GWP Magyarország
Közhasznú Alapítvány

STOCKHOLM JUNIOR WATER PRIZE

# Entry to the Stockholm Junior Water Prize – 2013
# Hungary

# THE IMPORTANCE OF THE SZINVA-STREAM

## BIOLOGICAL AND CHEMICAL-PHYSICAL EXAMINATIONS


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**Abbreviations and acronyms:**

- MSZ 12749:1993: Hungarian water-quality regulation
  Source: http://www.vkkt.bme.hu/feltoltesek/2012/03/msz_12749.pdf
- MN: Macherey-Nagel GmbH
- WTW: Wissenschaftuch-Technische Wersktätten
- All other abbreviations and acronyms match the SI standard.

**Acknowledgements:**
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Our special gratitude also goes to all the students that have been involved in this project since 2010. Last but not least we would like to emphasize that this project could not have been born without the devoted work of Péter Polák, who is our project leader and Biology teacher.

## Summary

In our project we examined the chemical, physical and biological quality of the local stream, the Szinva, which flows through our town and provides drinking water for our area. In the frames of the biology workshop of our school we used a MultiLine 3430 (WTW) device, with which we were able to measure the temperature, the pH-rate and the oxygen concentration of the water. We also used a VISOCOLOR ECO PF-12 photometric environmental case (MN). With its help we could analyse our samples and measure the concentration of ammonite-, nitrite-, nitrate- and phosphate-ions. From the physical aspect we measured electric conductivity, the saturation of oxygen and the concentration of oxygen in water. We started to measure the Szinva in 2010, but in this project we used the results of 2012. The biological part of the work was the so-called biomonitoring examination. We drew conclusions about the quality of the water by using indicator genera, which shows us given changes in the environment. We observed the macroscopic invertebrates, the well visible animals that hang on to different materials during winter. We examined them in two different periods of the year, starting from May and then from October.

With regard to the sudden lack of rainfalls since 2010 and the lowering of the runoff as a consequence, we obtained the following results:

- the upper-Szinva's water is still of excellent quality and is almost unspoilt
- the two main joining tributaries carry a lot of organic and inorganic pollutions which considerably degrade the quality of the stream
- this pollution is likely to be the production of man coming from sewage, detergents and garbage
- the self-purification of the Szinva is not as good as it was earlier due to the low runoff since the results on the lower parts are still bad
- with the help of the local people and the local government we have to deal with this situation to preserve one of Miskolc's most valuable resources.

# The importance of the Szinva-stream

## 1. Why is the Szinva important to us?

Different kinds of living water have always been one of the biggest values all over the world. Nowadays clean and natural streams become more and more desired since their cleanness is linked closely to the development of our societies. The first big empires were built on the banks of rivers: between the Tigris and Euphrates there were the Sumerians, then Babylon; alongside the Nile ancient Egypt was flourishing and there are many other examples. Agriculture and as a consequence the quality of life began to improve there. Inhabitants grew in number and trade expanded. For this reason communities of other areas who lacked this treasure were also given the chance to survive. If we think it over, the world works almost the same way today, as well. With one exception. By concentrating only on the development of industries we are likely to forget about the maintenance of balance in nature. If we do not make moves to compensate for its destruction we will have to learn how to swim in polluted water and to breed fishes which can live in sewage. The example of the river Yangtze in China, which has become a periodical water flow because of the enormous water-usage (watering, means of industry, drinking water) should be a reminder for all of us.

The old town of Miskolc lies in the north-eastern part of Hungary, just under the Bukk mountains. Its role in the country was growing bigger and bigger as time went by. First the prehistoric men settled down here in caves before the Ice Age as the circumstances (the rich fauna and flora of the Bükk and of course the huge number of springs and the Szinva stream) were quite pleasant. This is how the Szinva-valley became the centre of fabricating tools. Within thousands of years the Miskolc-area became not only the home of the very first stone-made objects but one of the most important factors in Hungary's heavy industry which left its mark on the countryside.

Miskolc with its 170 000 inhabitants is considered to be a big town in the country. It is also the centre of the region. Several springs of high quality give the two streams of the town, the Garadna and the Szinva, which after joining together divide Miskolc in two parts then the stream reaches the river Sajo.

As industry developed first the paper-factory of Diosgyor polluted the Szinva very strongly. Hopefully the situation is not that bad today any more, just to give an example: the water is now good enough for fishing. During the 50s and 60s the stream literally became the sewer of huge factories. Fortunately the restrictions and laws had some influence and from the 80s the quality of water started to improve rapidly. According to the scale set by the Hungarian authorities it varied between the first and the second class quality in the past fifteen years.

## 2. The flow of examinations

The rating of water samples is carried out on the spot in case of ideal temperature (T>15°C). If it is not possible the physical, chemical and biological examinations are performed in a laboratory. The examined components:

- temperature of water and air
- electric conductivity of water
- pH-rate of water
- quantity of dissolved oxygen and saturation of oxygen
- the momentary concentration of ammonite-, nitrite-, nitrate-, and phosphate-ions, which refers to the pollution of water
- sensible features such as its colour, odour, cloudiness or even its flakiness

The aim of the examination is the determination of the parameters which refer to pollution. On the other hand, the measured data could be significant for the authorities. The devices of our own are the following:

MultiLine 3430 (WTW) – digital device for environmental measurements

Tetracon 925 – conductivity-,

FDO 925 – oxygen-,

IDS pH-measuring sensor

VISOCOLOR ECO PF-12 photometric environmental trunk (MN)


*Chemical examinations*

The results of the performed chemical examinations are listed in the charts of the report.

Explanations of the used definitions:

*Conductivity*: Its value gives us information about the quantity of dissolved ions. The huger it is the more reasons there are for the examination and the water is more likely to be polluted,

*pH*: Gives us the chemical reaction of water to find out if it is neutral, acidic or basic.

*Dissolved oxygen ($O_2$)*: Indicates the quantity of oxygen in water since the living conditions of most organisms are bound to the concentration of it.

*Ammonite-ion* ($NH_4^+$): Indicates fresh organic pollution.

*Nitrite-ion* ($NO_2^-$): Indicates the decomposition of already existing organic pollutions.

*Nitrate-ion* ($NO_3^-$): Indicates the final state of the decomposition of organic pollutions.

*Phosphate-ion* ($PO_4^{3-}$): Indicates the presence of detergents coming most likely from sewers.

*Classes of water quality according to MSZ 12749:1993*

***1st Class – excellent***

Free from artificial pollution, clear and clean natural water in which the concentration of dissolved compounds is low, almost fully saturated with oxygen and the number of bacteria from the sewers is negligible.

***2nd Class – good***

Polluting compounds and biologically recyclable alimentary substances are present but only in small numbers. The dissolved substances do not ruin the life circumstances. The diversity of organisms is big and the number of species is high. Natural odour and colour, the number of bacteria from the sewers is low.

***3rd Class – middle-rated***

Moderately polluted water in which eutrophication is possible. The number of bacteria from the sewers is sensible. The dissolved substances are temporarily making the life circumstances unfavourable. The diversity of organisms could decrease and some species could proliferate. In some cases it leads to a specific odour and/or colour.

***4th Class – polluted***

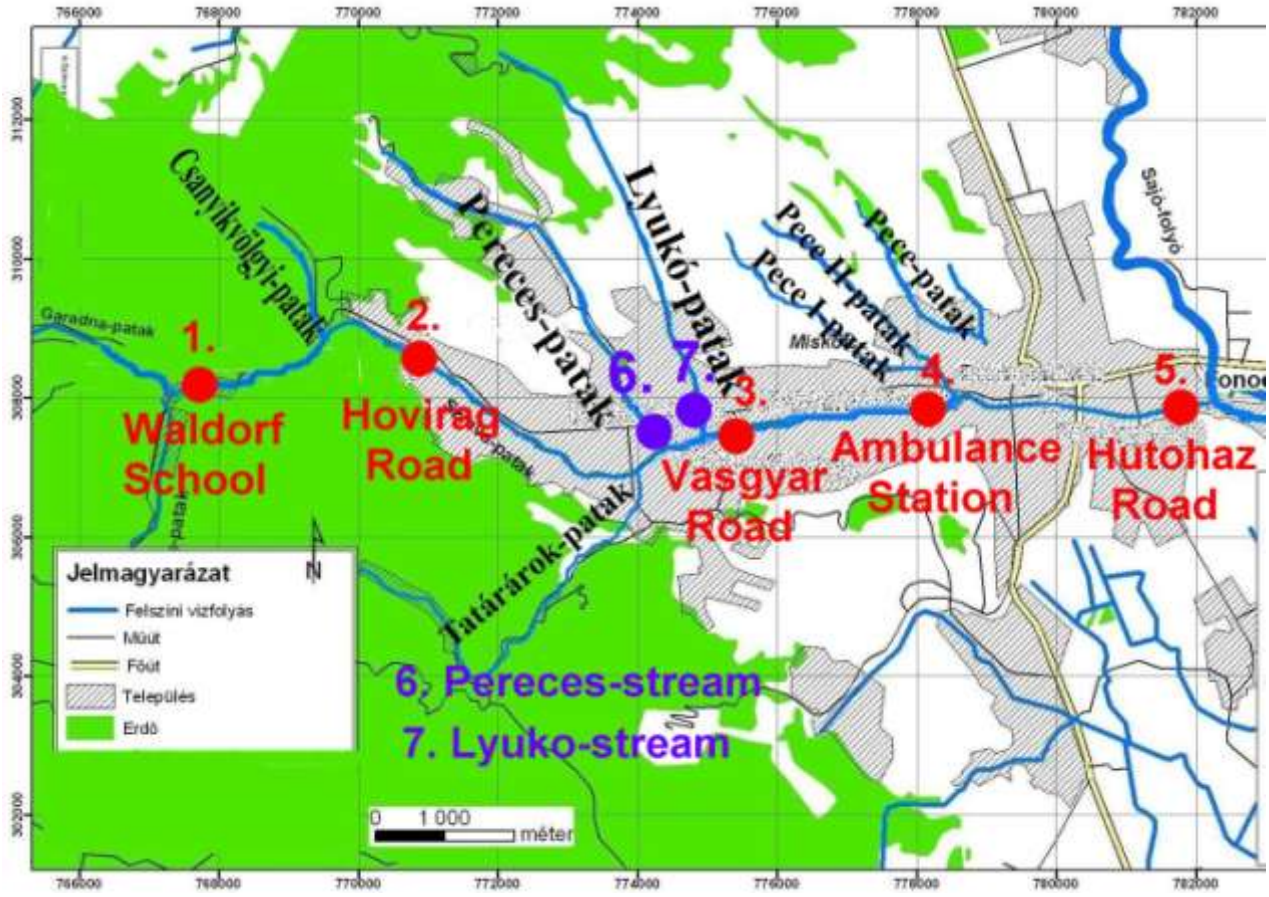
Rich in organic and inorganic substances often loaded with sewage as well. The number of bacteria from the sewage is dominant and the huge number of unicellular species is a characteristic of it. The water is cloudy, eutrophication is frequent. The concentration of biologically harmful substances could be higher than the limit of toxicity. It affects polycellular organisms badly.

***5th Class – strongly polluted***

Strongly loaded with organic and inorganic substances and sewage. The number of bacteria from the sewage is very close to the value in the sewages. The dissolved substances strongly limit circumstances of life. The water is usually very cloudy and has a bad odour. The colour varies. The concentration of biologically harmful substances reaches the chronic level.

The quality of water differs at different times of the day and seasons. Therefore it is important that the sampling should be carried out frequently. This frequency is determined by the MSZ 12749 regulation.

## 3. Measuring points and results



***1st measuring point:*** **Waldorf School – Felso-Hamor**

**1st chart**
**The Quality of the Szinva at the 1st Measuring Point**

| | **6th May 2012** | *9th June 2012* | **14th July 2012** | *18th Aug 2012* | **15th Sept 2012** | *20th Oct. 2012* | **24th Nov 2012** | **Quality** |
|---|---|---|---|---|---|---|---|---|
| Air Temperature (°C) | **15** | *22* | **23** | *23* | **15** | *10* | **4** | ------ |
| Water Temperature (°C ) | **9.1** | *15.6* | **16** | *16.4* | **9.3** | *7.8* | **6.4** | ------ |
| Conductivity (µS/cm) | **493** | *501* | **511** | *485* | **489** | *492* | **489** | **1st class** |
| pH | **7.7** | *7.8* | **7.917** | *8.0* | **8.1** | *8.2* | **8.3** | **2nd class** |
| Dissolved $O_2$ (mg/l) | **9.67** | *11* | **11.3** | *12.02* | **10.53** | *11* | **11.3** | **1st class** |
| Saturation of Oxygen % | **96.8** | *101* | **97.4** | *102* | **95** | *101* | **97.4** | **1st class** |
| $NH_4^+$ (mg/l) | **<0.4** | <0.4 | <0.4 | *<0.4* | **<0.4** | <0.4 | **<0.4** | **1st class** |
| $NO_2^-$ (mg/l) | **0.02** | *0.02* | **0.01** | *0.015* | **0.02** | *0.02* | **0.01** | **2nd class** |
| $NO_3^-$ (mg/l) | **2.5** | *3.4* | **2.5** | *3.2* | **2.5** | *3.4* | **2.5** | **2nd class** |
| $PO_4^{3-}$ (mg/l) | **<0.2** | *0.2* | **0.2** | *0.2* | **<0.2** | *0.2* | **0.2** | **2nd class** |

Fairly unspoilt part of the upper-Szinva. The quality of water is considered to be excellent here. Loading from part of the inhabitants cannot be seen. Only the joining Garadna stream brings in some pollution. In 2012 smaller nitrite and phosphate pollutions could be observed (1st chart). Sewage is not flowing into it. The watercourse is clean and clear, the stream is fast flowing.

***2nd measuring point:*** ***Bridge of the Hovirag road***

**2nd chart**
**The Quality of the Szinva at the 2nd Measuring Point**

| | **6th May 2012** | *9th June 2012* | **14th July 2012** | *18th Aug 2012* | **15th Sept 2012** | *20th Oct. 2012* | **24th Nov 2012** | **Quality** |
|---|---|---|---|---|---|---|---|---|
| Air Temperature (°C) | **17** | *24* | **25** | *26* | **16** | *11* | **6** | ------ |
| Water Temperature (°C ) | **9.3** | *16.4* | **17** | *17* | **11** | *7* | **5.5** | ------ |
| Conductivity (µS/cm) | **540** | *570* | **560** | *600* | **562** | *563* | **594** | **2nd class** |
| pH | **7.9** | *8.3* | **8.4** | *8.4* | **8.2** | *8.3* | **8.4** | **2nd class** |
| Dissolved $O_2$ (mg/l) | **10.7** | *9.3* | **8.2** | *8.3* | **10.4** | *10.9* | **11** | **1st class** |
| Saturation of Oxygen % | **95.5** | *97* | **87** | *88* | **97** | *93* | **91** | **1st class** |
| $NH_4^+$ (mg/l) | **<0.4** | <0.4 | <0.4 | *<0.4* | **<0.4** | <0.4 | **<0.4** | **1st class** |
| $NO_2^-$ (mg/l) | **0.02** | *0.03* | **0.02** | *0.02* | **0.025** | *0.03* | **0.015** | **2nd class** |
| $NO_3^-$ (mg/l) | **3** | *4* | **3.2** | *5* | **3** | *4.1* | **4.2** | **2nd class** |
| $PO_4^{3-}$ (mg/l) | **0.2** | *0.2* | **0.2** | *0.2* | **0.2** | *0.2* | **0.2** | **2nd class** |

At this measuring point the quality of water degrades a little but remains good. This part is highly urbanised. Loading of the inhabitants is present but low. After the flood of 2010 the local-government rebuilt the watercourse, which is clean just like the banks.

***3rd measuring point:*** ***Bridge of the Vasgyar road***

**3rd chart**
**The Quality of the Szinva at the 3rd Measuring Point**

| | **6th May 2012** | *9th June 2012* | **14th July 2012** | *18th Aug 2012* | **15th Sept 2012** | *20th Oct. 2012* | **24th Nov 2012** | **Quality** |
|---|---|---|---|---|---|---|---|---|
| Air Temperature (°C) | **19** | *25* | **27** | *27* | **17** | *13* | **8** | ------ |
| Water Temperature (°C ) | **10** | *17* | **18.2** | *17.9* | **13** | *10.1* | **6** | ------ |
| Conductivity (µS/cm) | **790** | *850* | **892** | *912* | **850** | *862* | **794** | **3rd class** |
| pH | **8.1** | *8.2* | **8.3** | *8.3* | **8.1** | *8.2* | **8.4** | **2nd class** |
| Dissolved $O_2$ (mg/l) | **10.4** | *13.2* | **14.4** | *15.9* | **13.2** | *10.3* | **11.8** | **1st class** |
| Saturation of Oxygen % | **94** | *140* | **156.6** | *173* | **129** | *94* | **97** | **3rd class** |
| $NH_4^+$ (mg/l) | **<0.4** | <0.4 | **<0.4** | *<0.4* | **<0.4** | <0.4 | **<0.4** | **1st class** |
| $NO_2^-$ (mg/l) | **0.04** | *0.06* | **0.07** | *0.08* | **0.07** | *0.06* | **0.05** | **3rd class** |
| $NO_3^-$ (mg/l) | **7** | *9* | **8** | *9* | **8** | *8* | **9** | **3rd class** |
| $PO_4^{3-}$ (mg/l) | **0.3** | *0.4* | **0.5** | *0.6* | **0.5** | *0.6* | **0.5** | **4th class** |

Above the measuring point three smaller streams join the Szinva: the Pereces, the Tatar-arok and the Lyuko. These ones bring in most of the pollutions. According to the data this point is considered to be between the 3rd and 4th class. The solution for this problem is to clean the mentioned three streams.

## ***4th measuring point:*** **Ambulance station**

**4th chart**

**The Quality of the Szinva at the 4th Measuring Point**

| | **6th May 2012** | *9th June 2012* | **14th July 2012** | *18th Aug 2012* | **15th Sept 2012** | *20th Oct. 2012* | **24th Nov 2012** | **Quality** |
|---|---|---|---|---|---|---|---|---|
| Air Temperature (°C) | **19** | *26* | **28** | *28* | **17** | *13* | **9** | ------ |
| Water Temperature (°C ) | **10.3** | *16.9* | **18** | *18* | **13.2** | *10.2* | **6.1** | ------ |
| Conductivity (µS/cm) | **700** | *844* | **872** | *900* | **830** | *827* | **785** | **3rd class** |
| pH | **8.2** | *8.3* | **8.3** | *8.4* | **8.2** | *8.3* | **8.4** | **2nd class** |
| Dissolved $O_2$ (mg/l) | **10.7** | *16.5* | **17.4** | *15.3* | **14.5** | *13.2* | **11.9** | **1st class** |
| Saturation of Oxygen % | **98** | *175* | **189** | *167* | **142** | *121* | **98** | **3rd class** |
| $NH_4^+$ (mg/l) | **<0.4** | <0.4 | **<0.4** | *<0.4* | **<0.4** | <0.4 | **<0.4** | **1st class** |
| $NO_2^-$ (mg/l) | **0.05** | *0.05* | **0.06** | *0.07* | **0.07** | *0.05* | **0.04** | **3rd class** |
| $NO_3^-$ (mg/l) | **6.8** | *8.7* | **8** | *9* | **7.5** | *7.8* | **8.3** | **3rd class** |
| $PO_4^{3-}$ (mg/l) | **0.3** | *0.4* | **0.5** | *0.6* | **0.5** | *0.6* | **0.4** | **4th class** |

This measuring point is quite new as we included it only in 2011 first. Through these results we wanted to know if the self-purification of the Szinva was effective in the green zone in which it flows between the 3rd and 4th measuring points.

## *5th measuring point:* Bridge of the Hutohaz road

**5th chart**
**The Quality of the Szinva at the 5th Measuring Point**

| | **6th May 2012** | *9th June 2012* | **14th July 2012** | *18th Aug 2012* | **15th Sept 2012** | *20th Oct. 2012* | **24th Nov 2012** | **Quality** |
|---|---|---|---|---|---|---|---|---|
| Air Temperature (°C) | **19** | *26* | **28** | *28* | **17** | *13* | **9** | ------ |
| Water Temperature (°C ) | **10.4** | *17* | **18** | *18* | **14** | *10.3* | **6.2** | ------ |
| Conductivity (µS/cm) | **690** | *820* | **863** | *892* | **840** | *813* | **769** | **3rd class** |
| pH | **8.2** | *8.3* | **8.3** | *8.4* | **8.2** | *8.5* | **8.6** | **3rd class** |
| Dissolved $O_2$ (mg/l) | **11.3** | *14.5* | **16.2** | *16.3* | **14.5** | *11.4* | **12.4** | **1st class** |
| Saturation of Oxygen % | **105** | *154* | **176** | *177* | **145** | *95* | **105** | **3rd class** |
| $NH_4^+$ (mg/l) | **<0.4** | <0.4 | <0.4 | *<0.4* | **<0.4** | <0.4 | **<0.4** | **1st class** |
| $NO_2^-$ (mg/l) | **0.04** | *0.04* | **0.05** | *0.06* | **0.04** | *0.04* | **0.04** | **3rd class** |
| $NO_3^-$ (mg/l) | **6** | *8* | **7** | *8.3* | **7** | *7.2* | **8** | **3rd class** |
| $PO_4^{3-}$ (mg/l) | **0.25** | *0.25* | **0.35** | *0.3* | **0.3** | *0.3* | **0.3** | **3rd class** |

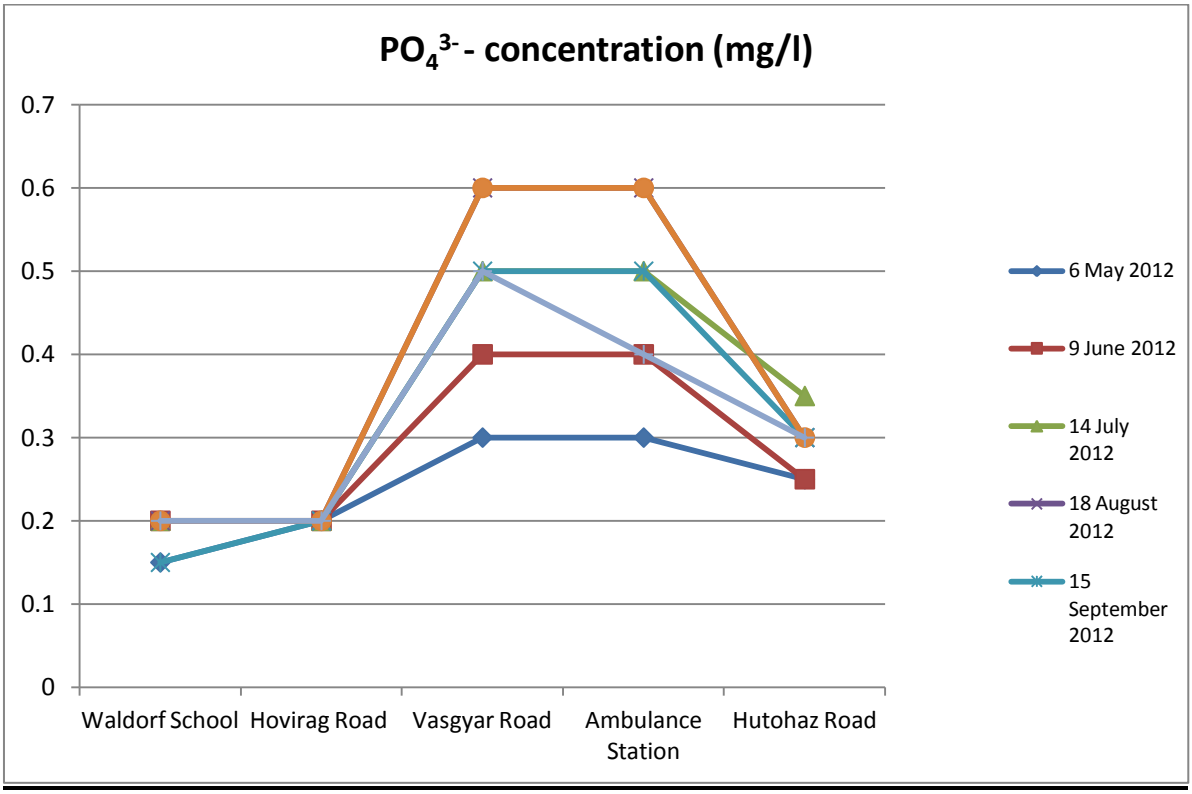
At the last measuring point the Szinva maintained the pollution caused at the Vasgyar throughout the whole year. As the runoff is little it was unable to dilute it.

The good quality of water experienced in the last few years is getting worse right now. From the third measuring point to the firth its quality is only of 3rd class.

The rate of the different ions does not change throughout the year and it would cause a lot of problems if there were not so many algae and plants in the watercourse which maintain the high

saturation of oxygen. At night, on the other hand, they are also consumers of oxygen. However, it is not experienced because of the good flow of the stream and the good water quality of the upper-Szinva. This is also proven by the great number of fish that can be seen in downtown.

**1st diagram**




The presence of the phosphate-ion is obviously the result of human activities: industrial sources, for example, or it refers to the presence of sewage. After the clean and clear upper-part there are sudden peaks from the 3rd measuring point.

High concentration favours plants and algae in water thus sluggish water could appear which might lead to eutrophication. We found a lot of them in 2012.

As it is clear from the 1st diagram, the most worrying extent of pollution is at the 3rd measuring point where the three mentioned smaller streams join together. The results are almost the same as at the ambulance station. Before the firth the concentration gets lower but still does not reach the level of the upper part. According to the examinations of 2012 the self-purification of the Szinva falls behind compared to the past years. The reason for this is the decrease of the amount of annual rainfall.

## ***6th measuring point*: Firth of the Pereces-stream**

**6th chart**
**The Quality of the Szinva at the 6th Measuring Point**

| | **6th May 2012** | *9th June 2012* | **14th July 2012** | *18th Aug 2012* | **15th Sept 2012** | *20th Oct. 2012* | **24th Nov 2012** | **Quality** |
|---|---|---|---|---|---|---|---|---|
| Air Temperature (°C) | **19** | *25* | **27** | *27* | **17** | *13* | **8** | ------ |
| Water Temperature (°C ) | **13** | *19* | **21** | *18* | **14** | *11* | **7** | ------ |
| Conductivity (µS/cm) | **1056** | *1130* | **1112** | *1200* | **1059** | *1124* | **1068** | **4th class** |
| pH | **8.1** | *8.2* | **8.2** | *8.2* | **8.1** | *8.2* | **8.3** | **2nd class** |
| Dissolved $O_2$ (mg/l) | **9.5** | *10.8* | **13.2** | *13.9* | **12.8** | *12* | **11.3** | **1st class** |
| Saturation of Oxygen % | **93** | *112* | **134** | *152* | **128** | *112* | **96** | **2nd class** |
| $NH_4^+$ (mg/l) | **<0.4** | <0.4 | **<0.4** | *<0.4* | **<0.4** | <0.4 | **<0.4** | **1st class** |
| $NO_2^-$ (mg/l) | **0.06** | *0.07* | **0.09** | *0.1* | **0.08** | *0.07* | **0.07** | **3rd class** |
| $NO_3^-$ (mg/l) | **10** | *13* | **12** | *15* | **11** | *12* | **14** | **4th class** |
| $PO_4^{3-}$ (mg/l) | **0.6** | *0.7* | **0.6** | *0.9* | **0.7** | *0.7* | **0.6** | **4th class** |

The Pereces-stream has been cleaned several times since 2009. The watercourse is visible. The deep muddy parts have also been cleaned. As a result the quality improved a bit, but the water coming from the mine still has huge conductivity.

The constantly high nitrite-, nitrate and phosphate-ion concentration allows us to think that sewage is led to the water. The state of the stream has not been changed greatly for years.

**Unfortunately the area is very loaded by means of human activity. At a specific part of the area we were able to see the traces of animal torture, for example, and a lot of garbage was thrown into or near the water.** See the pictures below.

**7th measuring point Lyuko-stream**

**7th chart**
**The Quality of the Szinva at the 7th Measuring Point**

| | **6th May 2012** | *9th June 2012* | **14th July 2012** | *18th Aug 2012* | **15th Sept 2012** | *20th Oct. 2012* | **24th Nov 2012** | **Quality** |
|---|---|---|---|---|---|---|---|---|
| Air Temperature (°C) | **19** | *25* | **27** | *27* | **17** | *13* | **8** | ------ |
| Water Temperature (°C ) | **12** | *16* | **17** | *17* | **12** | *9* | **6** | ------ |
| Conductivity (µS/cm) | **1782** | *1793* | **1649** | *1832* | **1781** | *1798* | **1865** | **4th class** |
| pH | **7.8** | *8.1* | **7.92** | *8.0* | **8.1** | *8.2* | **8.4** | **2nd class** |
| Dissolved $O_2$ (mg/l) | **9.5** | *9.12* | **8.85** | *8.5* | **9.6** | *10.4* | **11.6** | **1st class** |
| Saturation of Oxygen % | **91** | *95* | **94.2** | *91* | **92.4** | *95.3* | **96** | **2nd class** |
| $NH_4^+$ (mg/l) | **<0.4** | <0.4 | **0.5** | *<0.4* | **<0.4** | <0.4 | **<0.4** | **1st class** |
| $NO_2^-$ (mg/l) | **0.02** | *0.03* | **0.03** | *0.03* | **0.04** | *0.03* | **0.04** | **2nd class** |
| $NO_3^-$ (mg/l) | **14** | *15* | **13** | *16* | **16** | *13* | **14** | **4th class** |
| $PO_4^{3-}$ (mg/l) | **0.3** | *0.5* | **0.6** | *0.7* | **0.4** | *0.5* | **0.4** | **4th class** |

The state of the Lyuko-stream was almost the same throughout 2012. The water coming from the mine had huge conductivity as well. However, we have to emphasize that this is the natural characteristic of water coming from a mine since it is rich in minerals. On the other hand the huge concentration of phosphate- and nitrate-ions is due to the sewage led to the water.
The watercourse was almost always entirely covered with plants and garbage. The local government started to deal with this problem three months ago.

## 4. Biological, biomonitoring examinations

Biological indicators are organisms that indicate changes of the environment by their huge number or lacking. The advantage of this kind of measuring is that it gives us some information about living organisms.

The macroscopic invertebrates are well visible animals that hang on to different materials during winter. The most significant representatives of this group are the vermicules (e.g. leeches. hair-eels), molluscs (e.g. snails. shells), crabs (e.g. ampiphod. water-slater) and insects and their larvae (e.g. dragonfly. mayfly. stonefly). They cannot stand the changes of the environment therefore they are good indicators of pollution.

The group of macroscopic invertebrates has been used widely in other European countries to determine the quality of waters for decades.

With our accession to the European Union biological examinations like this become more and more important in Hungary. That is why we chose it for our Szinva Monitoring Project.

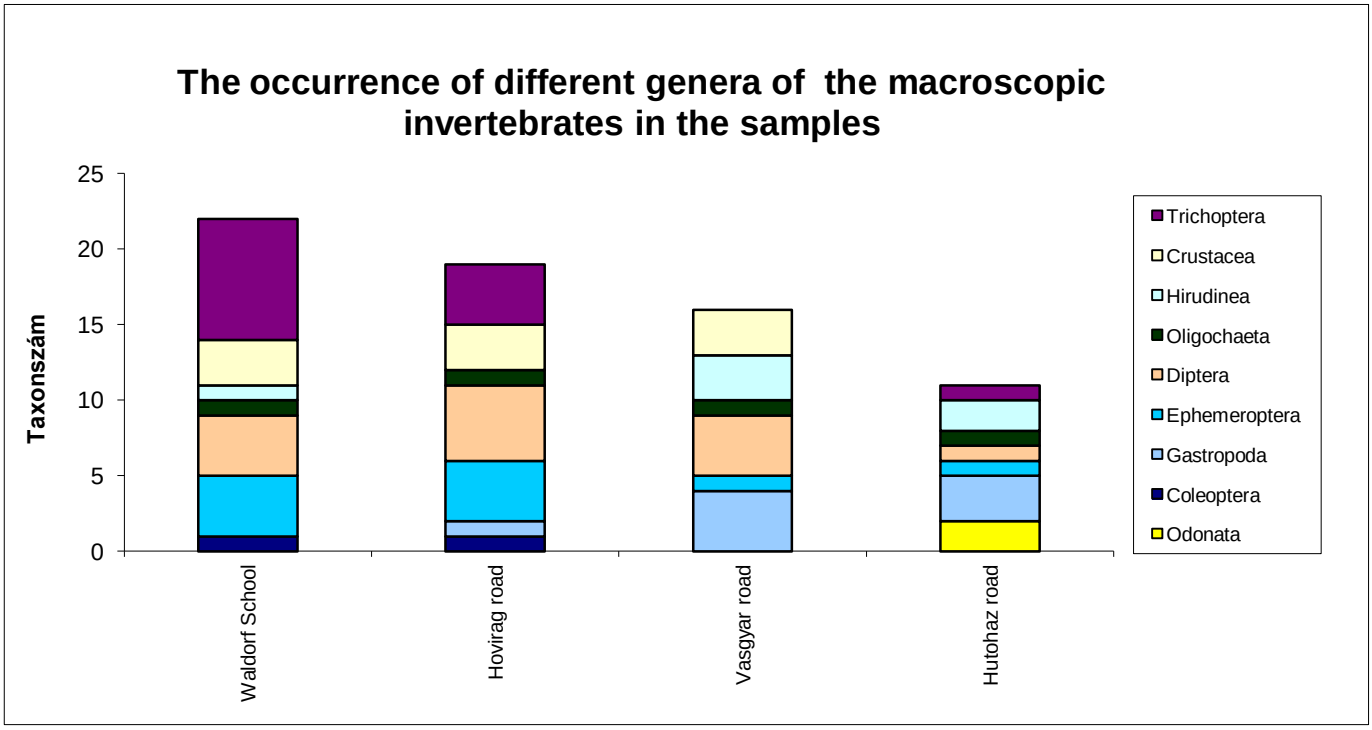
***The way of sampling***

The sampling was carried out at the same time in four different parts of the Szinva with the so-called 'kick & sweep' technique. This means that we moved the underlay by kicking it and with a net held against the current, we collected the animals. Afterwards we put the samples into different vessels and poured alcohol of 90% onto them and brought them into the laboratory. Until the time of identification the samples were stored in alcohol of 90%.

The given groups of animals are shown on the following ($2^{nd}$, $3^{rd}$) diagrams.

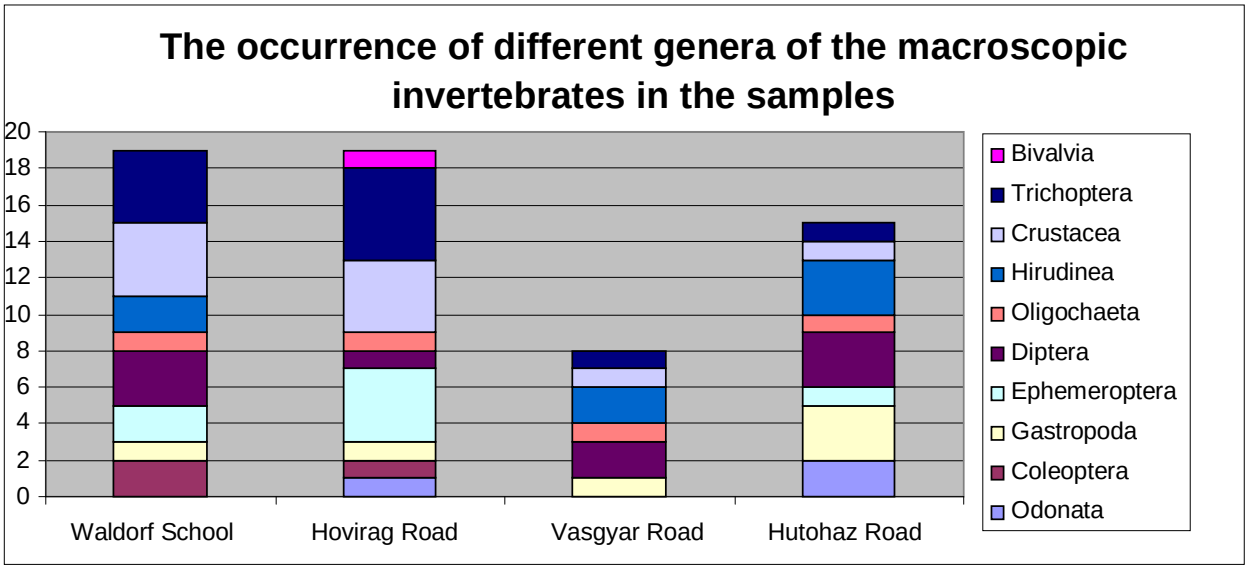
**$2^{nd}$ diagram**

**The Results of the Samples from May**



**3rd diagram**

**The Results of the Samples from October**

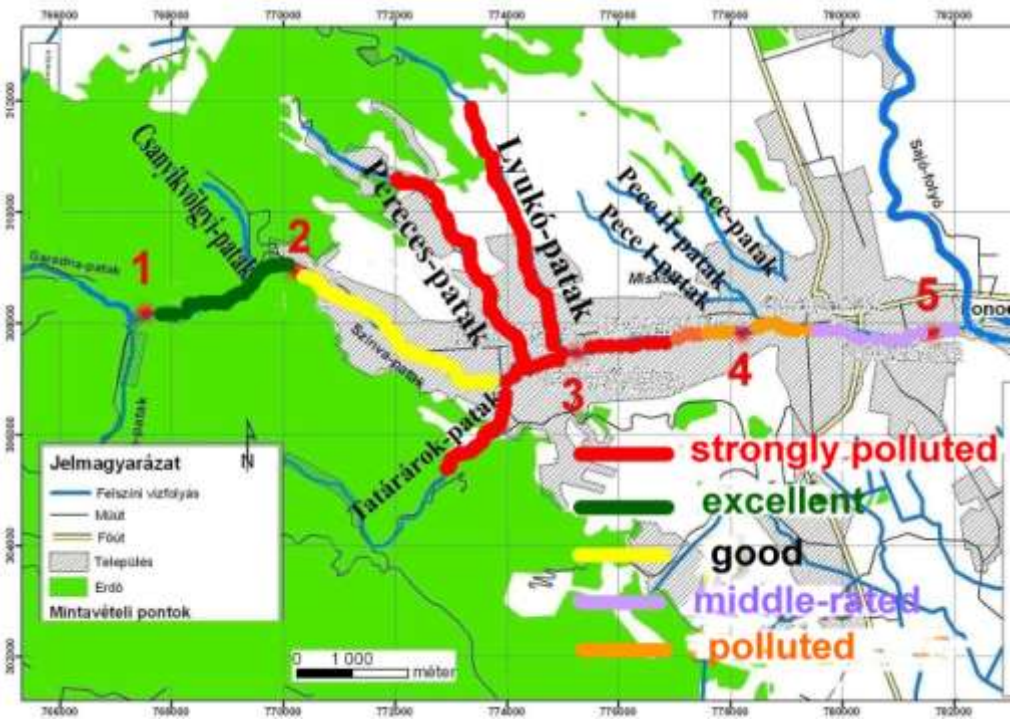



**Summary of the biological examinations of water quality**

- The *Waldorf school* measuring point has **1/c class – excellent quality** at the given time.
- The *Hóvirág road* measuring point has **2/b class – good quality** at the given time.
- The *Vasgyári bridge* measuring point has **4/a class – polluted quality** at the given time.
- The *Fonoda road* measuring point has **3/b class – moderately polluted quality** at the given time.

These results show us that from the Waldorf School to the Hutohaz road the quality of water is continuously deteriorating since 2010.

# 5. Conclusion




On the map above we can see the summarized results of the chemical and biological examinations.

It is clear from the results of 2012 that the lowering runoff affected the Szinva badly. The self-purification was not as effective as it was in the past years. The number of sluggish waters also rose and at given parts of the stream the number of macroscopic invertebrates decreased.

The most worrying factors are the two main tributaries (Pereces- and Lyuko-stream), which constantly carry pollutions into the Szinva and this way make the quality of the lower parts worse.

All in all we can say that the sudden lack of rainfalls (since 2010) has made the Szinva more endangered than ever. That is why the local government should make very careful decisions about the future of the Szinva, should not make the situation worse but should try to preserve one of the biggest treasures of Miskolc.

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