

# Protection and Restoration of Biodiversity of Semani basin

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## Introduction

The Semani River and its basin are important assets for Albania with dense inhabitant centers and rich natural resources, holding high biodiversity with endemic plant and wildlife species. The National Park of Tomorri and Fir of Drenove, Osumi Canyon and Nature Monuments hold outstanding value.

In this paper, the selected appropriate theories applied in biodiversity are described as well as the methodology used regarding the issues related to Seman watershed: deforestation, soil erosion and sedimentation; flooding and pollution which have affected the preservation of biodiversity and sustainability of the natural resources management.

This paper aims in suggesting recommendations regarding preparation of integrated management plan for the Semani watershed, erosion control and sedimentation, protection of forests and waters. Nevertheless some of the recommendations focus on the avoidance of new construction of dams on the areas holding valuable biodiversity. Thus, recommendation are set up to urge new system focusing on the ecosystem services and climate change adaptation measures; wise use of natural resources, in particular water resources and reduction of their pollution; people awareness on natural resources and biodiversity protection.

## Main characteristics of Semani Basin

Semani River is formed by Devolli and Osumi tributaries joining in Kozara, where after joining the Gjanica River; it crosses the Myzeqe Plain and flows to the Adriatic

Sea. Its basin has a surface of 5649km<sup>2</sup>. Some characteristics of the river are (Pano, 1990: 221):

- length 281km;
- annual discharge volume 5649 million m<sup>3</sup>;
- average water discharge 96m<sup>3</sup>/s;
- total sediment load transported to the sea 31,2 million t/yr;
- turbidity 4390g/m<sup>3</sup>;
- flow module of the sediment discharge in the surface of catchment 2340t/km<sup>2</sup>;
- average altitude of the watershed 863m (or two times more than the average of Europe).

The Semani basin represents a high diversity in its relief; climate and soil; landscape and biological diversity. The watershed relief includes the littoral, waste plains, hilly chains and high mountains. The coastal lowland has typical Mediterranean climate, while the highlands have a Mediterranean continental climate. Regarding the topologies of soil, in the lowland area there are alluvial soils; grey-brown soils of altitudes up to 600m; brown mountainous soils of altitudes from 600 to 1000m; grey forest soils from 1000 to 1800m; and mountain meadow soils occurring at altitudes of 1600–2600 m (Zdruli, Lushaj, 2008: 73). During the centralized economy, vast hilly areas were deforested and opened for agricultural use, were part of them at present time where abandoned and degraded by erosion.

## Main theories

Through the Theory of biodiversity, some of the components of biodiversity of



*Fig1 / Semani pine forest  
source / the author*

Semani basin are explained, including here also a great number of species and ecosystems (coniferous forest, shrubs and wetlands, plant and animal species). Biodiversity surveys are undertaken to find out what organisms exist in a given area, for monitoring endangered populations, evaluating conservation priorities and bioprospecting.

According to the Private Property Theory, the management of natural resources (forests, pastures, flora and fauna) by the commons leads inevitably to tragedy, free riding on the resource, and finally their destruction (Hardin, 1968:1243). Thus, in order to avert this, the options available are either privatization, or holding them as public assets, regulating the right of access to the natural resources through allocation.

In fact, there are good practices where forests and pastures traditionally are used in common by the village; or plots used by families which are very well protected and used without being legally seen as their properties. In such cases, the traditional law and the village council of elders have been the regulatory mechanisms for the protection and good management of the natural resources within their territory.

### **Methodology of study**

Methodology of study included an explorative research, highlighting key elements within the relationship between people and biodiversity, explaining why these interactions happen the way they do. Therefore, qualitative methods are used in which tried to discover concepts and relationships of the collected data.

The methodology is based on investigations and assessments concerning the biodiversity and natural resources use and protection, problems faced, and the best management practices identified in the field. The map of watershed with diverse land use category has been studied, as well as visual interpretation of orthophoto's and records where gained during the field visits and existing literature.

### **Biodiversity of Semani basin**

The Semani basin is rich in species, ecosystems and habitats. Along the coastline wetland, sand dunes and river delta with typical flora and fauna are apparent. The Mediterranean forest and shrubs zone includes pines (*Pinus halepensis*, *P. pinea* and *P. maritima*), a dense understory of shrubs composed of myrtle, dogwood, etc., with lianes over trees and other herbaceous plants.

The alluvial natural forest and riparian vegetation on riverbanks is composed by poplars (*Populus alba* and *P. nigra*), alder (*Alnus glutinosa*), ash (*Fraxinus angustifolia*), oak (*Quercus robur*), elm (*Ulmus minor*), etc.

The hilly area partly has been deforested and transformed into agricultural land, olive groves, fruit trees or vineyards. The agricultural land situated in along the hills of this area is heavily eroded. Partly, the area is covered by natural vegetation, shrubs of "Mediterranean makia" (*Pistacia lentiscus*, *Arbutus unedo*, *Phyllirea angustifolia*, *Myrtus communis*, *Cercis siliquastrum*, *Rhamnus alaternus*, *Viburnum tinus*, *Lonicera etrusca*, *Cistus*

incanus etc. The formations of kermes oak (*Quercus coccifera*) or Spanish broom (*Spartium junceum*) indicate a stage of degradation because they have replaced the foster broadleaved forests, due to overexploitation, intense uncontrolled grazing and fires.

Most of the forests are concentrated in the hilly and mountainous areas, composed of oak species: *Quercus frainetto*, *Q. cerris*, *Q. pubescens*, *Q. petraea*, *Q. trojana*; or mixed ones with *Carpinus orientalis*, *Ostrya carpinifolia*, *Fraxinus angustifolia*, *Castanea sativa* etc. The understorey is rich in shrub species like *Juniperus oxycedrus*, *Erica arborea*, *Paliurus spina-christi*, *Crataegus ssp.*, *Cotinus coggygria*, *Prunus spinosa*, *Coromila emerus*, and many grass species.

Above the oak zone grow beech forests, fir, black pine, Heldreich pine, accompanied by shrubs and some endemic, sub-endemic or Balkanic species. The mountain alpine forest ecosystems comprise species like *Pinus mugo*, *Pinus peuce*, *Populus tremula*, diverse shrubs and rich grass flora.

Within the watershed there are threatened species (Macedonian fir, white fir, horse chestnut, stone pine, Alepo pine, juniper etc.; threatended habitats (estuaries, coastal dunes with *Juniperus spp.*, wooded dunes with *Pinus pinea*, Alpine rivers and the herbaceous vegetation along their banks, lakes of gypsum carst, beech forests, sub-thermophilous (*Quercus*) woods, etc. (Vangjeli, 1994:169)

Among the most important places for biodiversity conservation are the: The National Park of Tomorri and Morava Protected Landscape. Of special value is also the Osumi Canyon, favored for rafting, as well as other natural monuments.

The Fauna of the lowland is rich and diverse with different species of birds (wild ducks and geese), field partridge, quail, turtle, dove, maritime eagle, amphibians and reptiles, whereas the river mouth is one of the favored places for its waterfowl, holding also water birds. The forests are home to big mammals such as the wolf, brown bear, chamois, boar, roe deer, fox, badger, hare etc.

However, a high number of fauna species are threatened or classified as endangered species. Thus, the moratorium of hunting of two years time-length issued by the Parliament has had some positive impact on increasing the population of diverse species of fauna.

### Problems related to the basin

Erosion and sedimentation is caused by poor land use practices, deforestation, overharvesting, overgrazing and gravel mining.

Water quality is degrading as a result of industrialization, agricultural, and municipal pollution, where air quality issues have largely resulting as a factor from industrial pollution, and Flooding mostly in the lower portion of the river system is increasing.

It is estimated that the loss of soil in Albania varies in an average from 25-40t/ha/yr. But, in Tomorrica (part of Semani Basin) it can be 18,000t/ha/yr, which is considered as amongst the most degraded and deserted areas of the country. The carrying capacity of irrigation reservoirs is reduced by 4% per year because of filling with sediments (1.5-2% was previously). Also, each year at national level the loss from agricultural land is to 40t/ha of soil and in places susceptible to erosion to 100t/ha/yr. (Lushaj et al, 2011: 214).

The added problems to erosion: damage of forests, water use, natural factors (great slopes of the terrain, climatic conditions with rainfall concentrated in the period of winter with high intensity, soil characteristics, dense hydrographic network-irregular gravel mining, sparse vegetation cover), human factors - interventions for economic activities (land use, lack of investments for protection from erosion, excessive logging, overgrazing, inappropriate agricultural practices).

According to a study (Bedini, E., 2007:9), aproximatively 500ha of land has been eroded and 112ha has been created mainly due to sedimentation of the material removed from the abandoned delta of Semani River. Between 1989 and 2001, the erosive situation has practically destroyed the sand spit of the Godulla lagoon. Along the part with a length of about 1300 m, between 1977-1981, the sea advanced for about 450m (with a rate of 150m/year), between 1981-1989 the sea advanced for about 430m (a rate of more than 50m/year) and between 1989-2001 the sea advanced for about 420m (a rate of 35m/year). These rates can decrease available soil depth for agricultural production and cause surface water pollution (rivers, lakes, lagoons, etc.).

Consequently, erosion is not only a social-economic problem but also an ecological one. Erosion and sedimentation of the landscape is extremely high and it is an



*Fig 2 / The erosion of Semani seashore  
source / the author*

ongoing process. In addition, the frequency of flooding and the negative impacts of sediment deposition are on the increase.

The most significant factor contributing to the increased flooding and sediment problems is related to river instability; which is caused by deforestation and gravel mining. The degraded river is meandering, or moving laterally; cutting banks and causing more erosion, where all of this contributes to the increased flooding and sedimentation.

In the last few years the flooding is favored as result of the interventions in the riverbed for gravel mining, illegal forest cutting and destruction of dikes.

In mountainous areas with sparsely population even without sewage systems, the problems of river pollution are overcome easy through self-cleaning ability of the river.

Because of the changes on hydrologic regime, during the last century, the river has changed 5 to 6 times its river mouth, within in a wide range of about 25km long (Pano and Frasher, 2002:152). On the other hand, the river mouth itself faces various types of pollution, including those from oil-extraction waste, and a lack of integrated coastal management.

Evaluation of the water quality based on the values of physical-chemical parameters and heavy metals, the Osum and Seman are deemed as heavy polluted, while Gjanica is extremely polluted. Passing through the city of Fier before joining with Semani, it also collects urban waste, leaving its water without any form

of life. It is estimated that every month in Gjanica flows around 12587-18091 m<sup>3</sup> liquid waste containing hydrocarbon and industrial oils (Abazi, 2013: 2228). Besides damage to natural aquatic flora and fauna, the water use for irrigation and farming is very risky.

Construction of hydropower plants as shown in fig. 4 (9 in Devoll, 1 in Tomorrica and 3 in Osum), all in ecologically valuable areas of "very high" and in "high" conservation value, (FLAVIUS, 2010-2014: 12) including the destruction of famous Osumi River canions, are a current threat to the natural heritage of Semani watershed, with a significant impact on the river ecosystem and the longitudinal continuum for living organisms and sediments leading to loss of ecological integrity, river degradation, and consequently a decrease in biodiversity.

Developing and using ecologically sustainable alternative sources such as solar and wind power is particularly high in this country. While river landscapes of highest conservation value should not be developed at all, those of lesser value are not necessarily recommendable for development.

Hydropower dams have a significant impact on the longitudinal river continuum for biota and sediments, leading to a loss of ecological integrity, which means lower biodiversity (e.g. migratory species) and species abundance, and serious river degradation processes downstream of dams (channel incision).

Construction of Gas Trans Adriatic Pipeline



*Fig3 / Trees uprooted by sea erosion  
source / the author*

– TAP is another current threat. For the Semani watershed, within 500 meters of the route corridor of the TAP project affected land were identified in total, 5,730 hectares of agricultural land, 2,850 hectares of forest, 1,400 ha of pastures and 347 ha of urban area. The pipeline passes through some natural reserves and monuments of nature, and the last 2.7 km before entering the sea through the estuary of Seman-Pishë Poro, which is a CORINE biotope, all these of major importance for nature conservation. (Plani Kombetar per Projektin TAP).

**Problems related to biodiversity**

The consequences of various human activities in Semani watershed (intensive agriculture, overgrazing, uncontrolled industry, and unplanned urbanization), destruction of dunes, forest fires, sea erosion and a variety of other human-induced stresses have taken their toll on ecosystems acting against preservation of biodiversity and sustainable natural resources management.

One of the most imminent conflicts to be avoided is the one between a high number of planned hydropower stations and the goal to maintain the high ecological value of river systems. Hydropower dams modify the entire river landscapes, leading to loss of characteristic, endangered habitats and species, interrupting river corridors, hamper sediment transport and produce channel degradation further downstream. Dams disconnect the river continuum for living organisms. Fish passes can only reduce this effect to a

certain degree and are not feasible for all projects, in particular for dams higher than 20 m. Preventing damage to river systems today will save future costs of measures to improve the ecological status and will preserve the last “river jewels” of the continent for generations to come.

Therefore priority should not be given to building new hydropower dams but upgrading existing ones and lowering energy demand by increasing the energy efficiency, for which the potential in our country is known.

Climate changes. It is observed that the climate warming stands at 1.20C in the whole country, associated with the decreased of rainfall with 200-400 mm, reducing wind speed by about 1.5 m/s and 5% moisture. The influence of heat is felt in the country’s water system, the water resources and to increase the intensity of erosion processes. Climate projections for the future show that Albania will face these phenomena (Komunikimi i dyte kombetar, 2009: 80):

- A 20C increase average annual temperature in winter and summer until 2049;
- The average rainfall decline by 8% until 2049.

The temperatures are expected to occur during the summer months (June-August). The significant impacts are expected to exercise greater pressure on biodiversity and the population.

Challenges for the future for climate change include the integration of climate change when the planning sector strategies in

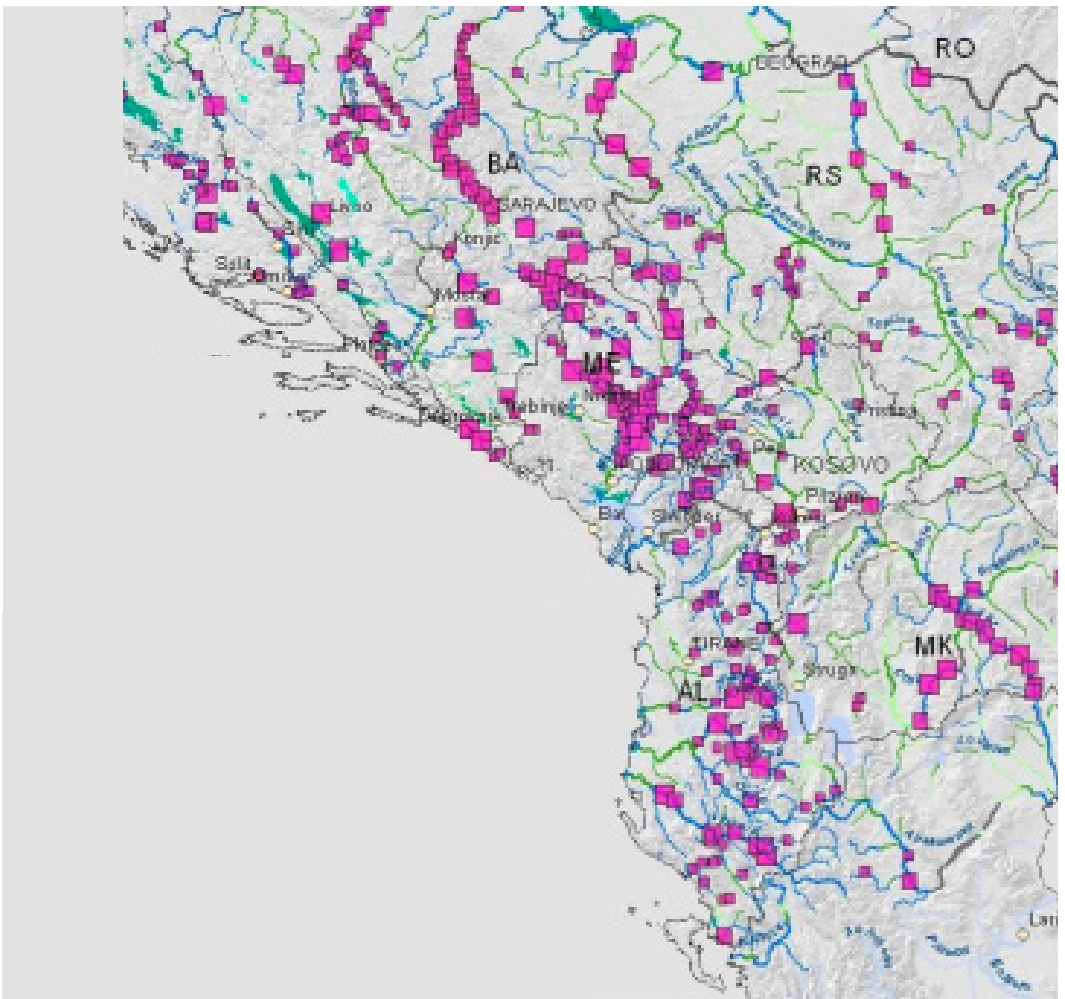


Fig4 / The planned hydropower plants for Devoll and Osum that would affect very high, high and low conservation stretches. source / Flavius (2014)

the field of health and social policies, agriculture and forestry, biodiversity and ecosystems, marine and coastal areas, water and production systems. Support for the development of forestry; development of management plans across river basins; rehabilitation of damaged riverbeds by 25% by 2020; increasing the surface of protected areas in 17% of the territory through the enhancement and integrated management of Protected Areas; establishment of the ecological network "Natura 2000"; provision of conservation status for 5% of threatened species and habitats. (Strategjia ndërsektoriale e mjedisit).

### Possible rehabilitation measures

For the biodiversity conservation is particularly important the extension of protected areas in order to ensure the representation of all types of ecosystems in the network of these areas. Objective was to establish the network of protected areas 17% of the territory. In addition to problems inherited from the past, it is noted that the current situation is partially due to the lack of policies and inappropriate legal system,

lack of clear property titles and failure of the current legislation. A special law is the 10-year moratorium on industrial logging. The legislation should allow further decentralization of forest management, transferring the public forests for use and ownership to the traditional users, villages and farming families. Our country should not only continue the path to approximate the legislation of the sector with *acquis communautaire*, but also to ensure its implementation in practice, as the only way to successfully meet the integration process in the European Union.

Biodiversity can be increased by restoring damaged ecosystems; providing additional habitat for rare, threatened, or endangered species; establishing additional ecological reserves; planting selected species on contaminated areas that immobilize the chemicals within the site, and accelerate degradation of the compounds into less harmful materials. Valuable trees, riverine and seashore woodlands should be protected. The road construction works should be kept to its minimum near rivers, streams and canals. Urban development should be controlled.



*Fig5 / Destruction of dunes  
source / the author*

Some good management practices can be extended specifically in mountainous and plain areas, including preparation of restoration projects with integrated technical and biological measures; maintenance of dikes and protection works along the river (penels, gabions). maintenance and cleaning of drainage system; afforestation of deforested and bared land on riverbanks and coastal area with suitable species; stop spontaneous gravel and sand mining; establishment of forest protection belts on both sides of the river 100-200 m wide in order to protect that from damages; ensure participation of local community, local government and interested parties (Muharremaj, 2001).

### **Conclusions and recommendations**

**Conclusions:** The Semani watershed has a high diversity of flora and fauna species and habitats, important forest formations (Mediterranean pines, oak, beech and fir, makia, riparian vegetation). It is the home of some endemic, sub-endemic or Balkanic plant species, of local and international importance, part of them under risk. Of great value are the National Parks of Tomorri (with bear, wolf, fox, etc.) and Fir of Drenove; the Osumi Canyon, preferred for rafting and Nature Monuments (geo, hidro- and biomonuments).

Problems related to Semani watershed deal with deforestation, soil erosion and sedimentation, flooding and loss of biodiversity. Recent threats include the construction of some hydropower stations and gas Trans Adriatic Pipeline – TAP, which affect also some of protected areas. Intensive agriculture, overgrazing,

uncontrolled industry, unplanned urbanization, gravel mining on riverbeds have also affected the preservation of biodiversity and sustainable natural resources management.

**Recommendations:** Preparation of the integrated management plan for the Semani watershed would include the erosion control and sedimentation through technical and biological measures, especially the protection of forests and increase the protected areas, riparian vegetation and the littoral forest belt. Mining of sand and gravel from riverbeds should be prohibited; it can be planned in places where the sedimentation overpasses the extraction and based on studies and restricted to low-flow periods. The construction of dams should be avoided on areas with valuable biodiversity. The damaged works and structures on rivers need to be repaired and the new ones should be planned and constructed when necessary.

It is recommended to set up the system of the ecosystem services and climate change adaptation measures; the application of conservation tillage measures in agriculture; the wise use of water resources and reduction of their pollution, monitoring the river sediments and water quality.

People awareness on natural resources and biodiversity protection with increased investments would help foster tourism as a means to promote development and prosperity in these areas.



Fig6 / Constuction for Semani riverbank protection source / the author

## References

Abazi, U. et al (2013) Contents of heavy metals in surface water and sediments in Mati and Gjanica Rivers in Albania, In: Journal of Food, Agriculture & environment Vol. II, p. 2228

Bedini, E. (2007) Use of GIS and Remote Sensing to detect changes along the coastline segment between Shkumbini and Semani Rivers. In: Buletin of the Geological Society of Greece, V. XXX, Athens, 2007.

FLUVIUS (2010-2014) Outstanding Balkan River landscapes. Euronatur Foundation and Riverwatch, Vienna

Hardin, G. (1968) The Tragedy of the Commons. Science 162: 1243-1248.

Kabo, M. (ed). (1991) Ultësira bregdetare. Në: Gjeografia fizike e Shqipërisë, Tiranë, V. I, Komunikimi i dytë kombëtar i RSH për ndryshimet klimatike, Tiranë, 2009.

Kovaci, V. (1996) Environment aspects and effects of erosion in the soil. Soil Resources in Albania, Tirana.

Lushaj, Sh. et al. (2011) Mbi disa konkluzione të studimit mbi zvogëlimin e erozionit të tokës dhe sedimentimit në Shqipëri. Në: Biodiversiteti – ruajtja dhe përdorimi i qendrueshëm. Tiranë. Map of Semani watershed [Online], Available:

<http://www.riversnetwork.org/html>

[http://www.riversnetwork.org/OL/examples/West%20Adriatic%20Sea\\_Shkumbin-Seman.html](http://www.riversnetwork.org/OL/examples/West%20Adriatic%20Sea_Shkumbin-Seman.html) 07 Jan 2016

Muharremaj, V. (2001) Pjesëmarrja e komunitetit në mbarështrimin e integruar me pjesëmarrje të pëllgut ujëmbledhës. Paper presented at the Workshop on Albanian Watershed Assessment Project. Tiranë, 6 p.

Pano, N. (1990) Ujërat. In: Gjeografia fizike e Shqipërisë. Tiranë, 221-239

Pano, N., Frashëri, A. The coastal geomorphology of the Semani river mouth - Karavasta lagoon in the Southern Adriatic Sea. Second Balkan Geophysical Congress and Exhibition. P. 152 [Online], Available: [http://www.balkangeophysoc.gr/menu/congresses/oral/152-153-014-5-Niko\\_Pano.PDF](http://www.balkangeophysoc.gr/menu/congresses/oral/152-153-014-5-Niko_Pano.PDF) 07 Jan 2016

Plani Kombetar Sektorial per Projektin TAP [Online], Available: [http://www.energija.gov.al/files/userfiles/projekti\\_TAP/Plani\\_Kombetar\\_Sektorial\\_per\\_Projektin\\_TAP.pdf](http://www.energija.gov.al/files/userfiles/projekti_TAP/Plani_Kombetar_Sektorial_per_Projektin_TAP.pdf). 06 Jan 2016

River assessment in the Balkan region [Online]. Available: : AL\_CountrySpecial14[smallpdf.com] Albania Euronatur Foundation -RiverWatch