

# Indication of Pollution Sources in the Natural Statement of Osumi River

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**Abstract:** ***Background:** River Osumi is located in the city of Berat, region of south and partly in western lowland of Albanian Republic. Berat city has a surface of 380 km<sup>2</sup>, part of UNESCO cultural heritage, counts 60 000 inhabitants in January 2015 and characterised by mediteranean climate. Osumi river crosses the center of the city and is a large collector of urban waste water which are discharged untreated directly through the riverbanks. **Aims:** The aim of the article is to assess the microbiologic level of pollution due to anthropogenic and industrial activity which impacts in the river statement and disturbing its natural equilibrium. **Materials and Methods:** The 5 stations monitoring the microbiological quality of the river during Spring-Summer season 2016 were chosen to cover as much of the river length distantly due to terrain access. Samples were taken on plastic sterilized containers up to 50 ml and analyzed for fecal indication bacteria. **Results:** Referred to the results of the analyses it is concluded that during summer months it is recorded a high level of FC peaking in specific stations such as (S5), (S1) and (S3) during June and July. **Conclusions:** The absence of a water treatment plant in Osumi river, sediment load, temperature and nutrients could be possible reasons why the level of FC reaches high values during the hot season. An urgent need for implanting a waste water treatment plant, a project of constructing a regional land field and also banning the construction of hydropower plants along the river basin could help and reduce the high risk of further degradation of Osumi river ecosystem.*

**Keywords:** Osumi river, fecal coliform, pollution, indicator

## 1. Introduction

Albania is situated in the western part of Balkan Peninsula and has a hydrographic territory with a surface of 44,000 km<sup>2</sup>, more than 57% of the national area of Albania [4].

Berat city with a surface of 380 km<sup>2</sup>, revealed "Museum city" during 1961 and part of UNESCO cultural heritage, is located in the region of south and partly in western lowland of Albanian Republic. The city is drained by Osumi river crossing the middle of its urban area. During January 2015 Berat has counted 60 000 inhabitants and is characterised by mediteranean climate, wet, mild winter and dry, hot summer. Osumi river is the main branch of Semani river, total length is 161 km [2].

Along the river are to be implanted and constructed a total of 14 small hydropower plants, 10 of them located in Skrapar municipality area [12].

Due to the importance of hydropower generation, industrial and agricultural activities, high population density, especially near large urban areas, strong anthropogenic influences on water quality are expected [14].

Osumi river is a large collector of waste water drained by all the quarters of Berat city discharged untreated. There are around 5 main channels draining waste water alongside the urban area of the river. There is no plan project for the rehabilitation of river waters regarding waste water

treatments either any emergency plan during flooding season [9].

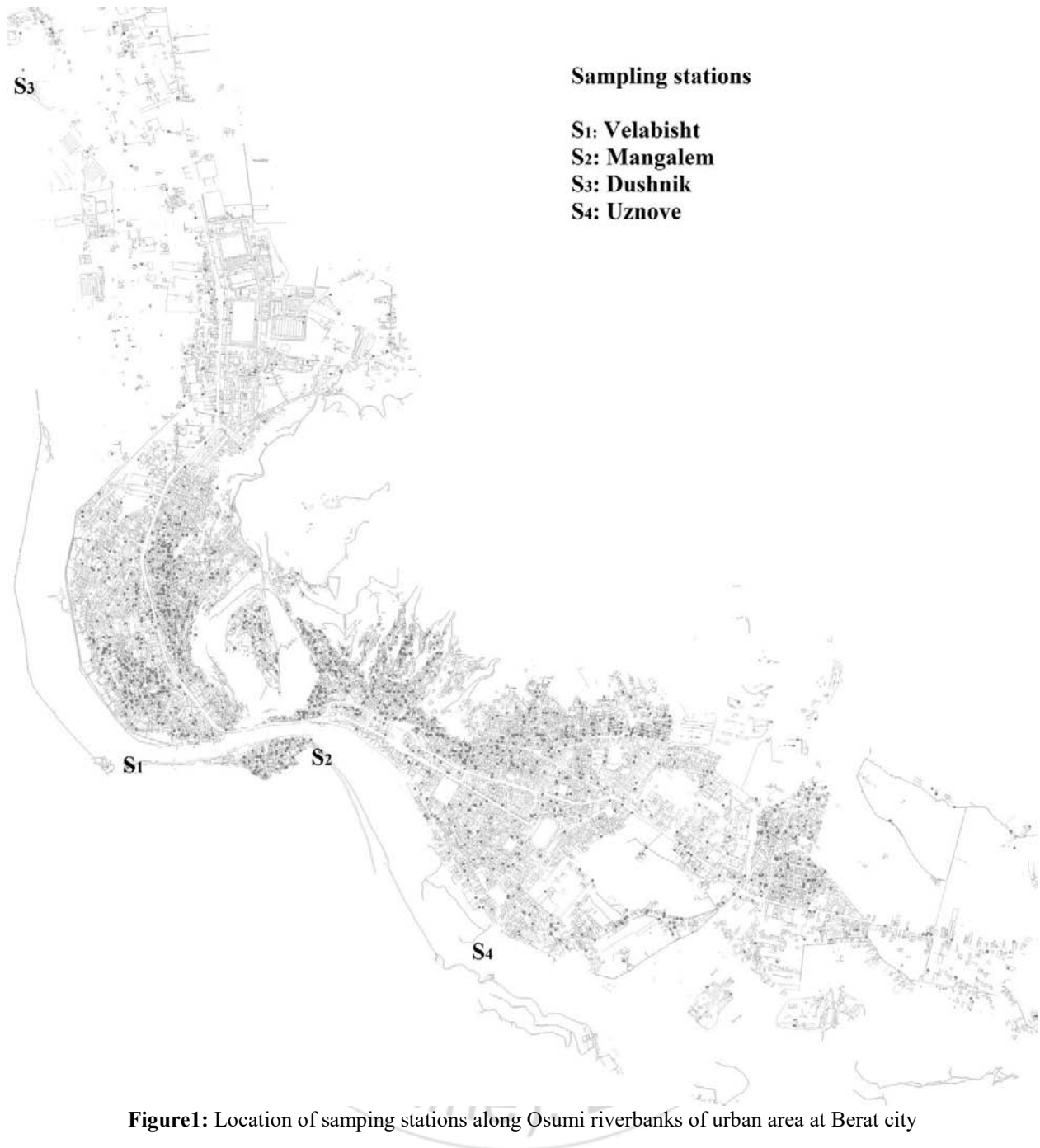
Water pollution is largely associated with the incidence of water and food borne diseases and the origin of many outbreaks, contributing in its aquatic ecosystem degradation. Urban and industrial wastewater discharges are released into surface water without prior treatment. Untreated manure and wild and domestic animals may also contribute to the pathogen load [11].

Except the 5 source points of waster waters, there are also non point sources which contribute in the microbiological contamination of Osumi river.

Various human activities usually take place along the river which increase the contamination of water and seriously impact the quality of water. Coliforms represents a large group of bacteria of fecal origin (e.g., *Salmonella* spp., *Shigella* spp., *Vibrio cholera*, *Campylobacter*, etc.) [13].

Presence of E.coli in water is associated with the presence of contamination of fecal material of human and other warm blooded animals pointing also the potencial of pathogenic organizms [3], [15]

The greatest microbial risks are associated with ingestion of water that is contaminated with human or animal feces. Wastewater discharges in fresh waters are the major source of fecal microorganisms, including pathogens [6].



**Figure1:** Location of samping stations along Osumi riverbanks of urban area at Berat city

Except rafting on Osumi Canyons, fishing is also preferred by local people around the urban area of the river. Various fish families are to be mentioned such as *Cyprinidae*, *Mugilidae*, *Anguilidae*, *Clupeidae* etc. *Cyprinidae* and *Clupeidae* families are randomly found in the lakes as their natural habitat. In the absence of latest microbiological data on Osum river, such information can be useful as baseline for future related studies; and in formulating regulations or policies on river protection and rehabilitation [1].

## 2. Materials and Methods

In aquatic systems, the detection and enumeration of all pathogenic microorganisms potentially present is impossible due to the large diversity of the pathogens, the low abundance of each species and the absence of standardized and low-cost methods for the detection of each of them [10].

The contamination of water bodies by sewage or manure is generally determined using the detection of Fecal Indicator Bacteria [8]. Monitoring Osumi river during Spring-Summer 2016, tourism peaks and recreation activities take place is crucial for the assessment of the river quality and longevity of its statement.

The 5 stations of monitoring microbiological quality of Osumi River during February-July 2016 located alongside the river are distant from one another due to terrain access. (See **fig.1**) "Uznove" station (S4) is located around 4,5 km from the center of the city. "Mangalem" station (S2) is a medieval quarter located in the center of the city. "Velabisht" station (S1) is next to the village situated 3.5 km distant from the center of the city. "Dushnik" station (S3) is situated next to the village of Dushnik 5.3 km. "Ura vajgurore" station (S5)

is located in the Municipal of Ura Vajgurore 9.3 km distant from the city of Berat [5]

The contamination of water by fecal pollution leads to exposure to pathogens via drinking water production, recreation and irrigation. However, monitoring the microbiological quality of surface waters is quiet neglected despite its importance for human health [7].

Samples were taken on plastic sterilized containers up to 50 ml, kept in 4° C and analyzed within 24 hours with MPN for microbiological quality. Assessment of the water quality was

based on fecal coliforms indicator and was expressed as MPN/100ml. Trays were incubated for at least 24 h at 44°C [14]. The classical culture-based methods (plate count on agar media) was applied to assess the microbiological contamination of waters. Plate counts were expressed as colony forming units (CFU) per ml of sample.

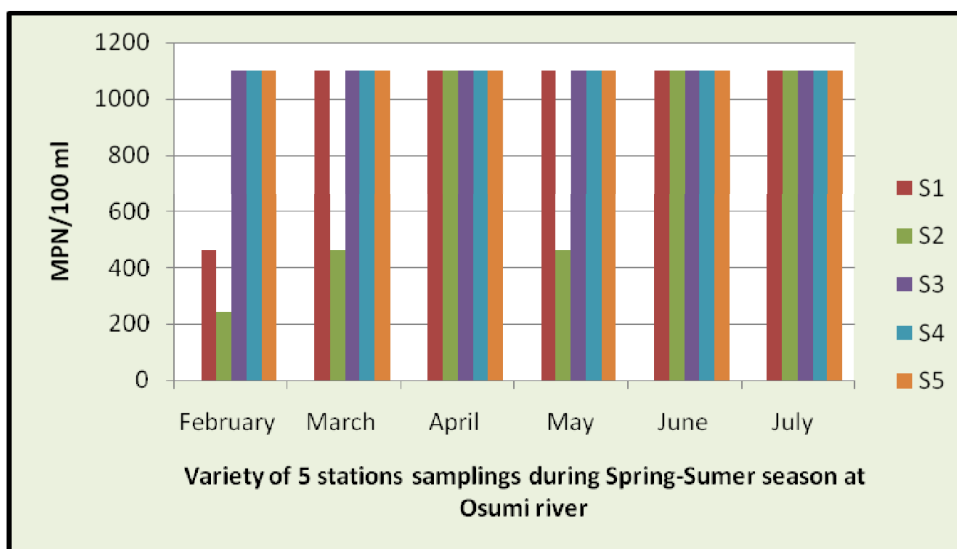


Figure 2: Osumi River water values of FC on 5 stations during Spring-Summer season

### 3. Results

Osumi river water values of FC as referred in the figures of the chart above (see fig.2) showing 5 stations samples during Spring-Summer season indicates the increasing values of coliforms during summer. Velabisht (S1) records higher values over 1100 mpn/100 ml during May, June and July meanwhile in Mangalem (S2) June and July indicates more than 1100mpn/100 ml as does Ura Vajgurore in (S5) with more than 1100 mpn/100 ml.

Compared to the other sample stations (S5) has the highest level of FC values during all period of samplings therefore it is the most polluted station due to industrial activity like quarries, fraction lines of stones, river drains along the decomposition field of urban waste and also all the untreated waste water of the city are directly discharged close to the sampling point.

Velabisht station (S1) scores higher values of FC during June-July because the water drains all the pollution sources coming from urban area of the city of Berat and also the sampling station under the bridge was surrounded by urban waste and inert materials disposed by the local inhabitants. Uznove station (S4) also had high level of microbiological pollution regarding fecal coli forms during all the period of sampling as the station was settled near the leather treatment plant.

Water polluted in chemicals is a favorable environment for microorganisms.

Dushnik station (S3) is situated next to the waste disposal field of Berat city which is settled near the riverbanks of Osumi and during the flooding all the plastic urban waste is spread with the river flow along the next villages.

On average, all the stations (S1) to (S5) indicate a very bad quality of water referred to the values of MPN compared to the EU Directive On bathing waters 2006/7/EC.

The absence of a water treatment plant in Osumi River, sediment load, temperature and nutrients could be possible reasons why the level of TC reaches high values during the hot season.

Level of HPC counted by cfu/ml incubated on 26°C in Osumi River Basin signs high level during the hot months, it shows up on the 5 stations of sampling and analyzing microbiological quality of the waters. As referred to the chart on fig.3 the highest level of microorganism's peaks in (S5) during June 20820 cfu/ml.

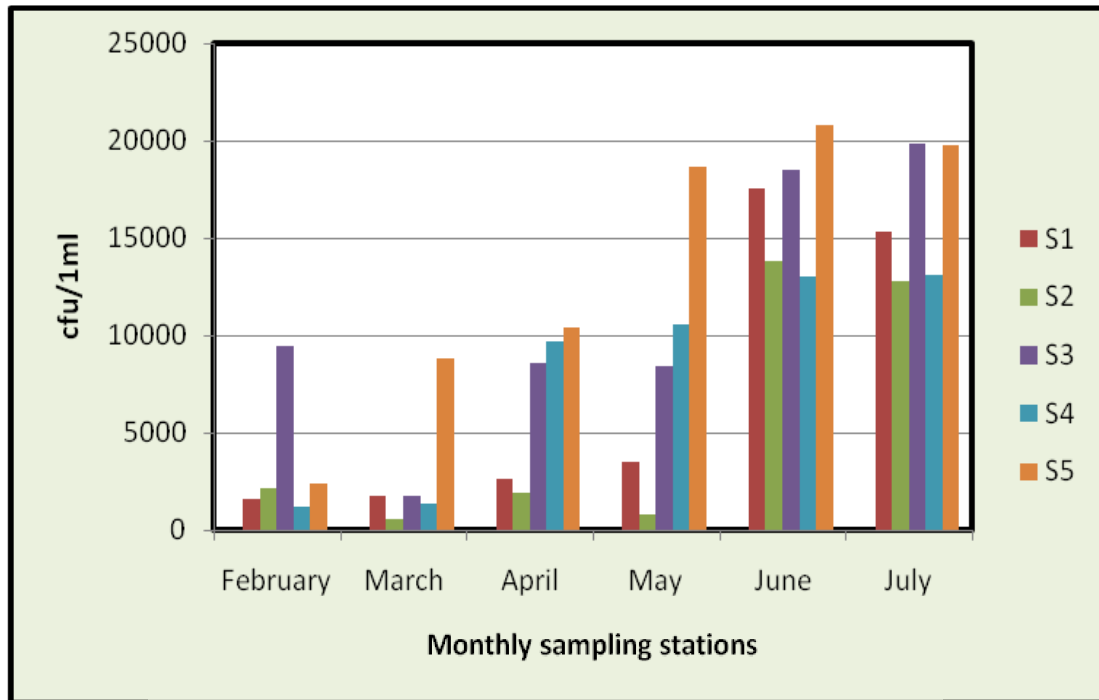


Figure 3: Osumi River values of HPC at 26°C on 5 stations during Spring-Summer season

Similar results are present in (S3) station during June-July with 19830 cfu/ml and also in (S1) during June with 17510 cfu/ml. As mentioned before the (S1) is situated in a polluted area with urban waste and inert disposals, instead (S3) is situated near the field of urban waste disposal alongside the Osumi River. (S4) is situated near the plant of leather processing which waste waters sometimes are discharged directly into the river without any prior treatment.

Assessment of HPC is important to obtain a real view of the total pollution level on Osumi River surface waters.

Level of HPC counted by cfu/ml incubated at 36°C in Osumi River Basin signs high level during the hot months, it shows up on the 5 stations of sampling and analyzing microbiological quality of the waters. As referred to the chart below on **fig.4** the highest level of microorganisms peaks in (S5) during May-June-July. In (S3) station the level of microorganisms is high during all the sampling period also in (S1) during June and July. Assessment of HPC in 36°C is important to obtain a real view of pollution level of Osumi river regarding pathogenic microorganisms.

#### 4. Conclusions

- FC values of all the sampling station displayed high figures of pollution in summer season exceeding standard values of EU directive 2007 due to the absence of a water

treatment plant in Osumi River. Positioning of decomposition field of urban waste, sediment load, temperature and nutrients might be possible reasons.

- Absence of a proper land field to dispose of urban waste or inert waste and positioning of the actual waste fields near river basin areas represents a serious problem causing mixing of river water with urban waste causing high risk of contamination.
- Absence of a waste water plant to purify waste water before discharging it directly into the river could reduce significantly the level of pollution from fecal coliforms and possible pathogens. The high volume of organic pollutants is generated by the households and by industries located nearby the riverbanks.
- Construction of a large number of power plants along the river stream could cause serious damage the natural ecosystem of Osumi river.
- Osumi river waters are utilized for fishing recreation but based on the high level of microbiological pollution, fishing must be banned.
- Also, the lack of sewage treatment facilities aggravates the condition since untreated liquid waste from households coupled with surface water runoff normally.



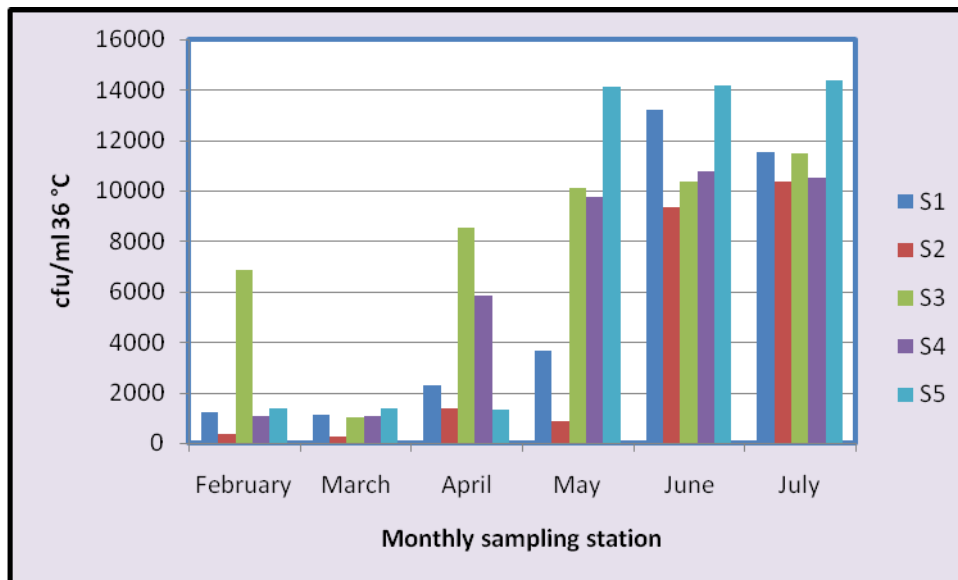


Figure 4: Osumi River values of HPC at 36°C on 5 stations during Spring-Summer season

## 5. Suggestions

- 1) An urgent need for installation of waste water plant is required to clean the waste waters before discharging them into the Osumi river.
- 2) A regional land field is needed to be constructed in order to reduce the high level of river waters contamination and avoid possible epidemics.
- 3) Construction and permission of Hydropower plants must be banned to stop the destruction of the ecosystem and natural statement of Osumi River.

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