

**Chemistry
project**

The Danube River
water quality
in Drobeta Turnu-
Severin



PROJECT THEME

Study of some physico-chemical characteristics of the Danube River water across our town.

PURPOSE

To identify the major problems for Danube river water quality in Drobeta Turnu-Severin town.

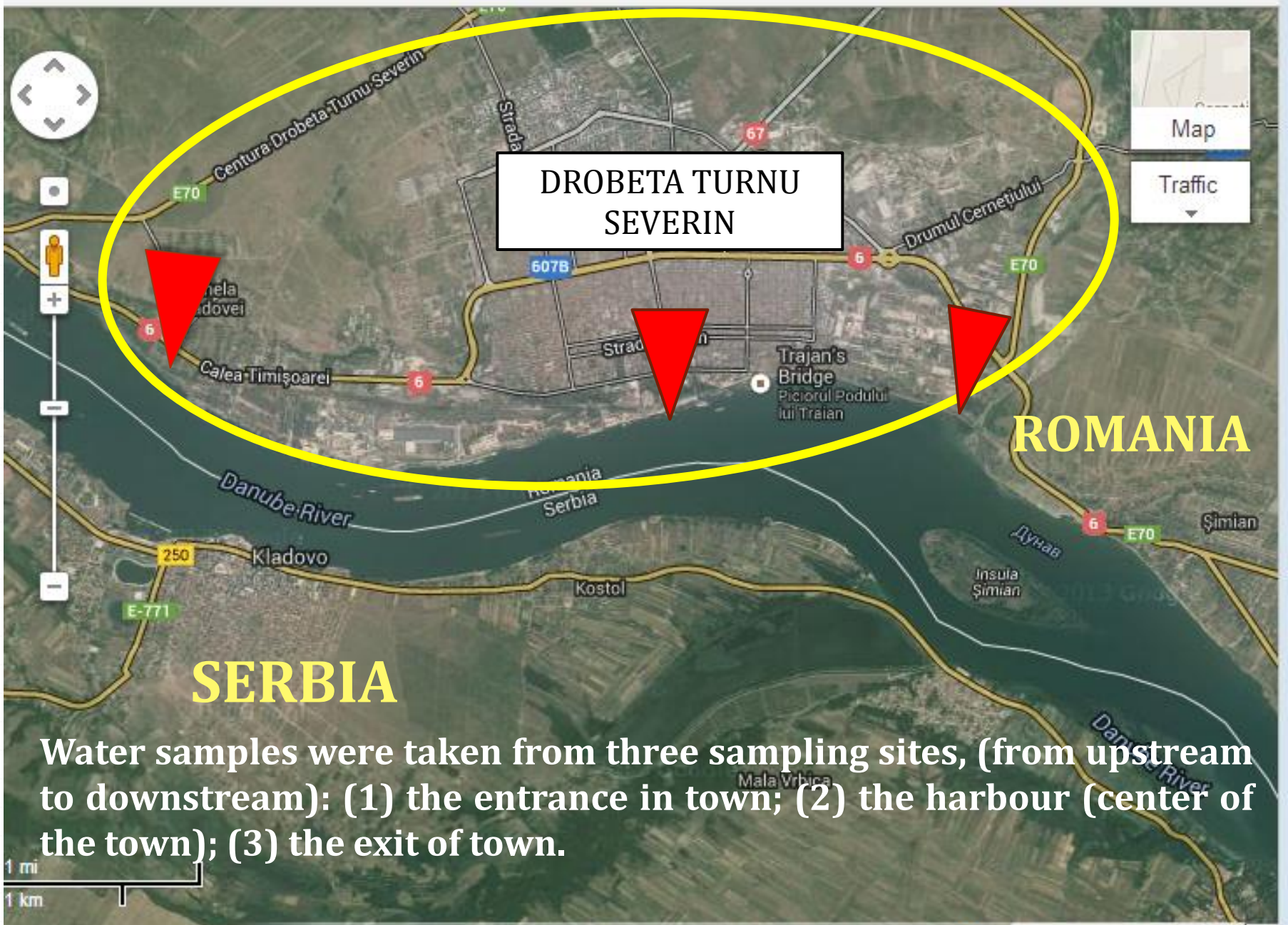
Why ?

1

The Danube river is the drinking water source in our town. (Our health depends on the health of the water we drink)

2

The Danube river is the source of life for many plants and animals (the pollution of the river affects its biodiversity)



DROBETA TURNU
SEVERIN

ROMANIA

SERBIA

Water samples were taken from three sampling sites, (from upstream to downstream): (1) the entrance in town; (2) the harbour (center of the town); (3) the exit of town.

1 mi
1 km



MATERIALS

- We used an Ecotest Water Laboratory kit.
- The tests were performed with the help of the instructions, using different reagents and following the specific work steps.
- The test results were determined from a colour chart.



Experimental work

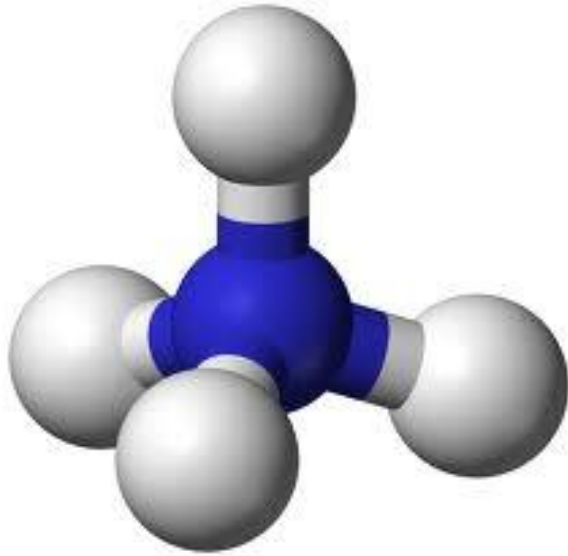
STUDIED PARAMETERS

- ✓ **ammonium**
- ✓ **nitrate**
- ✓ **nitrite**
- ✓ **phosphate**
- ✓ **pH value**
- ✓ **total hardness**

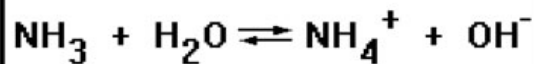
TIME WORK OF THE PROJECT

**3 months – November 2013, December 2013,
January 2014**

AMMONIUM



NH_3 ammonia



- ❑ Is one of the most important indicators for the pollution of water body.
- ❑ Naturally, ammonium results from the biological decay from plant and animal matter.
- ❑ Or, by the biological decomposition of waste matter and faecal matter.
- ❑ Ammonium itself is relatively harmless, but depending on the pH of water, part of the ammonium is transformed to the **aggressive NH_3 gas**, which is **poisonous** for aquatic life.

NITRATE



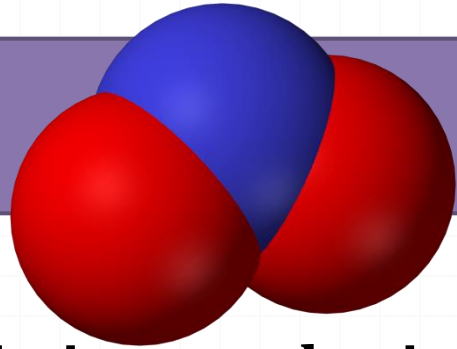
Sources of Nitrate in Our Groundwater:



Fertilizer
Manure
Waste Water Application
Septic Systems
Decaying Organic Matter
Natural

Nitrate is an oxidized form of nitrogen that typically comes from

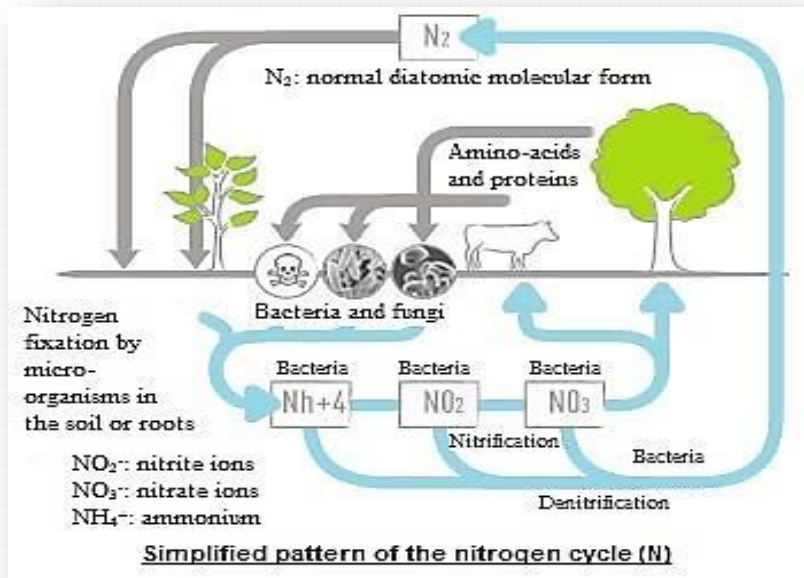
- Nitrates can be reduced to toxic nitrites in the human intestine, very harmful for babies and pregnant women.
- Nitrates stimulate the growth of plankton that provide food for fish. This may increase the fish population.
- However, if algae grow too wildly, oxygen levels will be reduced and fish will die.



NITRITE



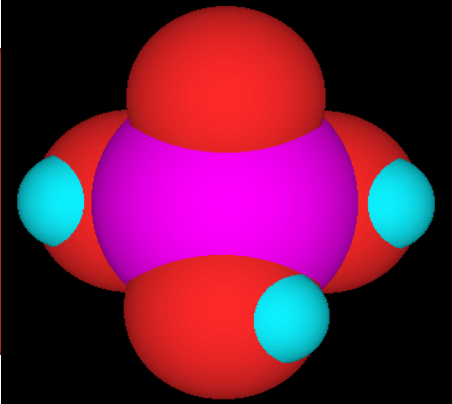
Nitrites and nitrates are produced naturally as part of the nitrogen cycle, when a bacteria breaks down toxic ammonia wastes first into nitrite, and then into nitrate.



Nitrites react directly with hemoglobin in human blood and destroys the ability of blood cells to transport oxygen. For babies under three months of age this condition causes *the "blue baby" disease*.

Nitrites produce a serious illness (*brown blood disease*) in fish.

PHOSPHATE

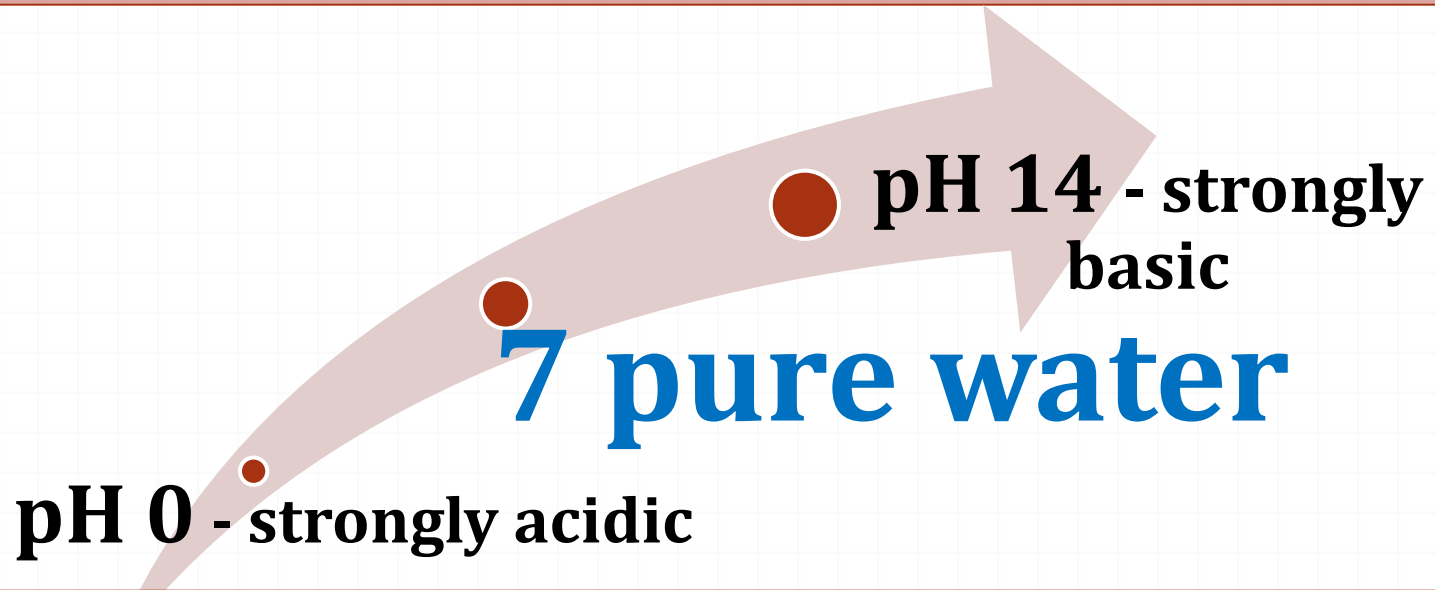


Phosphates come from fertilizers, pesticides, industry, and cleaning compounds. Natural sources include phosphate-containing rocks and human and animal wastes.

Phosphates stimulate the growth of plankton. This may increase the fish population. If too much phosphate is present, algae and water weeds grow wildly, choke the waterway, and use up large amounts of oxygen. Many fish and aquatic organisms may die.

pH VALUE

The pH value is decisive for the assessment of water. pH can be affected by chemicals in the water.



A basic pH value (pH larger than 7) indicates an excessive plant growth in ecological systems or the presence of pollutants.

Effects of pH on fish and aquatic life

pH minim	pH maxim	Effects observed
4.0	10.1	Limits for the most resistant fish species.
5.0	9.0	Tolerable range for most fish.
5.4	11.4	Fish avoided waters beyond these limits.
6.0	7.2	Optimum (best) range for fish eggs.
4.5	9.0	Trout eggs and larvae develop normally.
4.3	-	Carp died in five days.
4.1	9.5	Range tolerated by trout.
4.6	9.5	Limits for perch.
7.5	8.4	Best range for the growth of algae.

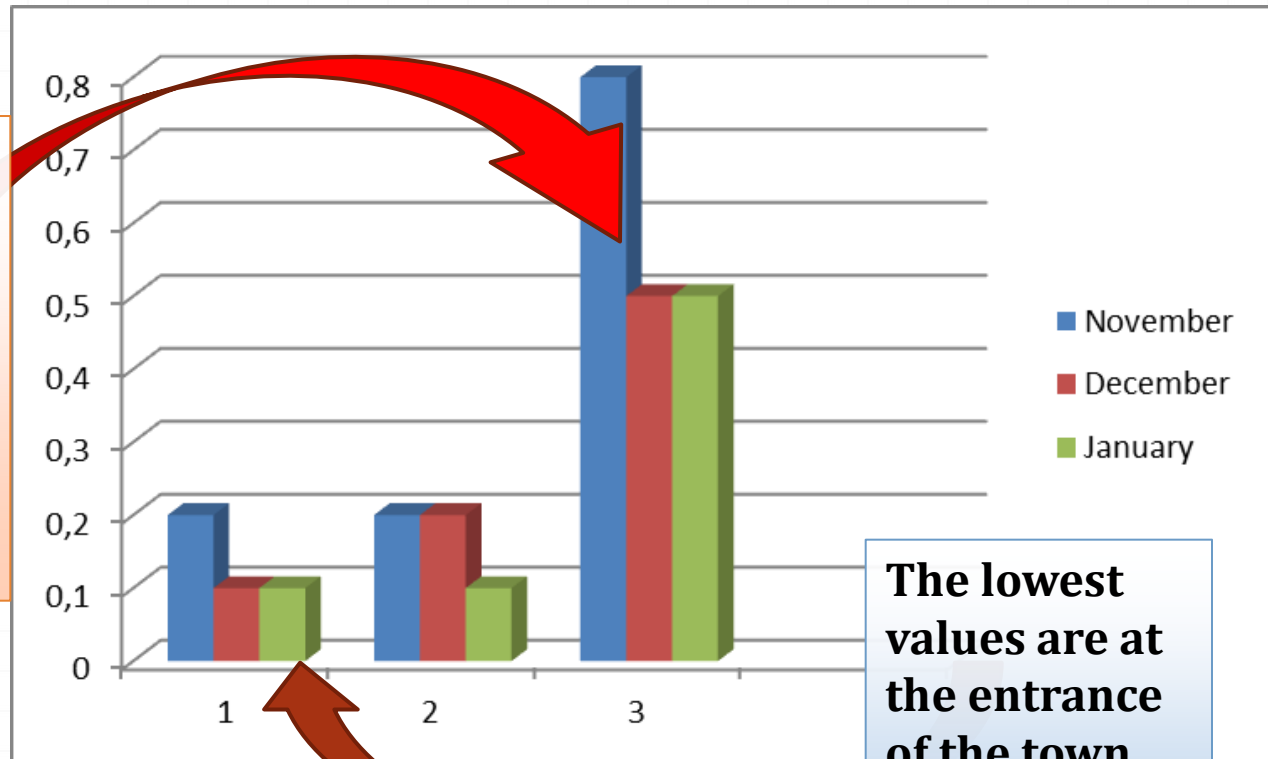
TOTAL HARDNESS (Ca/Mg)

- Hardness generally represents the concentration of calcium (Ca^{2+}) and magnesium (Mg^{2+}) ions.
- Hard water may shorten the life of plumbing and water heaters.
- High levels of total hardness are not considered a health concern. On the contrary, **calcium is an important component of cell walls of aquatic plants**, and of the bones or shells of aquatic organisms. **Magnesium is an essential nutrient for plants**, and is a component of chlorophyll.

Our experimental results

AMMONIUM

The biggest values are at site 3, after the Danube passes through the populated and industrial area of the town.

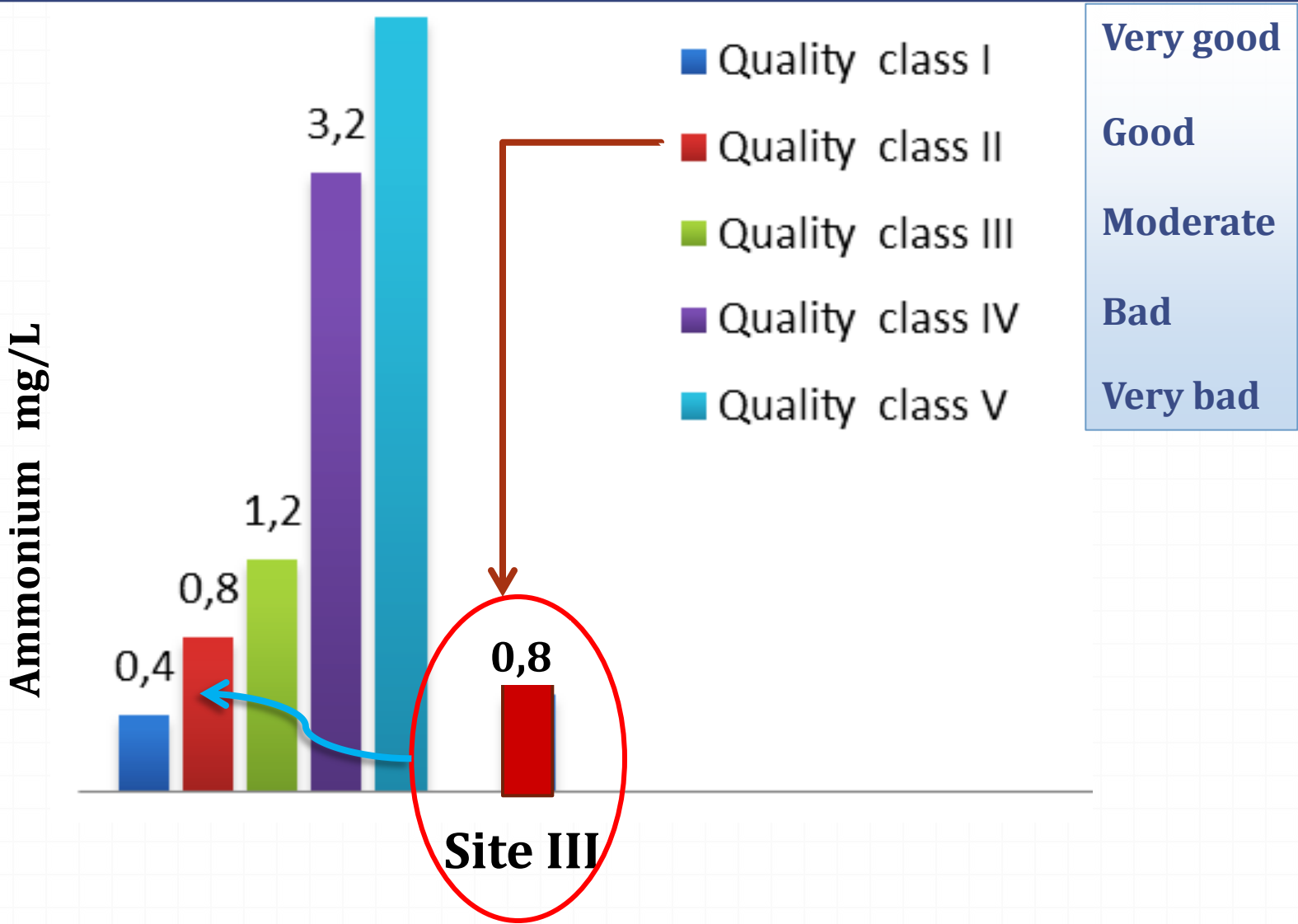


The lowest values are at the entrance of the town (site 1).

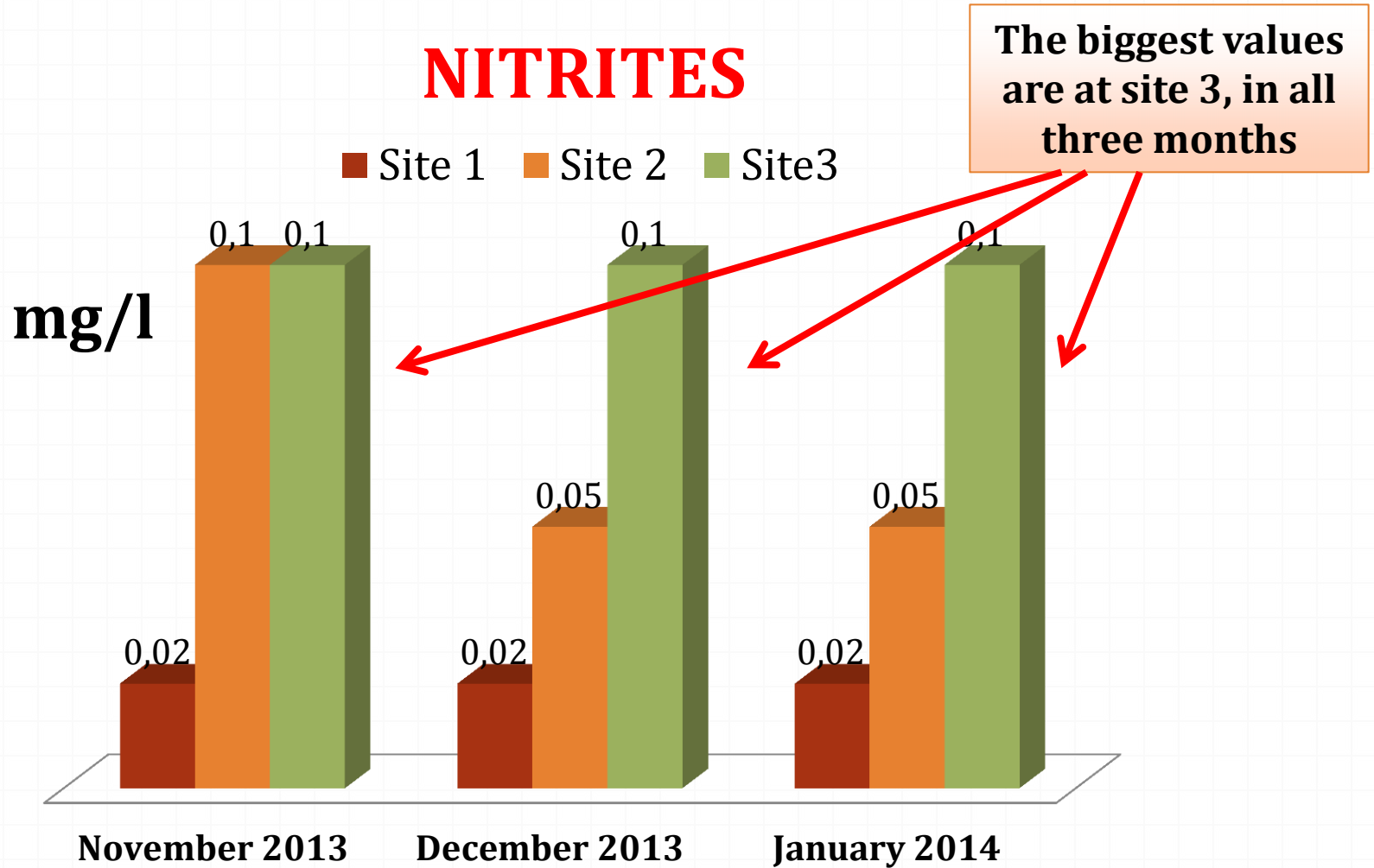
Comments

The ammonium concentrations had the tendency to decrease from autumn to winter, in accordance with the vegetation cycle.

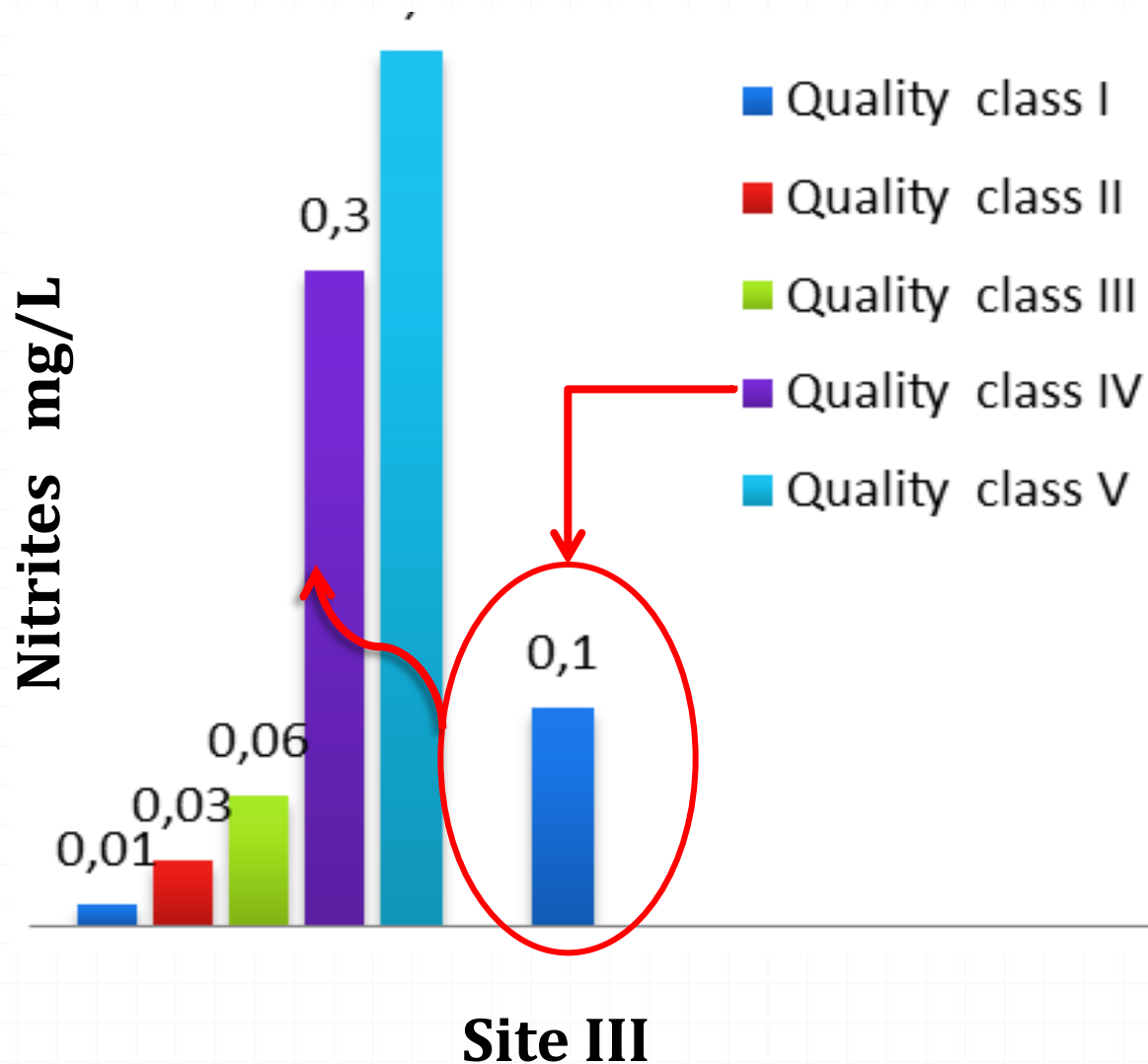
Quality classes for river water according to Romanian legislation



NITRITES

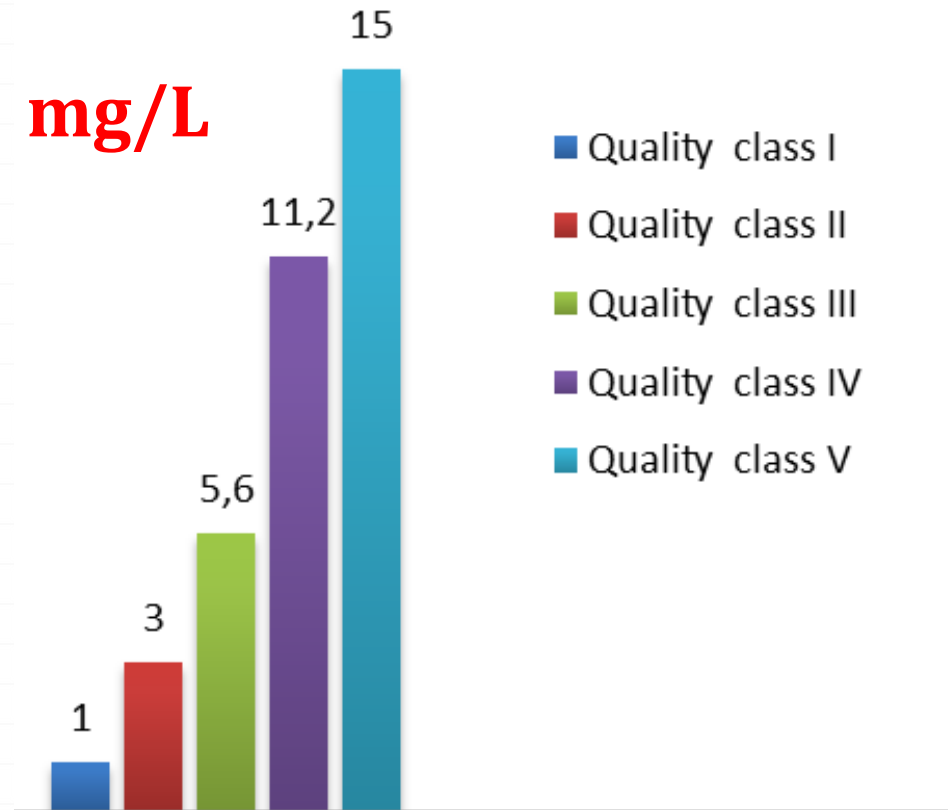


Romanian legislation - Quality classes for river water



Romanian legislation - Quality classes for river water

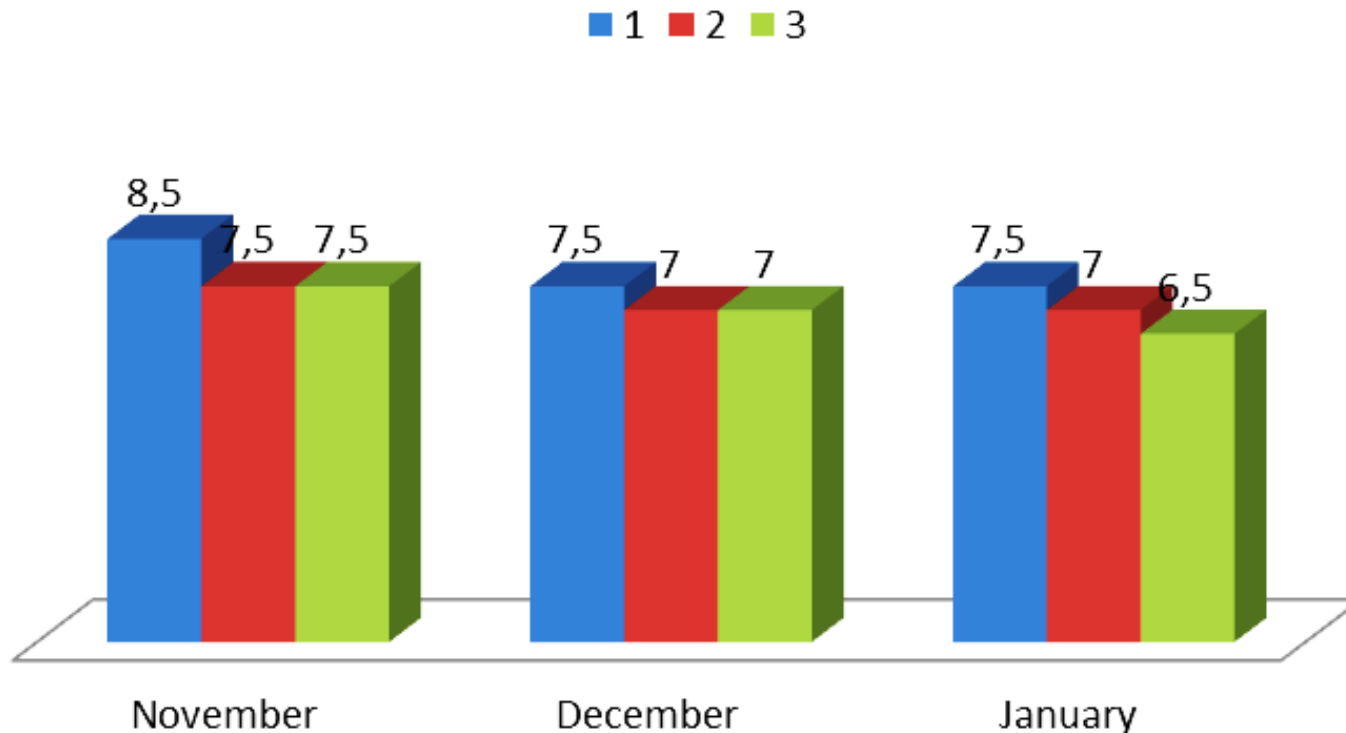
Nitrates mg/L



Our experimental results for nitrates

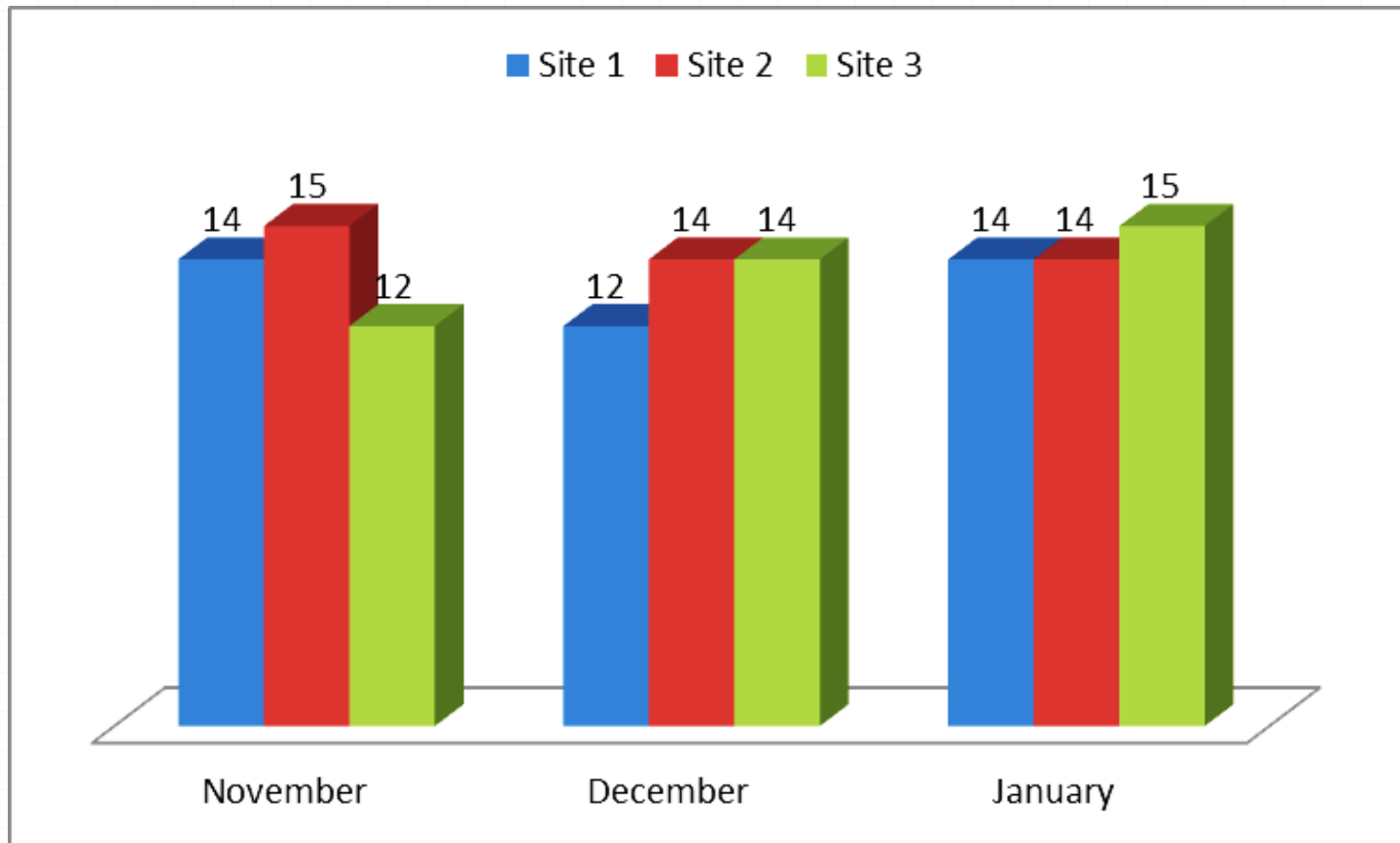
0 mg/L in all three sites and all three months.

pH value



1. For analysed samples, the average pH values range from 6,5 to 8,5 and do not exceed the limits (according to Romanian water classification).
2. The pH decreased slightly from November to January, because of natural factors (like biological activity cycle) and also of anthropic factors (e.g. the domestic sewage and agricultural run-off).

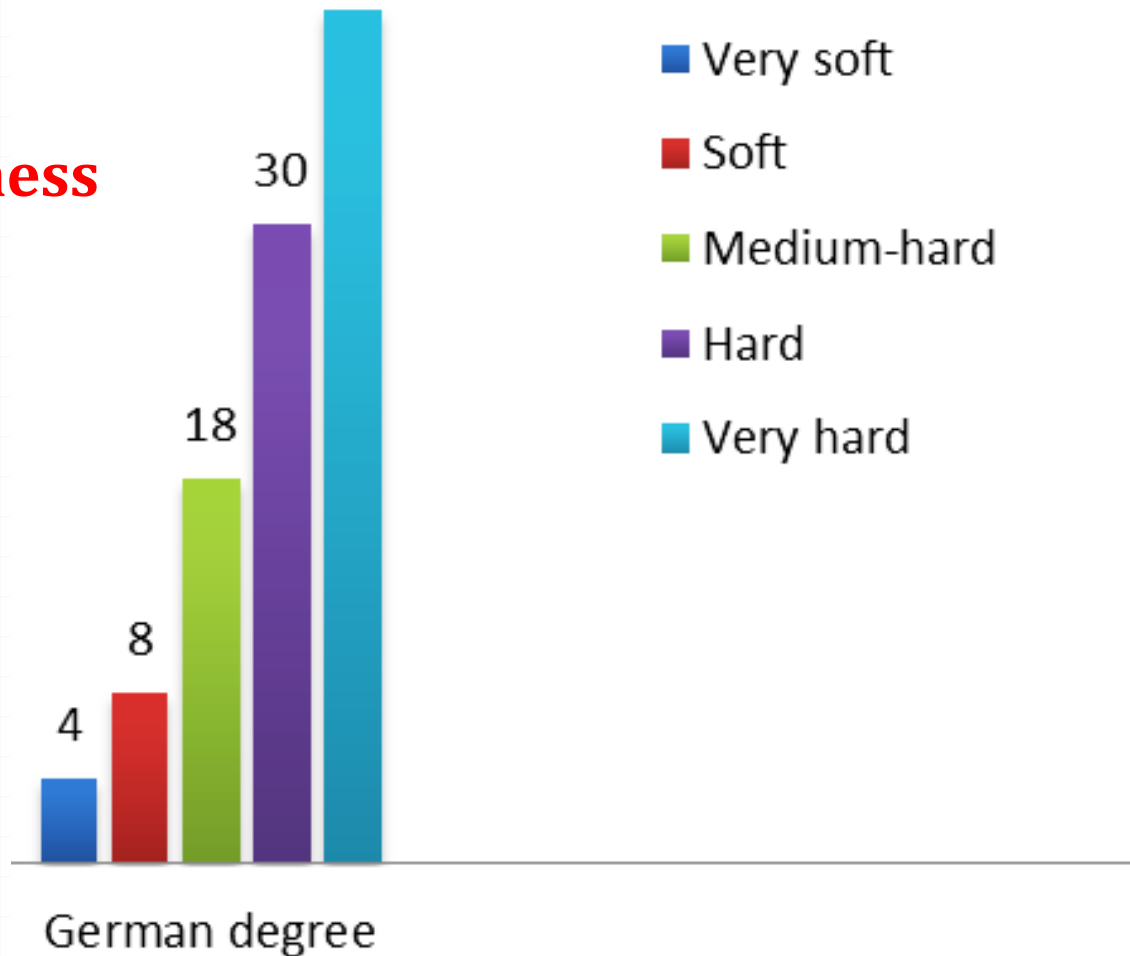
TOTAL HARDNESS



Total hardness is measured in degree of German Hardness.

Classification according to degree of hardness

Total hardness



According to the clasification, Danube water is **a medium-hard water** (with **max. 15 dH.**)

CONCLUSIONS

The quality of the Danube River water across Drobeta Turnu-Severin town is affected by both natural and anthropic factors.

Thus, the presence in water of nutrients, like ammonium and nitrites, can be associated with the biochemical cycles, but also with industrial activities.

The major problems for Danube river water quality in our town were identified to be the presence of nitrite, in concentrations which placed sometimes the water in 4th class of quality and the relatively high concentrations of ammonium.

REFERENCES

1. MESDR, Order of Ministry 161/2006, Ministry of Environment and Sustainable Development of Romania, 2006 .

2. International Commission for the Protection of the Danube River,
www.icpdr.org.

<http://www.h2ou.com/h2slab.htm>

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