

# The quality of water in the Nišava River in 2014

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**Abstract:** The river Nišava is among the most significant natural resources of the town Niš. The water from the river Nišava is used for water supply, thus its quality represents a restraining factor in the further development of the town in terms of sustainable development. The objective of this paper is to demonstrate the quality of water of the river Nišava over the course of 2014. The comparative analysis of the concentration of nitrates and nitrites in the river Nišava is presented herein, in accordance with the Law on Protection of Nature (Official Gazette of RS, No. 36/9 and 88/10) and the Law on Waters (Official Gazette of RS, No. 30/10) of the Republic of Serbia, taking into account the current rule books of importance for understanding the relevant substances and values of their concentration in the samples of the water from the river Nišava.

**Key words:** nitrates, nitrites, ammonium ions, environmental protection, the river Nišava.

## 1. Introduction

The United Nations Conference on sustainable development „Rio+20“(UNCSD), held on 20 - 22 June 2012 in Brazil was dedicated to 20th anniversary of the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 and the 10<sup>th</sup> anniversary of the World Summit on Sustainable Development (WSSD) in Johannesburg. Seven areas, which require priority attention, have been accentuated yet during preparation for the Conference “Rio+20”: decent jobs, energy, sustainable cities, food security and sustainable agriculture, water, oceans and disaster readiness. As water has being one of the seven priority goals and the Nišava River was in 2012 polluted by nitrates, nitrites and ammonium ions, the authors published in 2013 in the journal „Ecologica“ the paper „Analyze of the quality of water in the Nišava River - problem of pollution by nitrates, nitrites and ammonium ions“(Djekić *et al.*, 2013). In that paper was presented the comparative analyze of the data obtained by the Institute for Public Health in Niš for concentrations of nitrate, nitrite and ammonium ions in the River

Nišava during 2012. This paper deals with the possibility of still revealed pollution. It needs to be emphasized that the pollution by nitrate, nitrite and ammonium ions of the River Nišava represents very serious and the biggest ecological problem in Niš. Not less important is the fact that the year 2014 was extremely rainy, recording the highest precipitation since 1951 and that the spring season recorded the most rainfall within the last 120 years. In May 2014 the three days-lasting rainfall exceeded the thousand years mean values. The dominant property of climate in 2014 in the area of the Republic of Serbia was the extremely high precipitation rate (<http://www.sepa.gov.rs/download/Izvestaj2014.pdf> , page 38.).

## **2. Investigation Methods**

Compare of the data obtained through monitoring by the Institute for Public Health in Niš was done in 2014 ([http://www.izjz-nis.org.rs/higijena/akt\\_nisava.html](http://www.izjz-nis.org.rs/higijena/akt_nisava.html) ). Physical-chemical analyses included a standard analytical techniques proposed by the law regulatives, and applied in the Institute for Public Health in Niš (Regulation on dangerous substances in water „Official Journal of the Republic of Serbia", no. 31/82). Investigations of the water quality in the Nišava River are conducting seasonally, and during summer more often (monthly), at five places. Measuring places are:

1. River Nišava – village Prosek – dam,
2. River Nišava at level of the water-capture Public Communal institution (PCI) „Naisus“,
3. River Nišava, 100 m upstream from the mouth of the main and helper sewage collector of Niš,
4. River Nišava, 300 m downstream from the mouth of the main and helper sewage collector of Niš,
5. River Nišava 100 m upstream from its discharge in the South Morava River.

## **3. Results**

According to valuable legal and sub-legal acts the obtained results were analyzed: Water resources law (Water resources law „ Official Journal of the Republic of Serbia", no 46/91, 53/93 and 54/96), Water regime law („Official Journal of the Republic of Serbia", no. 59/98 and „ Official Journal of the Republic of Serbia", no. 101, 2005.), Regulation of dangerous substances in

water („Official Journal of the Republic of Serbia", no. 31/82). According to the last cited (Regulation of dangerous substances in water; „ Official Journal of the Republic of Serbia", no. 31/82), maximal allowed concentrations (MDC) for the I and II classes ammonium ions - 1.0 mg/L, nitrate - 10.0 mg/L, nitrite – 0.05 mg/L. MDK for the III and IV class is 10.0 mg/L for ammonium ions, 15.0 mg/L of nitrate and 0.5 mg/L nitrite. Results obtained during investigations at different localities are given in tables 1, 2 and 3, as well as at graphic presentation. According to the already mentioned “Regulation of dangerous substances in water” („Official Journal of the Republic of Serbia", no. 31/82), the obtained results suggest on:

1. River Nišava – village Prosek – dam

According to quality of water and concentrations of nitrate and ammonium ions, the Nišava River referred during the period of study to the first and II class (tables 1 and 3). However, the nitrite concentrations in March, August and October considered it into III and IV class. The nitrite concentrations in other months remain in the range of I and II class (table 2).

2. River Nišava at level of the water-capture Public Communal institution (PCI) „Naisus“

According to quality of water and concentrations of nitrate the Nišava River referred during the period of study to the first and II class (table 1). According to concentrations of nitrite and ammonium ions only in August considered it to III and IV class, while for all other months fits to I and II class (table 2, 3)

3. River Nišava 100 m upstream from the mouth of the main and helper sewage collector of Niš

According to quality of water and concentrations of nitrate the Nišava River referred during the period of study to the first and II class (table 1). The nitrite concentrations in March, July and August as well as the concentrations of ammonium ions in November considered it into III and IV class. These concentrations in all other months fits to I and II class (tables 2, 3).

4. River Nišava 300 m downstream from the mouth of the main and helper sewage collector of Niš

During the period of study the water from the Nišava River was in III and IV class by the quality, as well as by the concentrations of nitrate in August, and by nitrite concentrations in March, July, August and November. The same classes determined the concentrations of ammonium ions in July, August and November. In other months these concentrations referred I and II class (tables 1, 2 and 3).

## 5. River Nišava 100 m upstream from discharge in the South Morava River

Table 1 – Results of monitoring the nitrate (mg/l) concentration in samples of water from the Nišava River in 2014

Date of sampling	1.River Nišava village Prosek - dam	2.River Nišava at level of the water-capture, JKP NAISSUS	3.River Nišava 100 m upstream from the mouth of the main sewage collector	4.River Nišava 300 m downstream from the mouth of the main sewage collector	5.River Nišava 100 m upstream from discharge in the South Morava River
26/03/2014	5.2	4.7	4.4	4.4	5.2
12/06/2014	3.9	3.6	3.6	4.3	4.4
10/07/2014	3.9	4	3.9	3.7	4.4
06/08/2014	4	4.7	4.3	<b>12.96</b>	4.9
11/09/2014	4.57	2.73	2.8	2.67	2.7
12/11/2014	5.8	5.7	5.8	5.3	6.3

Table 2 – Results of monitoring the nitrite (mg/l) concentration in samples of water from the Nišava River in 2014

Date of sampling	1.River Nišava village Prosek - dam	2.River Nišava at level of the water-capture, JKP NAISSUS	3.River Nišava 100 m upstream from the mouth of the main sewage collector	4.River Nišava 3300 m downstream from the mouth of the main sewage collector	5.River Nišava 100 m upstream from discharge in the South Morava River
26/03/2014	<b>0.13</b>	0.05	<b>0.09</b>	<b>0.09</b>	<b>0.09</b>
12/06/2014	0.035	0.035	0.03	0.04	0.035
10/07/2014	0.02	0.02	<b>0.08</b>	<b>0.08</b>	0.04
06/08/2014	<b>0.15</b>	<b>0.15</b>	<b>0.15</b>	<b>0.4</b>	<b>0.4</b>
11/09/2014	0.05	0.03	0.03	0.04	0.04
12/11/2014	<b>0.06</b>	0.04	0.08	<b>0.1</b>	<b>0.2</b>

\*Source: Institute for public health in Niš

During the period of study the water from the Nišava River was in the I and II class due to concentration of nitrate. The concentration of nitrite in March, August and November, including the concentrations of ammonium cations in August and November classified it into the III and IV classes. The concentration of nitrite and ammonium ions in other months corresponds to the I and II class.

Table 3 – Results of monitoring the ammonium ions (mg/l) concentration in samples of water from the Nišava River in 2014

Date of sampling	1.River Nišava village Prosek - dam	2.River Nišava at level of the water-capture, JKP NAISSUS	3.River Nišava 100 m upstream from the mouth of the main sewage collector	4.River Nišava 300 m downstream from the mouth of the main sewage collector	5.River Nišava 100 m upstream from discharge in the South Morava River
26/03/2014	<0.05	<0.05	0.45	0.45	<0.05
12/06/2014	0.15	<0.05	0.05	0.20	0.14
10/07/2014	<0.05	<0.05	1.0	<b>1.25</b>	0.50
06/08/2014	0.5	<b>5.25</b>	0.5	<b>1.25</b>	<b>1.25</b>
11/09/2014	0.05	0.05	0.1	0.15	0.40
12/11/2014	<0.05	<0.05	<b>1.50</b>	<b>3.75</b>	<b>1.75</b>

\* Source: Institute for public health in Niš

According to "Regulation of dangerous substances in water" (Official Journal of the Republic of Serbia, no. 31/82) the obtained results, which are presented in tables 1, 2 and 3 reflects that the nitrate concentration in spite fluctuations at measuring cites remains within the MDC range, except in August at the locality number 4. The nitrite concentrations varied in March, July and November, and in June were in allowed range. The nitrite concentrations in August exceeded proposed concentrations within all monitoring localities tending to decrease in September and reach the proposed MDC value. The concentration of ammonium ions was within the MDC boundaries at monitoring places 1, 2 and 3, excluding in August at the locality no. 2 when the highest amount of 5.25 mg/l was recorded and in November at monitoring place 3. At monitoring places 4 and 5 the same concentration fluctuated, whereas at the locality 4 exceeded MDC value in August and November. Monitoring of concentrations for ammonium ions, nitrate and nitrite clearly reflects on their mutual dependence in hydrodynamic processes in water, i.e. that the increasing concentration of ammonium ions leads to decreasing concentration of nitrate and nitrite, and opposite. Such trend is obvious at tables 1, 2 and 3. The estimated data suggests on connection between concentrations of nitrate, nitrite and ammonium ions with the level of the Nišava River and discharge of waste water from the main sewage collector. Results of laboratory researches on the hygienic suitability of water from the Nišava River within the territory of the Niš city is in agreement with proposals of the "Regulation of dangerous substances in water" (Official Journal of the

Republic of Serbia, no. 31/82). Therefore, it can be concluded that the highly fluctuated quality of water in the Nišava River during the raised water levels is able to receive waste water without misbalances. However, during periods (months) of low water-level the Nišava River does not succeed to clean waste waters itself and leave the places downstream from the discharge of waste waters from the main sewage collector in catastrophic situations.

#### 4. Conclusion

The all above mentioned statements lead to conclusion that the River Nišava owns a water of good quality, as had owned in 2012 in spite the extremely high level in May 2014. Unfortunately, a water in the River Nišava downstream from the discharge of waste waters from the main sewage collector during months of low water level remains polluted with nitrates, nitrites and ammonium ions. Pollution of the water in the River Nišava is the biggest ecological problem in Niš (Djekić *et al.* 2013). The necessity for continual monitoring of the volume of waste water discharging from the city's sewage system into the recipient - River Nišava is already incorporated into the budget funds for the environmental protection of Niš in 2015 as well as the proposals for projection of purification systems. (<http://www.ni.rs/wp-content/uploads/150224-122-11.pdf>)

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