Ecological risk assessment and health risk of pollution on the river section Bahlui Iasi

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Abstract: In this paper we propose an assessment on Bahlui River, due to the evolution of its population and increasing number of water quality must be considered. Risk assessment is to reduce negative impacts on human health and ecosystems caused by pollutants in the river Bahlui
Keywords: assessment, ecological risk, surface water pollution

1 INTRODUCTION

Bahlui Basin with an area of 1950 Km2 is situated in the Moldavian Plateau in proportion as 95% of Iasi County. It is located between Plain and Plateau Jijia Barlad. Human life or damage to flora and fauna of the river Bahlui is very important and therefore proposes an evaluation.

Risk is the likelihood of a negative effect in a specified time and is often described as the equation: Risk = hazard x exposure.

Environmental risk is regarded as a phenomenon that comes from circumstances for witch decision- maker is able to identify developments/ ecological events it's possible and even probability. Water hazards are all threats to the population, its property and the environment, due process water, water that the Earth's surface, expressed qualitatively and quantitatively processes [2]

Table 1 shows the activities that are polluting the River Bahlui.

No	Activities
1	Surface water pollution due to industrial wastewater discharges
2	Surface water pollution due to sewage discharge untreated or inadequately treated
3	Surface water pollution due to mining activities
4	Surface water pollution due to activities in livestock breeding
5	Lack of facilities prepurge / disinfection of wastewater from hospital units
6	Surface water pollution due to sewage discharge
7	Pollution due to uncontrolled disposal of waste and the banks of the flooded rivers, especially waste and sawdust

Table 2 Classification of pollutants according to the characteristics and effects caused by these unpleasant

Groups of compounds	Induced effects
Biodegradable substances expressed by BOD	Oxygen deficiency in bottom, unpleasant odors, dead fish
Poisonous substances(As,Cr, Cd, Cu, Pb, Zn, Hg)	Poisoning animals. Plankton and fish died, the accumulation in tissues of aquatic fauna
Acids and alkalis	Buffering capacity destruction and disruption of ecological balance
Salts (Fe, Ca, Mg, Mo, Cl)	Change water characteristics (salinity, hardness)
Oxidizing agents and reducing (NH_3, NO_2, SO_3^{2-})	Reduction of dissolved oxygen, eutrophication, selective development of bacteria, unpleasant odors
Pathogens	Infections in humans and domestic animals, plant diseases
Disinfectants (Cl_2, H_2O_2, phenol)	Selective destruction of microorganisms, tastes, unpleasant odors in treated water

Table 3 Sources of pollution and pollution effects involved is shown in the table where the (NN) have noted normal levels, and through (no), high levels of impact

Point sources	Pollutant Effects

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Domestic wastewater	Potentially toxic	Disease transmission	Reduction OD	Eutrophication	Trophic chain damage	Aesthetic damage
	-	n.n	n.r	n.r	-	n.n
Industrial wastewater such as: -Organic	n.n	-	n.n	-	n.n	n.n
-thermic	-	-	n.r	-	-	n.n
Surface wastewater discharges: Inadvertently	n.n	n.n	-	n.n	n.r	n.n
-Possible to avoid	n.n	-	-	-	n.r	n.n
Wastewater drained from: -Agricultural land	n.n	n.n	n.r	n.n	n.n	n.n
Illegal discharges Diffuse						
-Discharge accidental	n.r	-	n.n	-	n.n	n.r

2. IDENTIFY SOURCES OF RIVER POLLUTION BAHLUI

The leading polluters are organic matter, nitrogen and phosphorus, which affect the ecological and economic system of mass Bahlui. Balance basin made for organic matter (BOD5 and COD-Mn), ammonium, nitrate nitrogen, total phosphorus, chloride, total substances dissolved and suspended materials indicate the degree of pollution of river waters to the confluence with the river Jijia Bahlui mostly due to the City Wastewater Treatment Plant. Science located 5 km upstream of confluence.

This analysis confirms the influence that is employment. Treatment Station on the river quality Bahlui in "degraded" and stresses the need refurbisment and modernization as it's urgent.

Section Jijia Chiperesti

In this section falls within degraded. The level of oxygen in the water is generally low and sometimes reaching zero. The difference between the calculated loads and loads downstream of the section considered, Chipereşti are classified under "unknown source". The table shows clearly that the values measured in river Bahlui Holyoke section is the most important source of pollution
.

Table 4 - Victoria-Chipereşti

Loading%	Total dissolved material	chlorine	CCO-Mn	CBO_5	NH_4^+	P	Total dissolved material	chlorine	CCO-Mn	CBO_5	NH_4^+	P	Total dissolved material	chlorine	CCO-Mn	CBO_5	NH_4^+	P
	2003						2004						2005					
Jijia-Victoria	30	23	17	13	10	6	44	34	20	21	13	18	40	34	26	19	17	34
Bahlui Holyoke	79	91	101	107	108	73	64	67	75	79	74	53	49	61	66	70	63	79
Known sources	0,3	0,3	0,5	0,6	2,0	0,7	0,2	1,5	0,4	0,4	1,3	0,5	0,3	0,5	0,4	0,5	1,1	0,4
Sum	**110**	**115**	**119**	**120**	**120**	**80**	**108**	**102**	**96**	**101**	**88**	**72**	**89**	**96**	**93**	**90**	**81**	**113**
Jijia Chiperesti	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Known sources	**-10**	**-15**	**-19**	**-20**	**-20**	**20**	**-8**	**-2**	**4**	**-1**	**12**	**28**	**11**	**4**	**7**	**10**	**19**	**-13**

* CET II Holyoke, drainage channel of the solid fuel dump

Source: A.N "Romanian Waters" Iasi branch

Section Bahlui-Holyoke

Ammonium concentration decreased towards the end of period in 2005and therefore was classified in category III water quality (single measurement giving a classification of Class II). STAS phosphorus values exceeded in 80% of cases.

Table no 5 - Section Holyoke upstream Treatment Station Science

Loading%	2003						2004						2005					
	Total dissolved material	chlorine	CCO-Mn	CBO_5	NH_4^+	P	Total dissolved material	chlorine	CCO-Mn	CBO_5	NH_4^+	P	Total dissolved material	chlorine	CCO-Mn	CBO_5	NH_4^+	P
Bahlui am. SE	23	20	12		6		36	31	25		19		38	27	30		13	
Treatment Station Iasi	72	63	83	109	94	128	60	69	74	84	93	108	53	62	92	105	123	99
Branch	0,9	0,5	0,3	0,1	0,2	0,2	1,5	1,2	0,8	0,2	0,2	5	2,4	1,3	1,3	0,9	0,7	1
Sum	**96**	**84**	**96**	**109**	**100**	**128**	**98**	**101**	**99**	**84**	**112**	**113**	**94**	**90**	**123**	**106**	**137**	**100**
Bahlui Holyoke	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Known sources	**4**	**16**	**4**	**-9**	**0**	**-28**	**2**	**-1**	**0,7**	**16**	**-12**	**-13**	**6**	**10**	**-23**	**-6**	**-37**	**0**

From Table 5 shows that in general are known sources of pollution. WWTP Iasi main polluter purged flow of approximately 4.2 m3 / s flow rate higher than the river flow upstream section Bahlui point of discharge of sewage treated.

Section Bahlui upstream Treatment Station Science

In this section the oxygen concentration rarely exceeded the value of 1 mg / l. Over 50% of measurements are below 4 mg / l. COD-Mn-pointer after water was permanently assigned to the degraded class. Ammonia water falls in Class II-III in 75% of cases. Nitrates and nitrites have led to a classification between Class I and II. BOD5 and phosphorus values indicators led to the classification of river water degraded in categories III, CCO-Mn and BOD5 indicators were classified in category degraded waters because of pollution caused by organic livestock farms in the area.

Section 4, River Bahlui

In the upstream sector of Iasi WWTP: these unknown sources can be tributaries and drainage channels have little or unmonitored, waste discharged directly into rivers, storm water that washes and transferred by the slopes of pollutants in surface runoff watercourses or groundwater.

Sections 2 and 3 on the river Bahlui

In Section 3 Bahlui resulting mass balance of large discrepancies in terms of inputs in the sector and charges out of this sector. These unknown due Duruşca unmonitored streams, Totoieşti, and Ileana Hoişeşti but industrial sources included in the balance of mass. Another contribution is made by sources in Section 2 and Section 4 Bahlueţ Bahlui.

In Section 2 Bahlui values are observed at low measurements, unknown. Existing number of sources for these tributaries indicates that they can make considerable load of organic matter, phosphorus and nitrogen compounds. Sources of these substances are largely diffuse character. Pollution from organic sources is small livestock farms and farms where animals are bred under industrial or less organized.

Pollutant loads from entering the accumulation Podu Iloaiei

Table 6 - Razboieni and Lake Podu Iloaiei

2003-2005	CCO-Mn	CBO5	phosphorus	NH4	NO3
Bahlueţ Războieni	66	47	95	73	91
Treatment Station Razboieni	32	52	4,1	26	4,5
Lake Sârca	1,0	0,5	0,8	0,3	2,4
Livestock farms Podu Iloaiei	0,5	0,5	0,2	0,4	1,9
Sum (Lake Podu Iloaiei entries)	100	100	100	100	100

Pollution sources located upstream section Razboieni

Table 7 Mass balance (% of measured quantities Razboieni) – Tg Frumos – Razboieni

2003-2005	Cl⁻	Total dissolved substances	CCO-Mn	CBO5	phosphorus	NH4	NO3	N_{total}

Bahlueţ Târgu Frumos	21	25		5	4	3	1,1	92	7
Treatment Station Târgu Frumos	20	15		37	66	28	41	5	41
Sum	**41**	**41**		**42**	**69**	**31**	**42**	**97**	**48**
Bahlueţ Războieni	100	100		100	100	100	100	100	100
Known sources	**59**	**59**		**58**	**31**	**69**	**58**	**3**	**52**

Sources may have the same causes: agriculture, livestock, households, small industry. That polluted groundwater monitoring would require pesticides. Treatment plant city of Tg. Nice contributes significantly to river pollution Bahlueţ.

Pollution reduction in recent years due to reduction in activity of poultry farms. Treatment capacity of the station is relatively low, the effluent containing large amounts of pollutants.

Table 8 Mass balance (%) Tansa lake, lake Pârcovaci (Cotnari contribution to the b-without input Cotnari)

2003-2005	Cl⁻	Total dissolved substances	CCO-Mn	CBO5	NH4	NO3	N total	P	MS
a)									
Lake Pârcovaci	8	18	7	7	5	1,7	3	3	15
Treatment Station Hârlău	17	11	22	37	39	35	36	109	12
Buhalniţa	20	21	24	30	26	2,5	14	38	26
Cotnari	2	2	88	214	36	0,4	44	11	22
Măgura	19	19	38	44	23	6	16	63	29
Sum	**65**	**71**	**178**	**331**	**129**	**46**	**113**	**224**	**104**
Bahlui - lake Tansa	100	100	100	100	100	100	100	100	100
Unknown source	**35**	**29**	**-78**	**-231**	**-29**	**54**	**-13**	**-124**	**-4**
b)									
Sum less Cotnari	**63**	**69**	**90**	**117**	**93**	**45**	**70**	**212**	**83**
Bahlui lake Tansa	100	100	100	100	100	100	100	100	100
Unknown source plus Cotnari)	**37**	**31**	**10**	**-17**	**7**	**55**	**30**	**-112**	**17**

Load values measured tributaries Buhalniţa Magura indicates that much of the contribution due to unknown sources other tributaries not included in the monitoring program. An inventory and monitoring them is absolutely necessary. Pollution s.c. Cotnari S.A. however, can be considered part contributing to intake BOD5, COD-Mn and nitrogen compounds. That waste disposal here is not directly but through a channel Bahlui 1 km induces errors in mass balance.

Table 9 Water pollution with organic pollution (examples of polluting units)

Affected water user	Polluting units	Nature of Pollution
Bahlui, Belceşti	S.C. COTNARI S.A. insufficiently treated water discharges	organic
Bahlui, Iaşi	R.A.J.A.C Iaşi	oil
Bahlui, Belceşti	S.C. Cotnari by insufficiently treated water discharges	organic
Bahlui, Belceşti	R.A.J.A.C Iaşi, sector Hârlău, S.C. Cotnari S.A by insufficiently treated water discharges and diffuse sources (50%)	organic
Rediu, Bahlui	S.C. Competrol S.A Iaşi	Oil

Source: A.N "Romanian Waters" Iasi branch

The catchment Bahlui surface water quality was affected due to accidental pollution of the corresponding failure of the sewerage system and wastewater treatment, diffuse sources, etc.

Table 10 Accidental pollution from different units

Source Pollution	Polluted natural source	Location (range)	Location nature pollution	Polluting unit
Storage of garbage on the banks of the waterways	Bahlui	Pârcovaci	Organic-average	Primary Pârcovaci
Garbage and industrial warehouse-Science	Bahlui	Downstream de Iaşi	Organic-average	RA CITADIN Iaşi
R.A.J.A.C Iaşi Collector shore as Bahlui	Bahlui	Iaşi	Organic substances from sewage	R.A.J.A.C Iaşi, improper operation - river collector barrier Bahlui
Beat slurry	Bahlui	Village Leţcani	Organic-average	S.C Poultry S.A.

Other sources of pollution other Bahlui basin deposits have been furnished or industrial garbage and untended on the banks of the river (or near) Bahlueţ, Bahlui, Vămăşoaia, Repedea and Cacaina. [1]

3. MATERIALS AND METHODS

A solution to the ecological rehabilitation of river Bahlui is increased by increasing the dilution of river flows Bahlui. Additional dilution flow required to ensure the achievement of certain grades could be obtained from the accumulation Tansa, poplar, and Cucuteni Iloaie bridge located upstream of Iaşi Bahlui River and its tributaries.

Most efficient solution is to enforce strict environmental laws and implementing authorities in reducing discharges of pollutants and pollution sources monitoring.

The effect of polluted water on human health.

Influence of pollutants may be differenciated into two categories: public health and some use (industrial, agricultural and fisheries).

Oxygen consuming organic substances in water for both development and after death (maximum permissible limit is 4 mg / l). for surviaval aerobic organisms is necessary.

Aerobic Oxygen is necessary for Self-purification processes, i.e. aerobic bacteria that oxidize organic substances which ultimately lead to Self-purification of water.

Risk management is a very important aspect of a community organization, because assumes a risk awareness and emergency response.

Example risk assessment

Probabilities	Severity	Risk
3	1	3

According to the Order 184/1997, risk is the possibility of a negative occurrence in a specific time and is often written [4]

$$Risk = probability \times severity$$

Simplified model

Gravity	probability
3 large	3 increase
2 average	2 averages
1 mild	1 low

Table 11 Sources of pollution

Domestic wastewater	Epidemiological potential, mineral and organic loading of solids and liquids
Agricultural wastewater	Microbial germs, chemicals, high load alluvial material, organic matter
Human Activities	Waste, river water residuum

probability	Gravity	Risk
Domestic wastewater (2)	(3)	6
Agricultural wastewater (3)	(3)	9
Human Activities (2)	(3)	6

Risk can be calculated by multiplying these two factors (likelihood, gravity) to get a comparative figure for example 3 (high) x 2 (average) = 6 [2]
When the assessment there is a large number of important pollutants, should be given greater attention to ways clearer presentation.

4. CONCLUSIONS

Surface water pollution has serious effects on the biosphere, affecting aquatic life from microorganisms to insects, fish and birds, but health and terrestrial animals and plants. In addition, pollution can affect people use water. The worst health implication is that different species of plants and animals living in water or wine directly or indirectly in contact with them. In some cases, surface waters are used directly in end of drinking on the health implications are identical to those of drinking water.

Recommendations: pollution loads due to tributary streams should be evaluated by a monitoring program near the confluence

-Preparation of GIS database to identify risk areas to affect water quality.

Long-term pollution reduction involves costs and increasingly complex methods; the effects can be reduced, but is absolutely necessary to pursue the achievement of desired quality class;

Risk assessment of contamination of water resources is very important both for users of these resources and for authorities to define measures and action required models ecological reconstruction of these areas.

Iasi-upstream of these sources was evaluated by mass balance, more than half of all sources that produce pollution of surface waters.

5. REFERENCES

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