POLLUTION OF WATER RESOURCES IN VOJVODINA

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Abstract. Water, elements of atmosphere and the living world appear and interact in nature. Despite the fact that elements of the natural environment mutually interact, they can be classified according to their specificity and their genesis. That is why natural resources are divided into hydrographic, climatic, geomorphologic and biogeographic. Of all natural resources in Vojvodina, hydrographic resources are particularly endangered because Vojvodina started to face the problem of drinking water shortage.

1. INTRODUCTION

Water is the base of a life and a fundamental element of every human being. The need of a grown-up person for water is from 2.5 till 3 l. The number of inhabitants on our planet is growing up rapidly, the need for water more faster, and its quantity is not changing. Till 2025, two/thirds of mankind will feel a serious absence of water. The experts estimate that about 1.1 billion of people don’t have the access to drinking water, 2.5 billions don’t have provided elementary sanitary condition (sanitation) and more than 5 million people (in a year) die from diseases, caused by polluted water. More than a half of population in developing countries suffers from, at least, one of six basic diseases related to water which kill more than 5 million people yearly, from which 11 thousand are children who die daily. That is three or four times more than the number of victims of the attack on the world business centre. That’s why water needs ethics for action (www.awid.org).

The United Nations Organization acclaimed 22nd March the World Day of Water, with the aim to emphasize its importance and restricted role in the development. We are nearer and nearer the time when the need for water will surpass stocks. There is no enough
drinking water in Vojvodina, so bad condition of water endangers obsolete technologies in factories, as well as imprudent people actions.

2. WATER POLLUTION IN VOJVODINA

When the quality of water is concerned, the problem is present in Vojvodina and it is always getting worse. Continental water is polluted and degraded by untreated, communal and industrial waste waters, flowing away water from agricultural areas, and thermo-power stations, as well as inland navigation, also lead to pollution. Polluted water which from the other neighbouring countries comes into Vojvodina also contributes to deterioration of the quality of water.

That water is mostly polluted by petroleum products, heavy metals, organic compounds and nutrients.

The quality of water in Serbia is inadequate. In 2001 the institution for health care of Republic Serbia found 29% samples from water systems which did not satisfy physical, chemical and bacteriological standards. The quality of water in most cities of Serbia worsened in 1994 and from the second class, which can be used for bath and drink, changed into the third class, which can be used only in industry and for irrigation.

In some settlements in Vojvodina, for example in Zrenjanin, water from a city water system is forbidden for drink and food preparation in 2004 by the final decision of sanitary inspector. The same prohibition is carried out in Melenci, Elemir, Taras, Aradac and Klek (www.zrenjanin.org.yu).

Water in the Big Channel of Backa, near Vrbas, is far away out of the fourth class. In autumn in the channel it is especially increased the content of organic matter that it could be equal with the content of organic matter in communal water. The increase of content of organic matters in this profile, in autumn, is a consequence of work of two sugar refineries which partially purified waste waters drain into the Big Channel of Backa. The increased content of organic matter is noted in the water of the Begej, and that is the consequence of draining unrefined waste waters of Temisvar. The Begej belongs to the third class when the water is concerned, the Tisa is to the second, and the Danube to the third (Dalmacija, et al., 2004).

Alkali such as sodium and potassium are naturally placed in water, but their concentration is being increased by pollution. In springwater and stone water sodium concentration must be under 20 mg/l. However, in some drinking water in Vojvodina the sodium content is over 200 mg/l, for example drinking water in Zrenjanin and in Kikinda.

The sodium content is followed in river basins of the Danube, the Tisa, The Begej and average monthly data are carried out for the period between 1998 and 2003. The highest concentration of sodium was found in the Tisa, and it was from 20.2 till 37.7 mg/l at the same time when the least amount of sodium was found in the Danube and it was from 10.8 till 19.2 mg/l. For the same period, it was also done the analysis in the water of the Big Channel of Backa, where on the location nearby Vrbas the sodium content was multifunctional increased, what is the consequence of industrialized waste waters and primarily from food industry, leather industry and metal work protection industry. The concentration in some moments reached the value of 120 mg/l. At the same time, the amount of sodium near Martonos on the Tisa was measured in values between 35 and 40 mg/l and near Itebej on the Tisa from 15 till 25 mg/l (Dalmacija, et al., 2004). Long term
intake of sodium surplus in the organism leads to hypertension and it could be harmful for people with heart, kidney and circulation diseases. Children with unformed kidneys and the elderly are particularly sensitive.

In water potassium is naturally placed, because it is also in the Earth’s crust, and it is necessary for a human organism for regular functioning of cardiovascular system. However, in an increased amount it can cause weak heart, coronary work and acute poisoning. Potassium in great amounts can come into water by use or production of artificial fertilizers, then in a chemical industry and in the production of glass. According to recommendation of the European Union, limit (value) for potassium is 12 mg/l (Official List SRJ, 42/98). In the period from 1998 till 2003 particularly great amount of potassium was noted in Zlatica near Vrbica, where it was measured 45 mg/l. The amount of potassium on the Tisa near Zabalj, the Krivaja near Srbobran was from 10 till 20 mg/l (Dalmacija, et al., 2004).

From earthen-alkali, potassium and magnesium are naturally placed because they are present in the content of Earth’s crust. In the case if their concentration is increased in drinking water, those metals cause water solidity. An increased potassium amount causes the appearance of kidney stone or bladder stone. Magnesium is not risky when human health is concerned, and in the case of toxic concentration, water gets flavour unbearable for drink. According to the international standards of drinking water a limit (value) for potassium takes 75 mg/l and for magnesium 50 mg/l. In the period from 1998 till 2003 on the Danube near Bezdan, the potassium quantity varied from 70 till 90 mg/l, what means that its concentration exceeded the limit (value) of international standards, but according to our code for the limit (value) of potassium in drinking water is 200 mg/l (Official List SRJ, 42/98). Industrial waste waters influence on the increase of potassium in watercourses, especially food industry. The increase of potassium in the Big Channel of Backa was evident in Vrbas and Crvenka, because lime is used in sugar refineries for separating organic matters from a sugar juice. Great concentrations of potassium in raw water could be avoided and decreased by the use of artificial fertilizers. The amount of magnesium in the same period did not pass the limit (value) on the Danube near Bezdan, on the Tisa near Martinos and the Begej near Ibej (Dalmacija, et al., 2004).

Because of the negative effect of economic factors the industry and agriculture of Vojvodina are developed insufficiently and in the case of their revival the pollution of inland water will increase. That is especially important when the river basin of the Sava is concerned, in which 80% of waste industrial waters are poured into. The consequence is the change of water colour, its flavour, smell and chemical structure. The most frequent pollutants are: chlorine, ammonia, sulphur-hydrogen, oil, heavy metals, pesticides, detergent, phenol, organic matters. Chlorine, ammonia and sulphur-hydrogen are harmful, even fatal for some organisms even if there is a concentration of only 1 mg/l. With spacious agricultural areas pesticides come in the Sava, which in the concentration of 1 mg/l lead to the fish plague. The Sava is a river which has a self-refinement power and it in Serbia, more precisely in Vojvodina comes with the water which belongs to the third class, but its quality is worsened again when the Sava accepts waste waters from Sabac, Obrenovac, Kolubara (Dukić, Stanković, Tesić, 1989).

The Danube in Vojvodina comes from Hungary with the increased amount of phenol and because of that monitors are placed which register the amount of phenol automatically. It is also microbiologically contaminated with the superfluous amount of
californ germs. Especially in Vojvodina, in the river basin of the Danube, organic contaminations are nodded and saturation of organic matters. As a result of superfluous pollution in July, 2005 in Subic-Dunavac, a fish plague has happened. In former part of the Danube flow huge fish samples were floating, which were making a bad smell in surroundings. Serbia brings to the Danube pollution with around 13% by nutrients and combined with the other countries in the region is responsible for the degradation of the lower flow of the Danube is 929 km long. It receives waste waters from a great number of pollutants, mostly food industry and textile industry by use of more liquid waste than it can receive. Water on that part of the channel belongs to the fourth class. Near Srbobran, in summer, a hydro-system the Danube-the Tisa-the Danube is also very polluted. The other channels usually belong to the second class but then their water is full of pesticides and other poisonous substances (Dukić, Tesić, Stanković, 1982).

3. CAUSES OF POLLUTION OF WATER RESOURCES

In Vojvodina there is a great number of reasons which cause pollution of water resources. As first, it is pollution of watercourse which comes into Vojvodina from the other countries. Then it is a lack of effective monitoring system which would control the quality of surface and underground water. Sewage system is not developed, because it covers 45% of urban population. Industrial liquid waste is drained without previous purifying treatment. The use of artificial fertilizer is inadequate, what causes pollution of water resources by nitrates. Legislature, in the area of maintaining use of underground water, is inadequate and exploitation of underground water resources is controlled insufficiently. The treatment of municipal dangerous water is very low, while the sources of water supply are protected inadequately. Also it is an inadequate protection of accumulations which are used for water supply. Drinking-water price is unsuitable and it is a low level of payment, which leads to poor financial base in organizations, which are responsible for people supply with drinking water. Consequence of financial problems is a bad condition of system for division of drinking water. In most municipal areas there is no treatment for drinking water or there is an inadequate technology. Insufficient construction of protective objects for flood protection as well as improper maintaining of existing ones also brings to pollution of water resources.

With all named causes of pollution of water resources in Vojvodina, state is more worsen because of improper coordination of drinking-water standard and bathing with rules of the European Union, as well as old and incomplete legislature for managing with water.

In order to overcome those difficulties Government of Republic Serbia passed waterpower engineering base for Serbia 2002-2012. That strategy brought a base for managing with water. Besides, in 2003 there were five local action plans by public participation. However, there is a problem of economic factor because local action plans mostly do not include a financial plan so that their escorting usually falls behind (NEAP).

4. EUOPEAN REGULATIONS IN A WATER AREA AND REGULATIONS IN A WATER AREA IN SERBIA

Water protection is considered as the widest regulated area within the European Union, in the area of environment protection. Beginnings of European policy connected
with water dated from 70’s from adopting programmes and law related legal regulations. At that time a regulation was focused on pure clean water. Since then, till 2000 policy connected with a water protection was carried out by Action programme for environment protection and a legal regulation (Becelic, 2003).

New European policy related to water via Water Framework Directive is current since December, 2000 and its aims are: comprehensive protection of all water, achieving of good water status in a period of 15 years, an integral managing of river basin, a combined approach related to the standard for limit of allowed emissions, a regular fixing prices and involving public.

In the area of water policy Water Framework Directive establishes frames for operation, in regard to introduce limit of emissions, so that mass through the participation of parameters, concentration (an emission level), which cannot be exceeded during one or more time period. Thirty-three substances are separated as risky substances, and the innovation of list of those substances is done every fourth year.

In Vojvodina, as a Province of Serbia, water protection from pollution is regulated by the Law of water, which is presented in Službeni Glasnik RS 46/91. Within this law it is regulated water protection from toxic materials, conducting and managing of water from basic importance, conditions and methods for managing, organization, finance and monitoring of conducting of already existing law.

A valid Regulation of water classification is divided in dependence of the level of pollution and water purposes. According to it, water which can be used for drink, in a food industry and for growing of different sorts of high-born fish after disinfection is water which belongs to the first class. Water which is after normal methods of analysis and treatment (coagulation, filtration and disinfection) good for recreation, swimming, water sports and growing of different sorts of less high-born fish belongs to the second class. Water which can be used in industry, except food industry and for irrigation belongs to third class. Water of fourth class is that which can be used only after a special treatment. All mentioned classes of water have maximal and minimum values of following parameters: suspended substance, total dry rest, PH value, dissolved oxygen, degree of biologic productivity, the number of coliform, visible waste matters, colour, smell (Službeni Glasnik SRS, 5/68).

Government of Republic Serbia every year brings a regulation of systematic testing and examining of water quality. Its content is, mostly, not changed every year, and that regulation determines a type and frequency of systematic examining of watercourses, sources, ground water and accumulation. This regulation determines a size of examined indicators as well.

Government of Republic Serbia every year brings a regulation of the amount of reimbursement for the usage of water, reimbursement for water protection and also for extracted material from watercourses. Depending on the type of users, the reimbursement for the usage of surface, ground and mineral water is charged by a cubic metre, that is by a litre of sold mineral water. All pollutants are divided into six groups and a basic reimbursement is increased for 50 % if a recipient is a watercourse of a first class. Depending on the degree of purifying water, before draining, specific indemnities are applied (Službeni Glasnik RS, 2/2003).

In order to conduct the appropriate protection of water resources it is necessary a control of quality in laboratories. It is necessary, first of all, because of a good reputation of
laboratories and users’ confidence. By using the laboratories we could avoid consequences which wrong results could cause. The analysis in laboratories is especially necessary in extreme situations when the values depart a lot and we must pay more attention (Kolle, 2001).

5. PROBLEMS AS CONSEQUENCES OF POLLUTION OF WATER RESOURCES

A great number of problems appear as a consequence of pollution of water resources in Serbia which imperil population and economy. On the territory of Serbia about 30% of water supplying with drinking water doesn’t satisfy physical, chemical and bacteriological standards, and that percentage in the area of Vojvodina is bigger and amounts to 67%. Hydric epidemics and illnesses which are mainly caused by a bad quality of drinking water appear as a consequence.

River beds are contaminated with heavy metals, hydrocarbons and nutrients, especially along local so-called black spots such as: Novi Sad and Pancevo. As a consequence of a lack of a factory for the treatment of liquid waste appears increasing pollution of surface courses, which also causes increased exploitation of underground natural resources and that brings to the negative decreasing of a level of ground water resources.

There is also an organic pollution of watercourses originated from radiated sources, which is often caused by agricultural activities, it is especially expressed in Vojvodina (NEAP).

By the Regulation of the quality of liquid waste and the way of their draining into the sewage system it is clearly issued what liquid waste must not contain. Those are radioactive matters, acid, alkaline and aggressive matters, inflammable and explosive matters, solid, viscous and floating matters, such as straw, reed, ash, glass, feathers, meat, remains of disinfectants, then liquid waste from healthy and vet institutions, harmful gases, such as nitrogen oxides, cyanic hydrogen, sulphur oxides, hydrogen sulphide, chlorine and so on (Slžbeni List RCG, 10/97).

6. THE AIMS OF NATIONAL ECOLOGICAL CAMPAINS

National Ecological team with the skilled help of Ecological agency for the reconstruction, carried out the aims which are necessary to be achieved in order to reach the quality of water resources in Vojvodina. Those aims are:
- coordination of national regulations about the control of water with the EU Frame Directive about water
- reconciliation of competence of national institutions for integral control of water
- coordinate the standards for drinking water and water for bathing to the demands of the Directive about drinking water and water for bathing till 2010
- decrease the using of water in the industry as well as at individuals
- qualifying of existing institutions for monitoring and reporting in order to implement The Danube Convention (Sofia)
- introducing the system for managing of the river basins in Vojvodina till 2012
- identifying the areas which are sensitive on the water pollution and zones exposed to nitrates till 2010
- improved quality of water in waterflows (especially those which are of great influence on water supply) and in canals for irrigation (especially the canal Danube-Tisa-Danube)
- decreasing of draining of nutritents and other dangerous matters from spotted and diffuse sources
- achieving the economic price of water, including the price of resources and expenses for the environment
- the construction of the factory for a primary and secondary treatment of communal liquid waste in all agglomerations, which have more than 100.000 inhabitants till 2014
- expand a sewage system on all agglomerations which have more than 100.000 inhabitants in order to cover 90% of the population of those agglomerations till 2014
- provide ecologically and technically accurate repeated use or postponement of mud from the purifying devices
- realize measures of protection of floods according to the Waterpower engineering base
- setting up the protective zone of existing and planned sources of water supply till 2007
- the quality of drinking water in all agglomerations which cater with water from centralized water systems should satisfy qualities of the Directive about drinking water till 2014
- reducing of the loss in a distributive network to 20% till 2010
- identify and set up a maintaining rate of exploitation of ground aqua-spheres
- innovate the standards and advance laboratories for the control of water quality

With all those mentioned aims of the National ecological campaign, it is necessary to educate the population. A public municipal company Water system and Sewage system in Novi Sad took important steps exactly in the education of population in the way that with the bill for municipal services they enclose a brochure ‘Without water there is no life’ to the population. In a brochure there is a given explanation that water is a life, that on our planet 97% is salt water, and fresh water only 3%. Then it is mentioned a strategic importance of water and how much water we spend daily (on cooking 3l, washing the dishes till 100l, bathing till 300l, showering till 80l, washing laundry till 250l). At the end all the possibilities are mentioned, as well as how to save water and reduce the amount on the bill.

7. CONCLUSIONS

As a result of pollution of water resources there is a great number of problems in Serbia which imperil population and economy. On the territory of Vojvodina 67% of drinking water supply doesn’t satisfy physical, chemical and bacteriological standards. Hydraulic epidemics and diseases appear as a result, which are caused primarily with a bad quality of drinking water.

In Vojvodina there is a great number of causes which give rise to the pollution of water resources. As first, it is a pollution of watercourses which come into Serbia from other countries. Then the lack of effective system of monitoring which would control the quality of surface and ground water. Sewage system is undeveloped because it covers only 45% of urban population. Industrial liquid waste drain mainly without previous purifying treatment. The use of artificial fertilizers is inadequate which causes pollution of water...
resources by nitrates. Legislation in the area of sustainable use of ground water is inadequate and the exploitation of resources of ground water is controlled insufficiently. The treatment of municipal dangerous water is very low while the sources of water supply are inadequately protected.

A national ecologic team by the professional help of European agency for reconstruction carried out the aims which are necessary for accomplishing in order to reach the quality of water resources in Serbia and, of course, in Vojvodina. And the most important, every day, on every place and in every situation we should educate children especially to learn to save water and to learn to love nature, to be sensitive when the question of environment protection is concerned because in future exactly they will cope with a big problem of water pollution and environment generally.

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