

## THE INFLUENCE OF HUMANS ON THE QUALITY OF THE RIVER UNA ENVIRONMENT

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### *Abstract*

The paper presents the impact of humans on the protection of the environment and river Una. River Una is 212 km long and springs near Donja Suvaja and Donji Lapac, flows into the river Sava near Jasenovac, and has been preserved thanks to the high awareness of the population who live on its banks, especially population of Una – Sana Canton. Education of the population in Una-Sana Canton is starting with children in kindergartens and continues throughout elementary and high school. Thanks to the high awareness of the importance of drinking water, river Una has maintained a high glow, and despite the global water pollution water from river Una is used for drinking.

**Keywords:** river Una, environment, solid waste, humans, ISO 14001.

## 1. INTRODUCTION

River Una, was named by the ancient Romans, who, when for the first time saw its picturesque beauty and heard the murmur of her waterfalls in Martinbrod, Štrbački Buk and waterfalls in Ripač, exclaimed, "UNA" which in translation means "**the one**", or "**the only one**."

For the cities of Bihać, Martinbrod, Kulen Vakuf, Ripač, Bosanska Krupa, Bosanska Otoka, Bosanski Novi, Kostajnica, Kozarska Dubica and Dvor na Uni the importance of river Una is invaluable, and without it we cannot survive. In these cities, today there are more than 700.000 people in the territory around the river Una, which is over 9,368 km<sup>2</sup>. This river has the most beautiful waterfalls in Europe. A large waterfall Štrbački Buk is located in Bosnia and Herzegovina, near the border with Republic of Croatia. Štrbački Buk consists of several waterfalls, close to one another, with the biggest waterfall being about 25 meters high, and it provides a magnificent image in which a person can enjoy. This waterfall is located in a National park Una.



**Figure 1:** Flow of river Una



**Figure 2:** Štrbački Buk on river Una

Figures 1 and 2 show the flow of the river Una and her beautiful waterfall Štrbački Buk, located in the heart of the National Park "Una".

## **2. THE BASIC PRINCIPLES OF THE ENVIRONMENT PROTECTION OF RIVER UNA**

Starting with the existential significance of the river Una for the people on its banks, generations of people have established the regulations on water protection in Bosnia and Herzegovina. These regulations define water as a common good, and today the current Water Act, besides determining water as a common good, stipulates special protection of waters by all levels of government in Bosnia and Herzegovina, BH entities, cantons and local governments, cities and municipalities, and prescribes obligations of legal entities and individuals in terms of water and declared it a heritage that must be preserved, protected, and accordingly treated. The population on the banks of the river Una is educated in the field of domestic regulations on water protection. Bearing in mind the water as a resource and the capacity of the environment, the basic principles of environmental protection are applied in the field of water management, which are determined by the provisions of the Law on Environmental Protection, which is based on the *acquis communautaire*, that aim to promote sustainable development and preserve the environment for present and future generations, and are based on the principles of preventive action, elimination of environmental damage at source, shared responsibility, integration of environmental and other sectoral policies, and the "polluter pays" principle.

Water protection is one of the three areas of water management, which includes:

- water waste treatment,
- treatment of solid waste through landfills (leachate treatment),
- water saving measures,
- implementation of legislative measures related to water protection, particularly those relating to the protection of water springs and associated water facilities, and
- planning and reservation with adequate protection of future resources, in particular through regional and urban planning etc.

In modern times, in order to achieve water protection, it is necessary to harmonize implementation of the European directives, and of particular importance are the Urban Waste Water Treatment Directive, EU Drinking Water Directive, and the EU Directive on the protection of groundwater against pollution and deterioration. This is especially important for the town of Bihac, if we bear in mind that Bihać source of drinking water Klokot is affected by the groundwater coming from Croatian territory.

The Summary of European environmental legislation makes over 300 legal - technical documents (directives, regulations and decisions) classified in several groups, but the man is the key solution to this problem if we consider that it was non-educated man who is the major polluter. Thus, the cause of environmental pollution is a man who does not possess sufficient knowledge and feelings in order to preserve the environment in which he lives.

## **2.1. The Keepers of river Una – UNA EMERALDS**

The Association for creating a culture of preservation and protection of the river Una ‘‘Una Emeralds’’ was established on 17 May in 1985. Association ‘‘Una Emeralds’’ is working on environmental education of children and adults, raising environmental awareness to a higher level, educates the young generations about sustainable development, teaches them the selective disposal of solid waste, reducing emissions, replacing fossil fuels with renewable energy sources, energy saving, preservation and rational use of our natural resources - water and forests, and the study of the basic principles of democracy, as well as mastering the rules of parliamentary decision-making through the Children's ecological Parliament. For its original ecological creativity in working with children, ‘‘Una Emeralds’’ were given a series of world recognitions. Una Emeralds are maintaining a philosophical thought ‘‘*Una River should not be protected from the people, but rather teach people how to protect Una*’’, a slogan ‘‘*clear mind - clear Una*’’, and motto ‘‘*Una is loved with heart and protected with science*’’. The people who live on the banks of the river Una very often have the important thought for the future, which is: ‘‘*Una can buy all the treasures of the world, but all that treasures cannot buy Una*’’.

## **2.2. The problem of solid waste**

The biggest problem for the preservation of the environment in the area of the river Una Basin is the problem of solid waste. Unfortunately, we have to conclude that the awareness of young people is much greater than that of the representatives of politics who are not capable to solve the problem of solid waste. While government officials at all levels are spending vast amounts of money to various projects, the municipalities are creating illegal landfills that are potential threat to drinking water in the catchment area of the river Una.

By adjusting the nature to him, a man disturbs the balance of nature, so it's no wonder that many species of plants and animals are extinct, there are no pure river flows, forest landscapes, and the atmosphere every day becomes more and more polluted. Economic and technological development in recent decades endangers the life and health of people in many ways. In order to protect the ecosystems in cities in the catchment area of the River Una it is necessary to solve the problem of solid waste from two or more regional landfills.

During the war in Bosnia and Herzegovina due to war actions, the population was not able to dispose the solid waste in an appropriate manner, so illegal landfills were formed in each town. Unfortunately, these landfills are temporarily kept even today. Each of these landfills has threatened the sources of drinking water. This consequence will remain for the next hundred years, because the toxic substances have deeply penetrated through karst areas. An example is the illegal landfill Gorjevac - Bihać. This illegal landfill is threatening sources of drinking water in the village Ripač, near Bihać.

**Table 1:** The results of the testing of water parameters

Parameter	Točak Mevludin	Točak Smiljina	Stubo	Jelina pećina	Una	Measuring unit	MAC For drinking water
Temperature	12,6	11,0	11,3	10,6	10,9	°C	-
PH	7,56	7,75	7,55	7,51	7,85		6,5 – 9,5
Conductivity	621	752	632	535	437	μS/cm	2500
Oxygen saturation	5,6	6,1	8,1	6,0	9	mg/lO <sub>2</sub>	8
(HPK)	9	8	4	5	7	mg/lO <sub>2</sub>	3
Ammonium ion-NH <sub>4</sub> <sup>+</sup>	-	-	-	-	-	mg/l	0,5
Nitrates, NO <sub>3</sub>	43,063	37,026	39,257	7,071	2,330	mg/l	50
Nitrites, NO <sub>2</sub> <sup>-</sup>	-	-	-	<b>15,821</b>		mg/l	0,1
Chlorides, Cl <sup>-</sup>	12,127	33,321	17,916	9,569	3,386	mg/l	200
Sulfates	25,995	23,487	15,970	13,281	12,730	mg/l	200
Fluorides	0,289	-	0,061	0,031	0,017	mg/l	1,5
Phosphates	2,750	1,158	2,073	0,997	0,278	mg/l	0,15

The analysis of the results in Table 1 indicate that the water sample in Jelina pećina contains high concentration of nitrite 15.821 mg / l, while in the other samples nitrites were not identified. The values of other parameters, such as nitrates, sulfates and chlorides show a significantly higher concentration than in the river Una but do not exceed the MAC.



**Figure 3:** Illegal landfill Gorjevac – Bihać

Systematic solution to the environmental protection in the countries members of the European Union started in the early 70s of the last century when the laws and regulations in the field of environmental protection were first enacted. Among other things, this legislation established a system of waste treatment, and established a new branch of industry which we called the economics of waste. Unfortunately, in the territory of Bosanska Krajina this is not yet taken hold in practice. The reason for this situation is a considerable number of people in management positions in the cantons and municipalities that do not have sufficient awareness for the environment protection, so we will have to force them to implement these laws through legislation and standards.

In the catchment area of the river Una there is an increasing amount of waste, as well as the entire territory of Bosnia and Herzegovina. Average production of municipal waste in BiH is amounted to 0.7 to 0.9 kg / per capita per day or 270-300 kg /per capita per year. In the developed countries, the production of solid waste is more than 3 kg / per capita per day. Prior to 1992, industrial companies have been the largest waste disposal units, but due to the devastation of companies during the war, these amounts have changed. However, in the future, the attention must be directed to their re-activation, that is to the treatment of industrial waste.

According to the Constitution of BiH, the Law on Waste Management in Bosnia and Herzegovina, and all the responsibilities which are not explicitly defined as the jurisdiction of BiH, is in the exclusive jurisdiction of the entities. Accordingly, on the basis of constitutional provisions the responsibility for environmental protection is divided into several administrative levels, entities and Brčko District.

According to the Constitution of Bosnia and Herzegovina, human rights and basic freedoms in the category of law, all persons within the territory of Bosnia and Herzegovina are entitled to the human rights and freedoms including the right to live. The Constitution of Bosnia and Herzegovina does not emphasize the right to a healthy

life and a healthy environment through the environment. Therefore, the responsibility for the environment is not subordinated to the state. In Bosnia and Herzegovina, the executive branch of government of Bosnia and Herzegovina is the Council of Ministers, which exercises its rights and responsibilities as a government function, in accordance with the Constitution of Bosnia and Herzegovina, the laws and other regulations of Bosnia and Herzegovina.

Environmental Protection Fund was formed in Bosnia and Herzegovina. Within the Ministry of Foreign Trade and Economic Relations there exists the Division for Natural Resources, Energy and Environment which consists of four departments, including the Department for Environmental Protection. At the cantonal level there are laws on waste management and cantonal waste management plans which are unfortunately not implemented in practice. These plans must be in accordance with the strategy of waste management of the entities. The plan is enacted by the legislative body of the canton.

### **3. BAS EN ISO 14001:2011**

The development and implementation of environmental management system (EMS) according to the requirements of EN ISO 14001/2011 is very important for every organization. The implementation of EMS of the requirements of ISO 14001 organizes training of its customers, employees and the community, demonstrates the ability to consistently and continuously manage aspects of the risk to the environment, reducing their impact on the same to an acceptable minimum or completely eliminating it, giving at the same time the contribution to the development of environmental awareness of its employees as well as a contribution to sustainable development from a position of renewable energy sources. Evaluation and certification of the implemented EMS in relation to the requirements of ISO 14001 is conducted by an accredited certification company, at the choice of the organization.

### **4. CONCLUSION**

Based on the results obtained during this study we can conclude that the education of the population in the area of ecology was successfully and continuously implemented, the outcome of which is a high awareness of the environment preservation which has resulted in water of high quality in the river Una Basin, which can be used for drinking. On the other hand the awareness of the authorities who decide on municipal and industrial waste is at low level. There is a possibility, if no corrective measures to eliminate illegal landfills are taken, the possibility to have drinking water Ripač would be eliminated.

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