hydrotechnical constructions with the natural parks from Romania, without any major effects on the landscape and on the natural environment (eg. The Apuseni Natural Park); and also the decision to flood some areas with large volumes of water to the detriment of the protected areas. This is also the case of the Natural Reservation of Tătarului and

Runcului Quays within the Mara Basin, Maramureş County. The quays will be almost completely flooded after the work at Runcu Dam will be completed.

As already said, according to the G.E.O. 57/2007, there are three internal zoning of the Maramureş Mountains Nature Park of major interest. This ordonance also treated the restrictiveness and the permissiveness of this zoning. The following articles and paragraphes are referring to the facilities and the constructions within the park, listed on zones.

Full protection zone

Art. 22

(4)The full protection zones include the most valuable assets of the natural heritage within the natural protected areas;

(5)In the zones mentioned in the para. (4) there are prohibited:

a) any form of exploitation or use of natural resources, as well as any form of land-use, incompatible with the purpose of protection and/or conservation;

b)the activities of construction-investment, except for those that are designed to administrate the natural protected zone and/or the activities of scientific research or of those that are designed to ensure the national security or the prevention of natural disasters.

(6) Notwithstanding the provisions of para. (5), in the special conservation zones, outside the scientific reservations perimeters with a strict regime of protection, the following activities may be performed:

g)) actions to remove the effects of some disasters, based on the approval of the public central authorities responsible for the environment. If the disasters affect the forests, the actions of removing their effects are made at the proposal of the administration of the natural protected area, with the advice of the scientific council, based on the approval of the central public authority responsible for forestry;

The sustainable management zone

Art. 22

(9)In the sustainable management zones the following activities may be performed:

g)the actions of removing the effects of some disasters, at the proposal of the administration of the natural protected area, with the advice of the scientific council, based on the approval of the central public authorities for the environment protection. If the disasters affect the forests, the actions of removing their effects is made at the proposal of the protected natural area administration, with the advice of the scientific council, based on the approval of the central public authorities responsible for the forestry;

The zone of sustainable development of human activities

Art. 22

(8) In the development of human activities zones the following activities may be performed:

g)the actions of removing the effects of some disasters, at the proposal of the administration of the natural protected area, with the advice of the scientific council, based on the approval of the central public authorities for the environment protection. If the disasters affect the forests, the actions of removing their effects is made at the proposal of the protected natural area administration, with the advice of the scientific council, based on the approval of the central public authorities responsible for the forestry;

As in any system, the reservoir depends entirely on many factors. In order to realise such an important project, all these factors must create favorable conditions for the intended purpose. In addition to this, a primordial necessary condition is to respect the actual environmental compliance, a legislation that allow intervention in case of such disasters, as proven in the Articles of Government 2151/2004 and GEO 57/2007 mentioned above. The next step consist in choosing a storage scheme and the location, taking into account some specific conditions that must be accomplished.

The area where Vişeu River Basin is situated has the highest favorability rating in the construction of a reservoir, according to a map that evaluates the potential of every region where an anthropological reservoir could be built, according to the study made by Gâştescu and the collaborators in 2003.

The water storage scheme suitable for this basin is the one on parallel streams. The construction conditions are accomplished in a very large extent and in order to reduce the negative impact of the constuctions and of other facilities (if necessary) there may be applied various structural methods (figure 7).

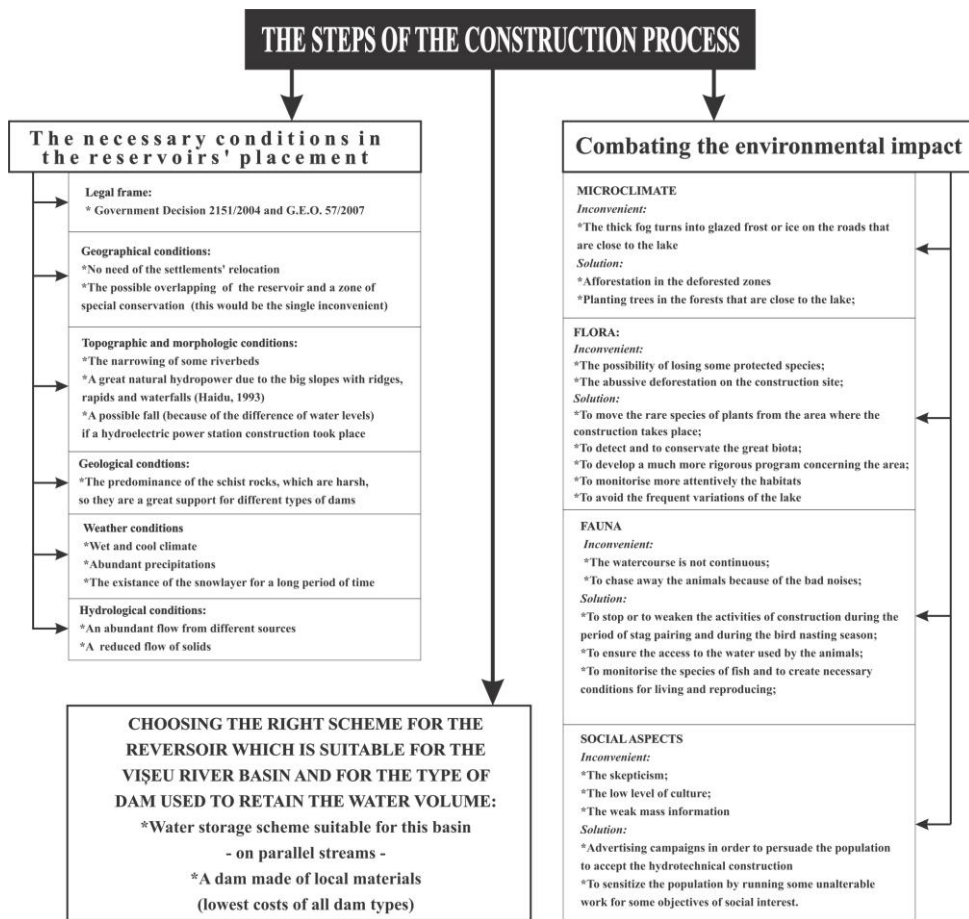


Fig. 7. The steps of the construction process.

Looking in detail at all the stages and conditions offered by the analysed zone, it has been realised a modelling GIS of 3 constructions located on the main tributaries of the Vişeu River: Ruscova, Vaser and Țâșla, which can retain a sufficient water volume in order to prevent any flood that may occur and have the strength of the previous ones. The only inconvenient would be overlapping of Ruscova Lake and one of the special conservation areas (image 8, table 2).

Table 2. Minimal parameters of the area and the capacity of the proposed reservoirs
(source : Șerban, Pandi, Sima & Selagea, 2010).

Reservoir	NMR (m)	Surface planimetry (mil. m ²)	Real surface (mil. m ²)	Surface overlain the special conservation area (mil. m ²)	Total volume (mil. m ³)	The highest flood wave volume (mil. m ³)
Ruscova	732	1,925	2,125	0,256	57,586	53,424
Vaser	880	1,785	1,919	0	48,742	42,840
Țâșla	950	0,863	0,933	0	25,245	5,982

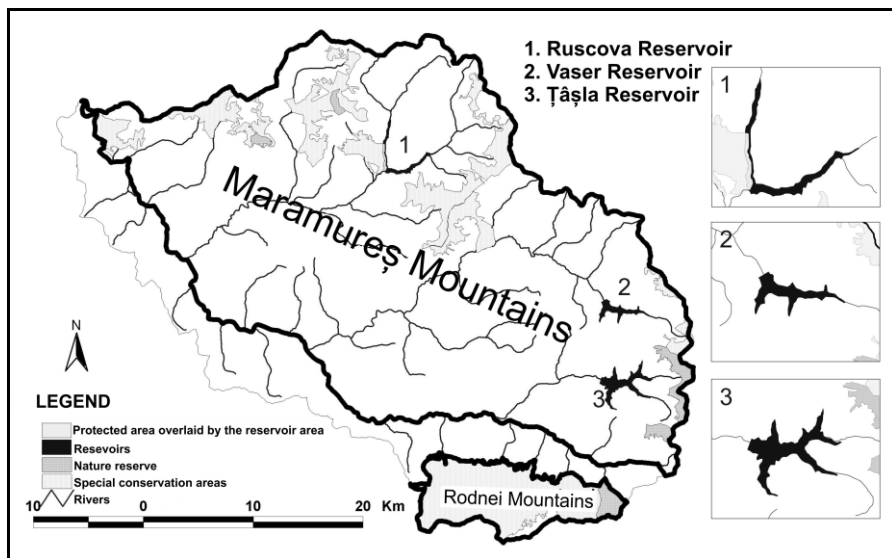


Fig. 8. The reservoirs' placement.

There are also some advantages and disadvantages that may occur with the construction of such a facility, as they may be seen in the following table (table 3):

Table 3. The advantages and the disadvantages of the construction.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Avoiding the adverse effects of the downstream freshets, in the construction area • Storage of water volumes for the need of different consumers; • Improving the drinkable water quality; • Turning the water gravitational energy, by the means of a power station (production of electricity – some of the money obtained from electricity could be used for rearranging the park) • Does not require the relocation of the settlements • Offering a large number of jobs in case of the construction • Improving the infrastructure and the access roads in the area • The area of land flooded by the lake water is smaller than the land that must be protected against floods 	<ul style="list-style-type: none"> • High costs • The overlapping of the lake surface with a part of the special conservsation area • Impact on the groundwater • Relocation and loss of some protected species

7. Conclusion

Sometimes, the floods carry a series of natural functions, creating in this way specific conditions for the natural environment, which is on balance even when the floods happen. Although, the need for conservating the natural conditions cannot be accepted as a hypothesis in the actions of protecting the environment because such conditions could confuse the human activity or could be even harmful.

Therefore, such a solution would be able to outline the „sought harmony”, bringing on more benefits than losses : the protection against floods of nine settlements with a total population of 86647 inhabitants (according to the Census of 2002), the development of the infrastructure and the growth of tourism industry, the possibility of receiving new funds for environmental protection, the sustainable development of the area and most important, the avoidance of human losses and of economic and financial losses.

REFERENCES

Băloiu V. (1980), *Amenajarea a bazinelor hifrografice și a cursurilor de apă*, Edit. Ceres, București.

- Cocuț M.** (2008), *Teză de doctorat – Caracteristicile scurgerii apei din Depresiune Maramureșului în zona montană limitrofă*, Cluj-Napoca.
- Dohotar V.** (2008), *Organizarea spațiului geografic și amenajarea teritoriului în bazinul superior al Vișeuului*, Cluj Napoca.
- Gâțescu P., Driga B., Sandu Maria** (2003), *Lacurile de baraj antropice – între necesitate și modificări ale mediului*, în vol. *Riscuri și catastrofe*, vol. II, editor V. Sorocovschi, Casa Cărții de Știință, Cluj Napoca.
- Haidu I.** (1993), *Evaluarea potențialului hidroenergetic natural al râurilor mici – Aplicație la Carpații Maramureșului și Bucovinei*, Edit. GLORIA în colaborare cu RENEL, Cluj-Napoca.
- Pop P. Grigor** (2006), *Carpații și Subcarpații României*, Ed. Presa Universitară Clujeană, Cluj-Napoca.
- Șerban Gh., Touchart L.** (2008): *Un nouveau parc naturel autour d'un vieux lac artificiel: les enjeux d'une Roumanie en transition dans les Monts Apuseni*. Géocarrefour, „*Les Parcs nationaux entre protection durable et développement local*“, Volume 82, No 4, l'Association des Amis de la Revue de Géographie de Lyon, Université Jean Moulin - Lyon 3, Lyon, France, pp. 243 - 253, articol A, (<http://www.geocarrefour.org/>).
- Șerban G., Pandi G., Sima A., Selagea H.**, (2010), *Combaterea efectelor viiturilor din bazinul Vișeuului prin amenajări hidrotehnice cu impact minimal asupra unor arii protejate*, Institutul Național de Hidrologie și Gospodărire a Apelor Conferința Științifică Jubiliară, 28-30 septembrie 2010.
- * * * (1992). Atlasul cadastrului apelor din România, București.
- * * * (2005) Hotărârea de Guvern nr. 2151 din 30 noiembrie 2004 privind instituirea regimului de arie naturală protejată pentru noi zone, publicată în Monitorul Oficial nr. 38 din 12 ianuarie 2005, Guvernul României, București.
- * * * www.muntiiaramuresului.ro