Testing the quality of drinking water

One of our Comenius project aims was test drinking water quality of each country. We used for it the AQUANAL – Water Laboratory, which contains six tests on substances dissolved in water. Ammonium, Nitrate, Nitrite, Phosphate, ph-value and Total hardness. The test result is determined from a color chart.
The examination of the four „indicators" already mentioned for the pollution of water (nitrate, nitrite, ammonium and phosphate), along with the determination of water hardness and the ph value, will produce a clear picture of the quality of the water.

Nitrate (NO_3^-)

Nitrates have a very positive influence on the grows of plants. For this reason nitrate based fertilizers are used in gardening and agriculture. Due to washing out of these partially very high concentrations in agriculturally cultivated ground, high nitrate contents are often measured in water bodies in the vicinity. An excessively high nitrate concentration in ponds and rivers supports the growth of plants and algae. A big health hazard, especially for babies is caused by micro-biological, transformation of the nitrates into nitrites in the human body. Nitrite can obstruct the oxygen transport in the blood of newborns and babies causing internal asphyxiation. Adults are not exposed to this health hazard because oxygen is linked to the red blood cells in a way that cannot be deactivated by nitrite. Nitrate belongs to the most problematic substances in potable and surface water. Up to now only little is known its health hazard potential. For this reason it is indispensable to regularly check the nitrate concentration in water.

The results of our tests show that all schools have a low nitrate concentration (10 mg/l). The recommended value for drinking water in EC is 25 mg/l and the highest value may be 50 mg/l.

Nitrite (NO^-_2)

Like ammonium an increased nitrite concentration is an important indicator for a potential faecal pollution of water. In addition to the decomposition of organic waste products, nitrite can also be produced by the reduction of nitrate. A reduction of nitrate to nitrite is possible in many ways. Nitrite has been classified as being dangerous to health, especially for babies (see a chapter of nitrate.). The analysis for nitrite in drinking water is imperative, and belongs to one of the most important water examinations.

A limiting value for nitrite is 0,1 mg/l, this value should not be exceeded.
Our water analysis indicate that Pärnu-Jaagupi has very high concentration of nitrit in drinking water- 0,1 mg/l. It is really too high. We have to check over our results. A little higher were results also in Hungary, nitrite concentration was 0,05mg/l. Other partner schools have very low concentration of nitrites.

Ammonium (NH^+_4)

Ammonium is one of the most important indicators for the pollution of a water body. Ammonium is produced by the decomposition of nitrogen-containing organic substances through micro-organisms under low-oxygen conditions. Due to over fertilization ammonium can get into river and ground water directly. However, ammonium can also be produced by the microbiological decomposition of waste matter and faecal matter, serious pollution of the water has always to be anticipated in case of positive findings. Ammonium is also produced by the enzymatic decomposition of urea. For this reason the ammonium concentration is a very important criterion to judge the quality of water in swimming pools. A limiting value of 0,1 mg/l should not be exceeded

As we can see on the chart limiting value for drinking water is 0,5 mg/l and EC recommended value is 0,05 mg/l. Almost all countries have good drinking water except Spain, Granada, which has ammonium concentration 0,1 mg/l, but it does not exceed EC limiting value.

Phosphate (PO^{3-}_4)

Phosphate is a highly reactive element, and thus does not occur elementally in nature, but only in form of various organic and inorganic compounds. On account of the multitude of phosphorus-containing products in households and industry a serious phosphate pollution of the environment has set in during the last few decades. Due to phosphates the water body will lose its biological balance. Besides ammonium and nitrite, an increased phosphate concentration in drinking water is also a significant indicator for potential pollution of the water body with faeces.

Our water analysis show that most of our students can drink water without phosphates, only Granada students have a little amount of phosphates in their drinking water (0,25 mg/l.) Limiting value is 6,95 mg/l phosphate in the drinking water

pH value

The ph value is also very decisive for the assessment of water. The scale of possible ph values ranges from ph 0 (extremely acidic) to ph 14(extremely basic). In the middle of the ph scale there is the so-called neutral point at a ph value of 7.. In an ideal case the ph value of clean water should range around ph 7, however, slight deviations are usual and harmless to health. Too low ph values in the drinking water (4-5) may lead to increased corrosion in metallic pipes used for drinking water. A shift of the ph value into the basic range (ph value larger than 7) indicates, among other things, an excessive plant growth in biological systems. Fish react very sensitively to variations of the ph value.

Our results show that all schools have ph value 7,5- 8,5. It means quite normal water.

Total hardness /Ca/Mg)

The hardness of water is significantly determined by the calcium salts dissolved in the water. The water hardness of drinking water constitutes no health problem even given „very hard" water. But soft water is better for hot-water systems: coffee machines, washing machines etc.

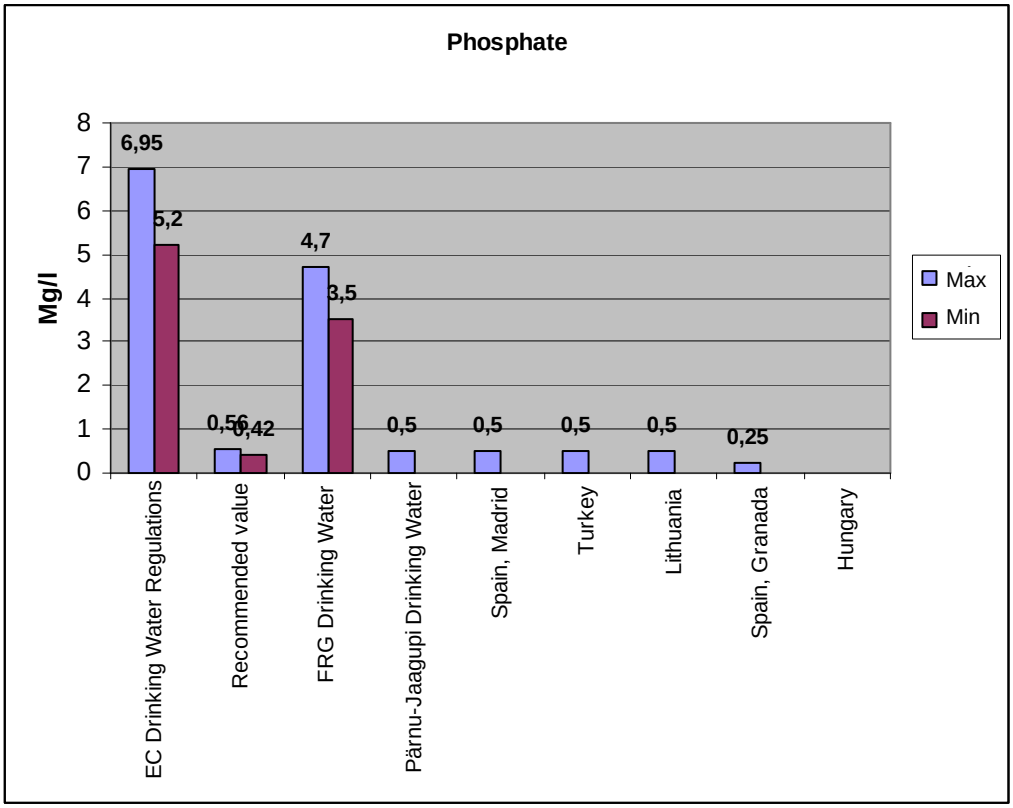
Our test shows that we have soft water and medium hard drinking water in our countries.

Summary

We tested the quality of drinking water in Estonia at Pärnu-Jaagupi in January 2008 and in Spain at Fuenlabrada in April 2008. We have results from six schools: Pärnu-Jaagupi Secondary School.Estonia**;** Joniškio "Saules" Vidurine Mokykla**,** Lietuva; I.E.S. Fray Luis de Granada, Spain; I.E.S. Joaquin Araujo Madrid, Spain; ALEV High School, Turkey and Fay Andras Szakkozepkkola Szakiskola es Kollegium. But we have not results from France.
The results show that, we have quite good drinking water except Pärnu-Jaagupi which has some problems with nitrites. And Granada has little more ammonium. But all waters measure up to EC Drinking Water Regulations limiting values.

Phosphate (PO^{-3}_4)

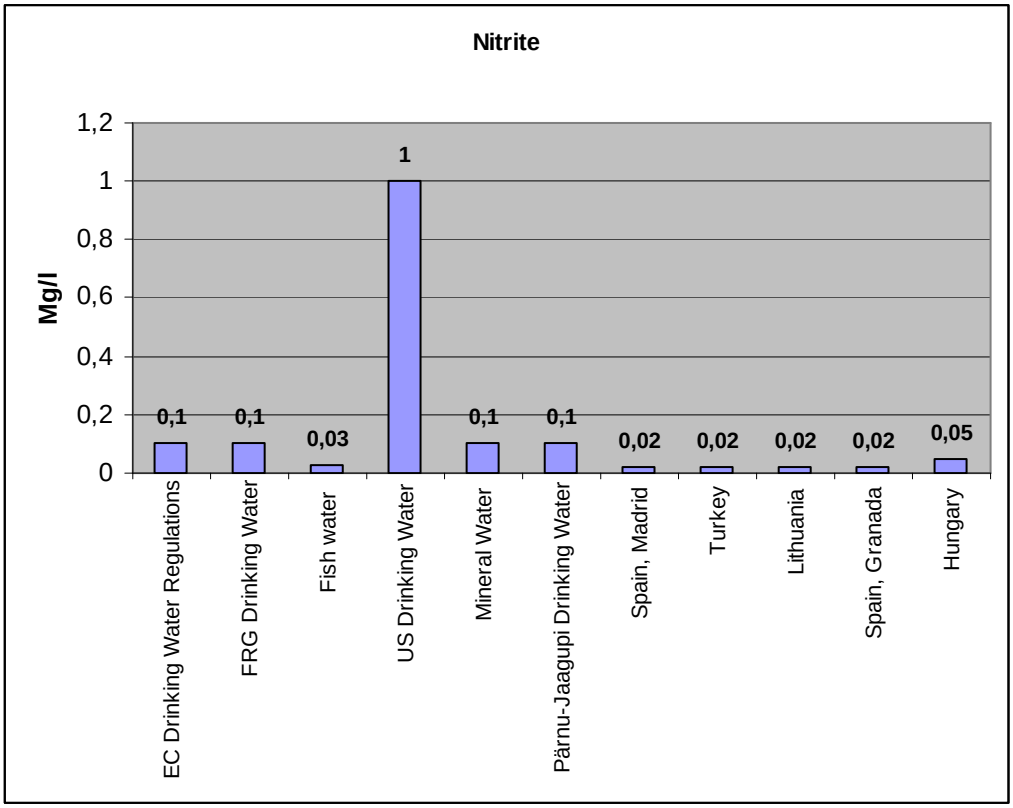
Limiting values	Mg/l PO 4	Mg/l P2O5
EC Drinking Water	Max. 6,95 mg/l	Max. 5,2mg/l
Recommended value	0,56 mg/l	0,42 mg/l
FRG Drinking Water	Max. 4,7 mg/l	Max. 3,5 mg/l
Measuring range of AQUANAL	0,5...6,0 mg/l	0,38...4,5 mg/l
Pärnu-Jaagupi Drinking Water	0,5 mg/l	
Spain, Madrid	0,5 mg/l	
Turkey	0,5 mg/l	
Lithuania	0,5 mg/l	
Spain, Granada	0,25 mg/l	
Hungary	-	



Nitrite (NO^-_2)

Limiting values

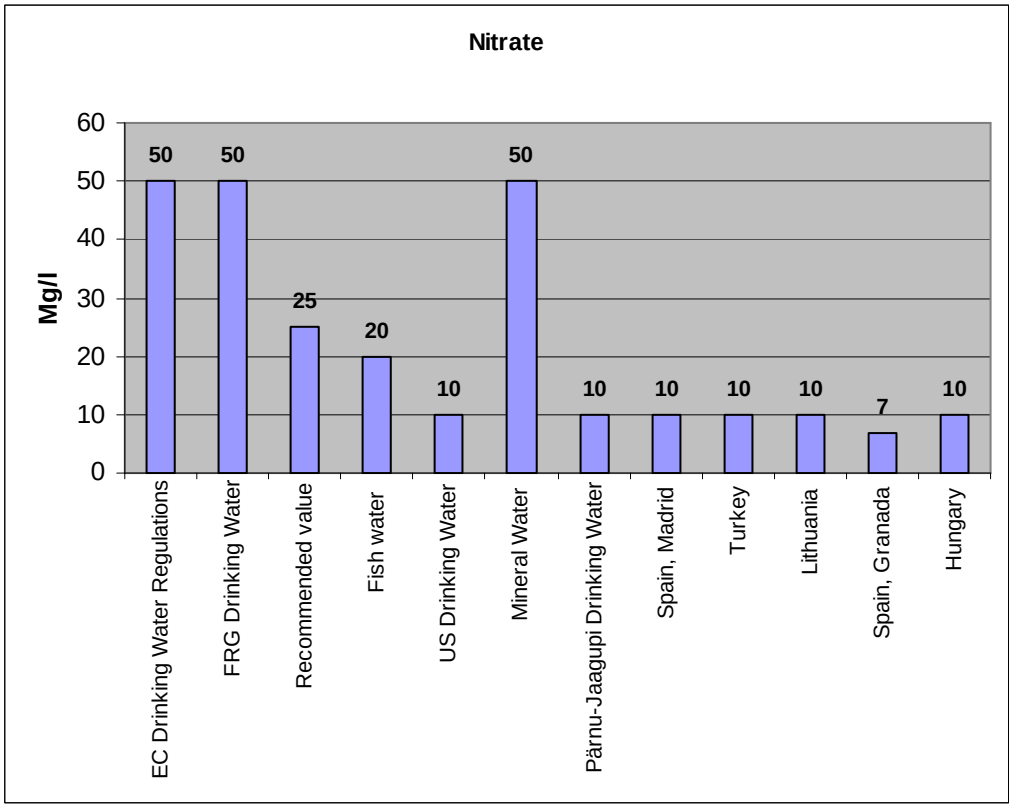
EC Drinking Water	Max. 0,1 mg/l
FRG Drinking Water	Max. 0,1 mg/l
Fish water	Max. 0,03 mg/l
US Drinking Water	Max. 1,0 mg/l
Mineral Water	Max. 0,1 mg/l
Measuring range of AQUANAL	0,02...1,0 mg/l
Pärnu-Jaagupi Drinking Water	0,1 mg/l
Spain, Madrid	0,02 mg/l
Turkey	0,02 mg/l
Lithuania	-
Spain, Granada	0,02 mg/l
Hungary	0,05 mg/l



Nitrate (NO^-_3)

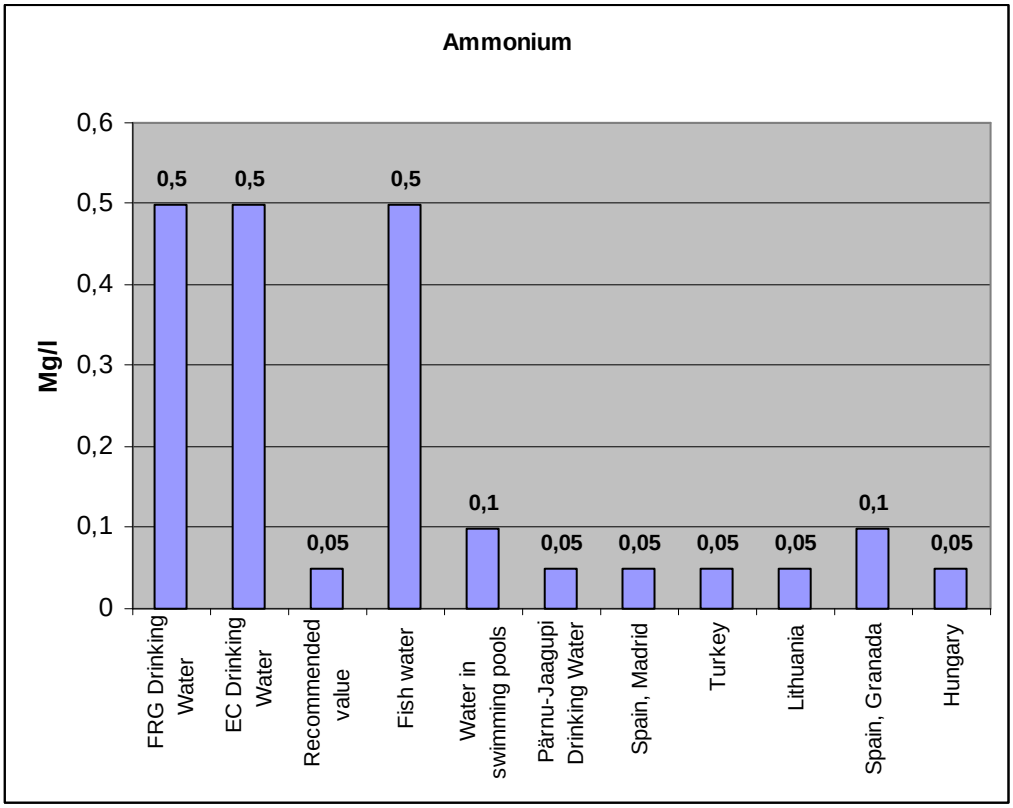
Limiting values

EC Drinking Water	Max. 50 mg/l
FRG Drinking Water	Max. 50 mg/l
Recommended value	25 mg/l
Fish water	Max. 20 mg/l
US Drinking Water	Max. 10 mg/l
Mineral Water	Max. 50 mg/l
Measuring range of AQUANAL	10...80 mg/l
Pärnu-Jaagupi Drinking Water	10 mg/l
Spain, Madrid	10 mg/l
Turkey	10 mg/l
Lithuania	10 mg/l
Spain, Granada	7 mg/l
Hungary	10 mg/l



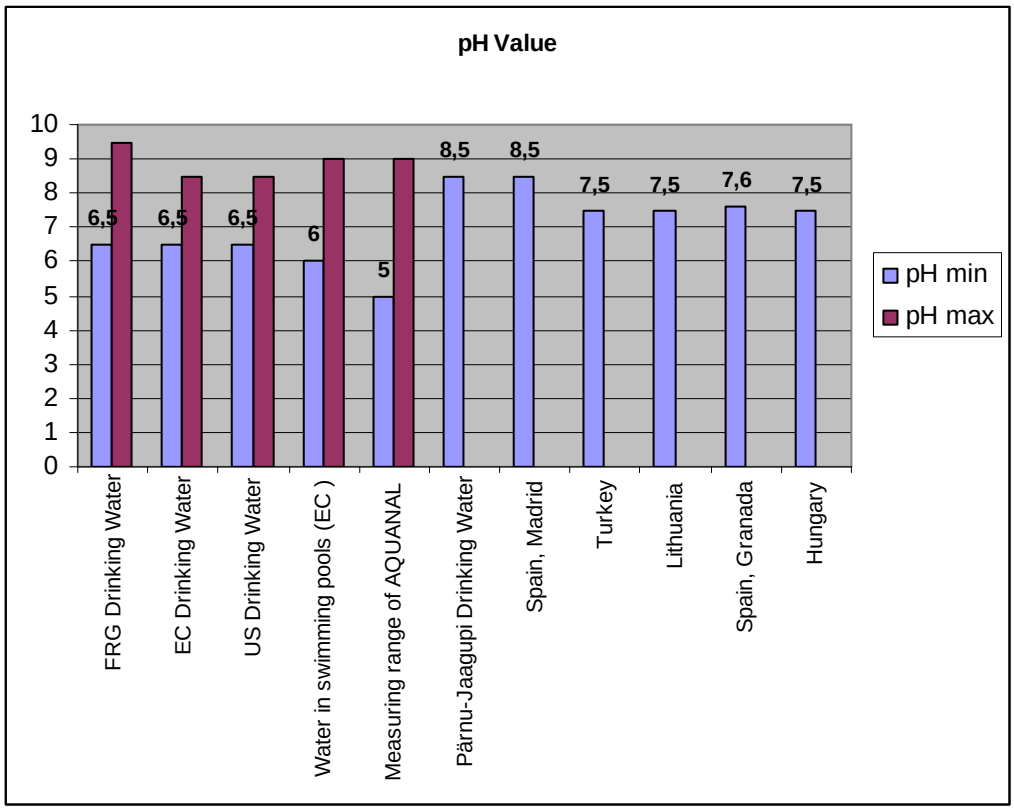
Ammonium NH^{+}_{4}

FRG Drinking Water Limiting values	Max. 0,5 mg/l
EC Drinking Water Limiting values	Max. 0,5 mg/l
Recommended value	0,05 mg/l
Fish water	Max. 0,5 mg/l
Water in swimming pools	Max. 0,1 mg/l
Measuring range of AQUANAL	0.05...10,0 mg/l
Pärnu-Jaagupi Drinking Water	0,05 mg/l
Spain, Madrid	0,05 mg/l
Turkey	0,05 mg/l
Lithuania	0,05 mg/l
Spain, Granada	0,1 mg/l
Hungary	0,05 mg/l



pH value

Limiting values	**pH min.**	**pH max.**
FRG Drinking Water	6,5	9,5
EC Drinking Water	6,5	8,5
US Drinking Water	6,5	8,5
Water in swimming pools (EC)	6,0	9,0
Measuring range of AQUANAL	5,0	9,0
Pärnu-Jaagupi Drinking Water	8,5	
Spain, Madrid	8,5	
Turkey	7,5	
Lithuania	7,5	
Spain, Granada	7,6	
Hungary	7,5	



Total hardness (Ca/Mg)

Classification according to degree of hardness

0-4 d	Very soft water
4-8 d	Soft water
8-18 d	Medium-hard water
18-30 d	Hard water
Over 30 d	Very hard water
Measuring range of AQUANAL	1 drop of reagent= 1,25e = 17,85US
Pärnu-Jaagupi Drinking Water	Soft water
Spain, Madrid	Soft water
Turkey	Soft water
Lithuania	Medium hard
Spain, Granada	Medium hard
Hungary	Medium hard