

„Entry to the Stockholm Junior Water Prize, 2014”

# Our water is our future

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## 2 Hypothesis

In the centre of our project the water consuming customs of the young people in Europe stand. According to our hypothesis teenagers do not consume enough liquid and especially not enough tap water. After some symptoms have occurred (eg. headache, spasm) many of them realize that they did not drink enough that day. The reasons for this can be a stressful lifestyle, that there is no time for paying attention to this during the day. Still, drinking tap water is the cheapest and the simplest method to do something for our health. We experience in our surroundings that teenagers mostly drink soft drinks and juices. Many of them drink mineral water as well but almost none of them drink tap water.

Last year there was a project in our school about the drinking customs of the inhabitants of Tata and the chemical analysis of tap water. This rose our interest in connection with the topic – our fellow students presented their ideas in several classes.

We participated in a Comenius international project meanwhile. It was in connection with water and we found it interesting to examine the same topic in the schools of the countries that we got to know.

In Hungary, more and more people consume mineral water saying that tap water is unhealthy. The most important aspect that interests people is which one is healthier for the body. Tap water is one of the most strictly controlled food products in Hungary. Unfortunately, a lot of people drink mineral water daily instead of drinking tap water, although depending on the composition, its consumption should be restricted.

We made a questionnaire to explore the habits of our fellow students. We used a similar questionnaire to the one we had last year to be able to compare the data to the ones that have been collected in our school. This questionnaire was uploaded onto the homepage of our school to make it easier for the foreign students to fill in.

We think that an environmentally conscious lifestyle is also important. Therefore we tried to get an answer to the question “What do the people do for less energy consumption and thrift?”

Apart from the questionnaire we collected some extra questions to explore the background data of the countries. These had to be collected and sent as one. We needed these to compare them with the data we collected from the internet in connection with Hungary.

### **3 The quality of water**

An important part of our project is to study the quality of the water supply of the different cities in Europe, from where we collected the information. We collected these data in connection with Tata (and Hungary) from the internet, and from the other countries with the help of some additional questions (Appendix 2).

The drinking water supply of Tata is ensured from the XIV/A karstic water shaft of Tatabánya. This water has the quality of mineral water, and its name is Vértesi Ásványvíz, qualified in 2009. (chemical analysis).

The drinking water supply of the other countries is very different. The Spanish Jaca has an abundant water supply from the snow and rain of the Pyrenees. The Turkish Canakkale being on the coastline receives its drinking water from the Atikhisar-Dam-lake in the nearby mountains. The German Cloppenburg collects its water from the underlying layers of the town. Adria in Italy is in the Po-delta and receives its water from the rivers. The Dutch Alkmaar's water supply is the IJsselmeer and the surrounding sand dunes, and the Lithuanian Rietavas draws its water from a lake near the town.

We asked whether they treat the water in any way to clean it or not. Except for the water of Alkmaar, which is filtered by the sand dunes only physically, all the water should be treated chemically as well. In Hungary they use chemical and physical methods too, so we can say that this is something in common. In most of the countries chlorine, ozone and active carbon are used, like in Hungary.

The water pipe system is quite old in Hungary, like in Spain, but the rest of the countries wrote that they had modern and quite new systems. The quality and the age of the water pipe system do not have an effect on the quality of the water, according to the responses.

### **4 Questionnaire analysis**

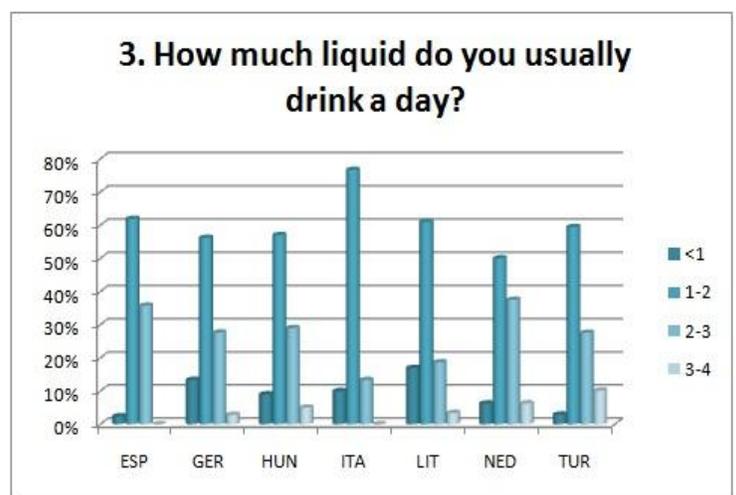
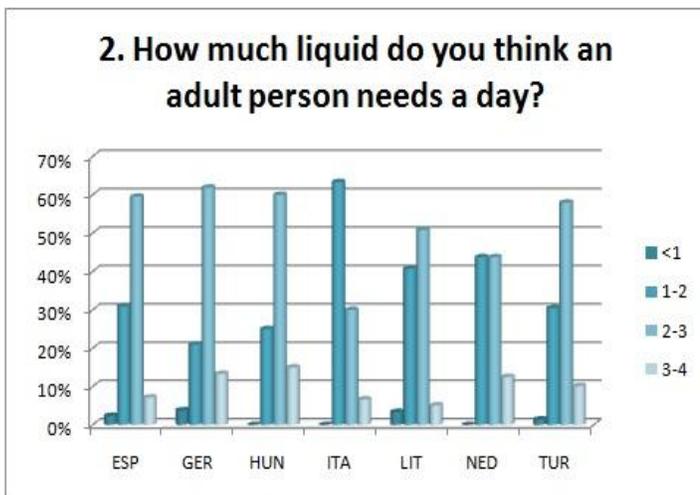
In our survey we were curious about the liquid and the water consumption of teenagers in different European countries. More than 320 students completed the questionnaire abroad and 250 in Tata, in our school. The forms were completed in our grammar school by our fellow students from Tata. We collected the data from secondary schools in Spain (Jaca), Turkey (Canakkale), Italy (Adria), Germany (Cloppenburg), Lithuania (Rietavas) and the Netherlands

(Alkmaar). We got to know the teachers and students of the first 5 schools in an international Comenius project and the Alkmaar Gymnasium is a twin school of ours. We indicated the age of the respondents, their gender and their nationality in the anonymous questionnaires. We created charts according to genders and nations and drew the conclusions of the results.

We wanted to raise precise questions in the questionnaire, which were connected with each other according to what we had written down in the hypothesis. With the help of experts we wanted to form a professional questionnaire that provides right data, but can be completed easily and quickly. The questions are in thematic order. First we focused on the customs of liquid consumption. There were questions about the drinking of mineral water as well. Finally we had questions in connection with tap water consumption and domestic water cleaning systems.

We established an online questionnaire on the homepage of our school with the help of our teacher of information sciences. It was the easiest way to make the fellow students of the partner schools abroad fill in the poll. We inserted the questionnaire in a compressed form, thus our drawn conclusions are clearer (Appendix 1).

In questions 2 and 3 we asked how much water the students think they should intake and how much they actually consume. We analyzed this matter according to nations. From the responses (Chart 2 and 3) it can be seen that the 50-60% of the respondents in all countries know that an adult should drink about 2-3 litres of liquid daily, but the majority of them (60%) consume only 1-2 litres a day.

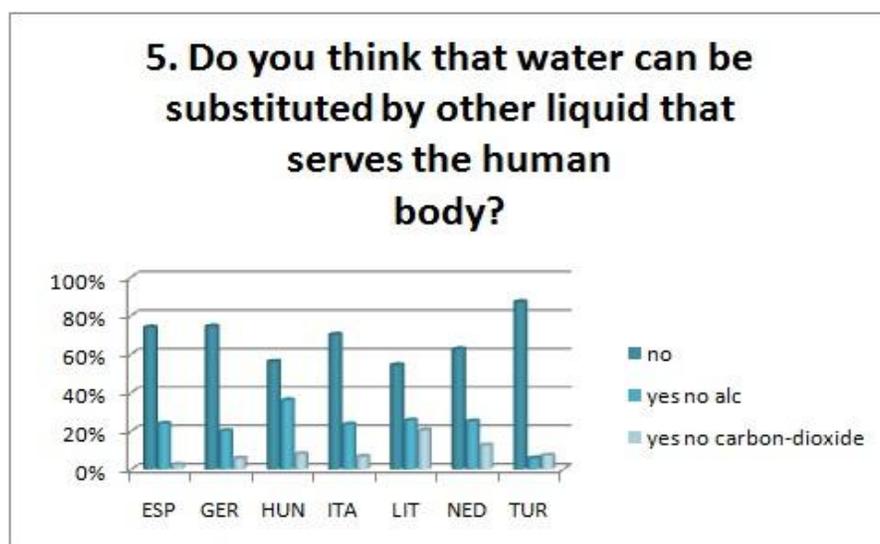


We wanted to know the biological effects that poor water consumption can have. The results evidently showed (Table 1) that people from different countries differ in their cultures, beliefs and thoughts. In every country there was one biological effect rising much higher than the others. In Germany and the Netherlands it was headache, in Italy and Lithuania hypertension, and in Turkey and Hungary people think that poor water consumption causes the formation of a kidney stone. It can be concluded that they know the negative physiological effects of low intake, although most of them do not do anything against it.

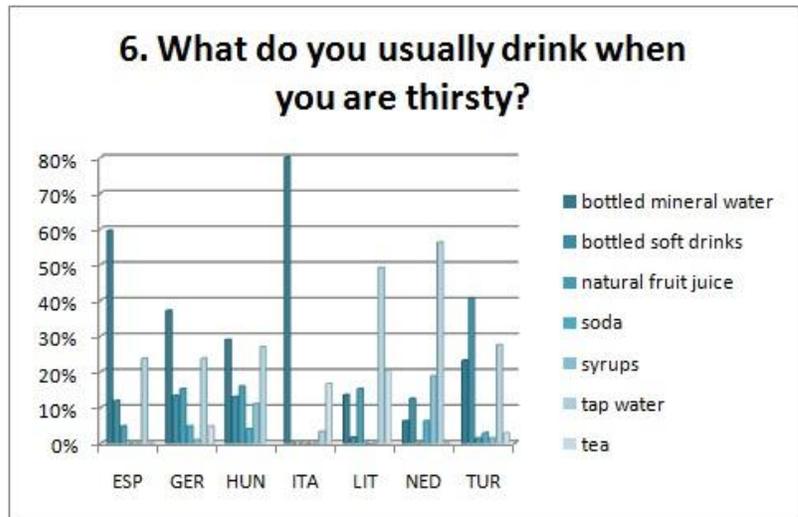
Effects	ESP	GER	HUN	ITA	LIT	NED	TUR
diabetes	5%	2%	18%	3%	19%	13%	14%
headache	17%	73%	2%	10%	12%	63%	9%
hypertension	43%	12%	24%	53%	51%	6%	10%
kidney stone	36%	12%	56%	33%	19%	19%	67%

**Table 1**

We expected that people are aware of not only the importance of liquid consumption but of the importance of the quality of liquid they drink, as well (Chart 5). In all the countries about 70% of the students gave the correct answer that nothing can replace water.



We were curious about the drinking customs as well (Chart 6). According to genders, girls drink more mineral and tap water than boys. We can say that boys consume other liquids more than girls. The drinking customs are interesting when it comes to nations, because it can be affected



by traditions and the quality of tap water. In the diagram Italy strikes out because almost 80% of the students drink mineral water when they are thirsty. In Lithuania and in the Netherlands they drink a lot more tap water. On the other hand, it is very interesting that Turkish students drink more soft drinks than water.

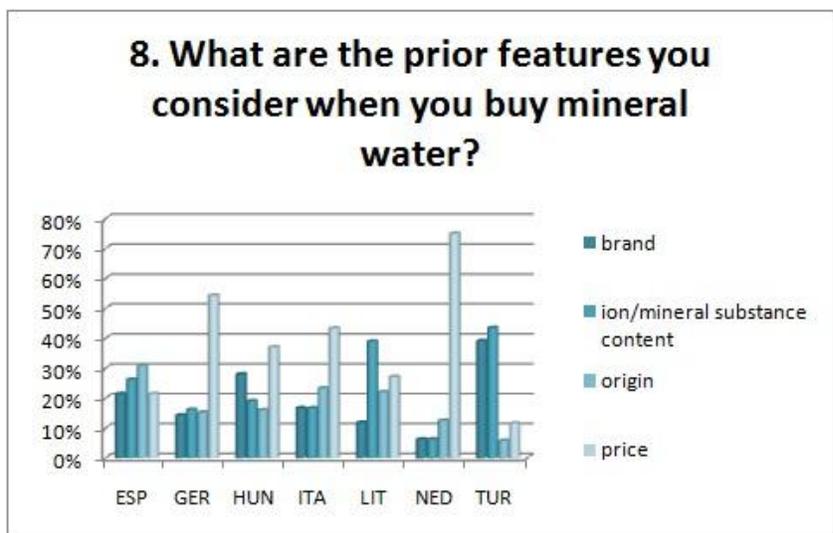
In questions 16 and 17 we asked how much a family spends on tap water (16) and on mineral water and fizzy drinks (17) per month. The answers were confusing, especially after that in question 6 we got to know what students prefer to drink. It can happen that the parents have different customs than their children, but it is very unlikely. For example, the Turkish students wrote that the family spends a low sum of money on fizzy drinks although they drink the most soft drinks.

We also asked about the negative effects of consuming high sugar content and fizzy drinks (Table 2). Most of the respondents think that these beverages cause diabetes without reference to the nations. It is interesting and deserves attention that students are aware of the dangers and so do not consume these drinks at a high rate.

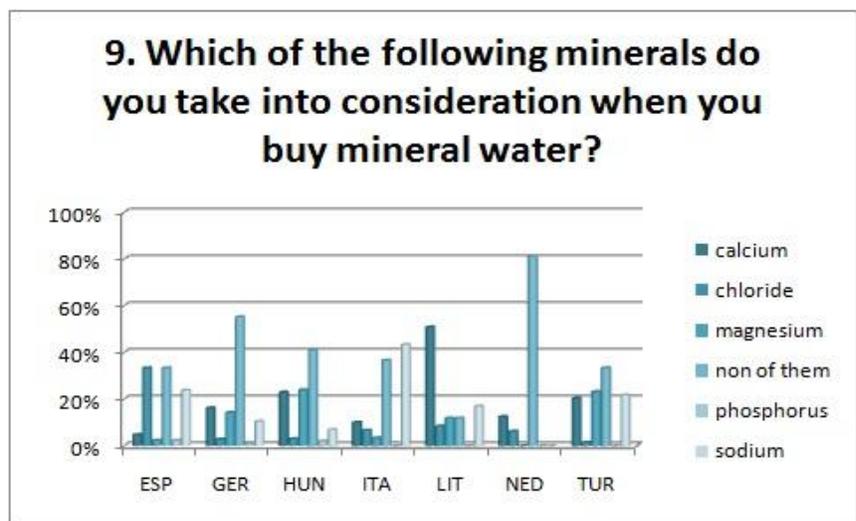
Effects	ESP	GER	HUN	ITA	LIT	NED	TUR
diabetes	48%	58%	59%	70%	69%	63%	61%
headache	5%	17%	no data	3%	7%	6%	10%
hypertension	43%	15%	31%	13%	14%	25%	10%
kidney stone	5%	10%	10%	13%	10%	6%	19%

Table 2

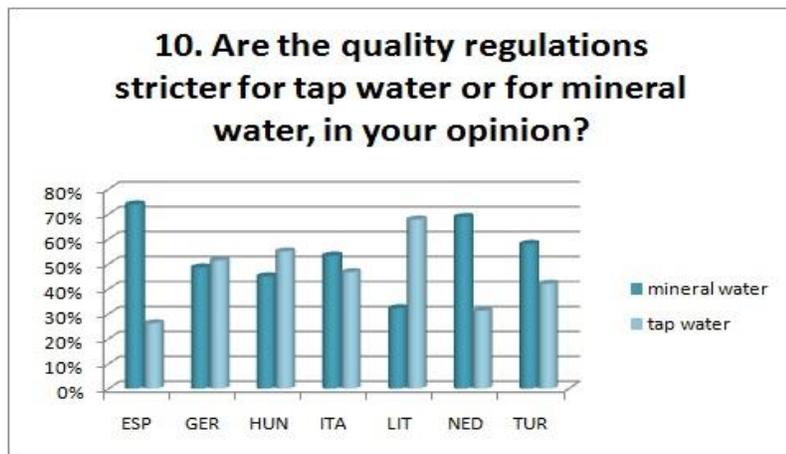
In our poll we asked about the prior features of choosing mineral water (Chart 8). The Germans, the Italians and especially the Dutch take the price first. For the Lithuanian and Turkish people the mineral content is the most important. The brand of the mineral water is not really motivating for the students although for the Hungarian students this is the most important factor after the price.



In the survey we wanted to know which minerals students take into consideration because in the adverts we hear about some of them, but not necessarily about the ones we need. In the previous questions it became clear that for most of the teenagers the ion content is not important.



So it is not surprising that the answers for this question are very different with no real consciousness (in any countries).



Nowadays the consumption of mineral water can be considered as a trend but lots of people do not know that the quality regulations for tap water are stricter than those of mineral water. We were interested whether the students knew it or not. Although the Lithuanians, Hungarians and

Germans had more right answers than wrong, we can say that the respondents are not aware of this fact (Chart 10).

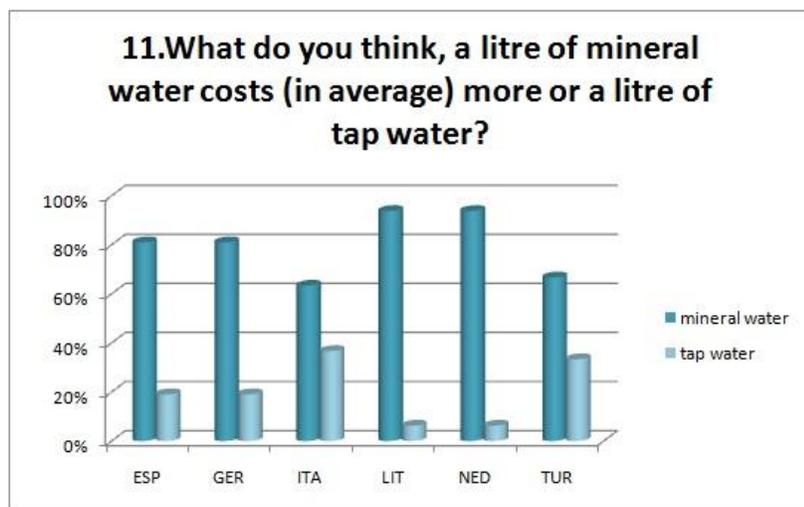
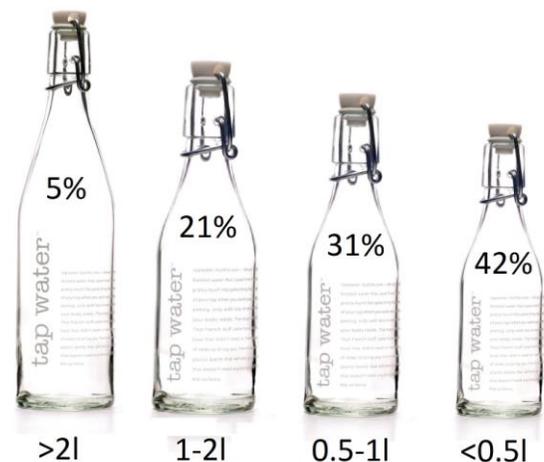
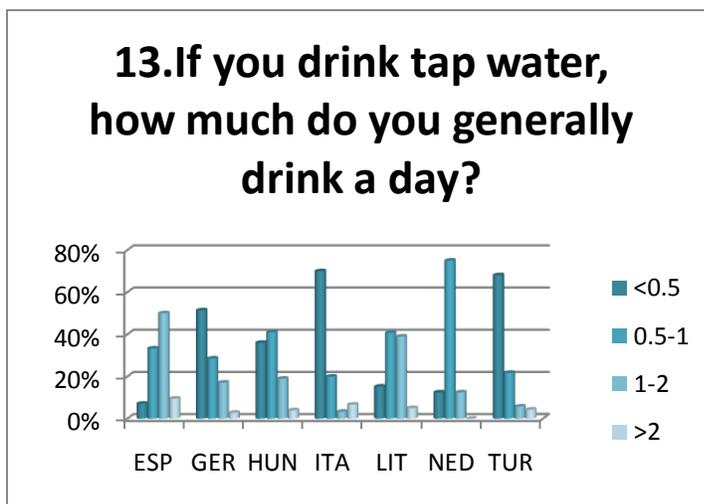
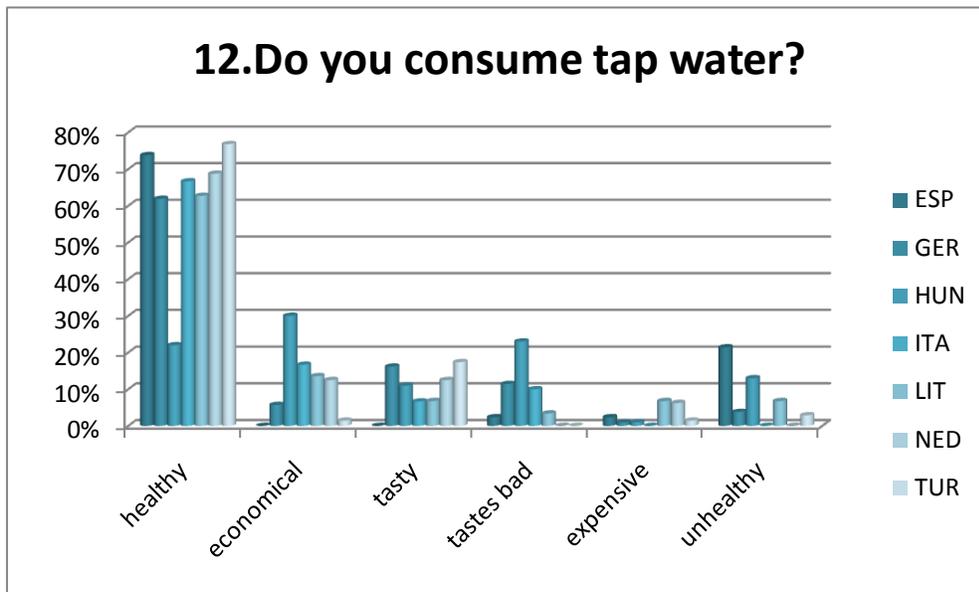


Chart 11 shows clearly that most of the interviewed people know that mineral water costs more than tap water. The question rises: if the quality of tap water is the same or better, it is cheaper and there are no additional expenses of the production of it, then why do not consumers prefer drinking it? We asked in

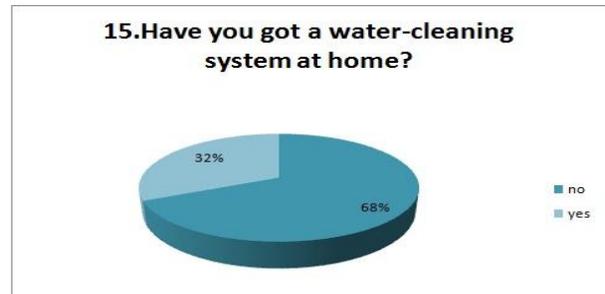
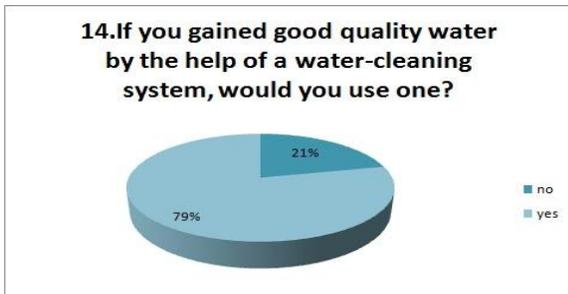
the additional questions (Appendix 2) about the price of 1 litre of tap water and 1 litre of mineral water in Euros. We have learned that –in the same way as in Hungary – 1 litre of mineral water is about 30-40 Euro cents while the price of 1 litre of tap water is about 100 times lower.

In every country a high number of respondents answered that they drink tap water because it is healthy.



In Turkey, Italy and Germany students significantly drink less than 0.5 litre of tap water. In the final two countries in the chart it is because they usually drink bottled mineral water but in Turkey they unfortunately consume soft drinks. We can also see from the results that really few people drink more than 2 litres of tap water on a daily basis.

Most of the respondents (79%) would set up a water cleaning system if they could gain good quality water with the help of it. It turned out that in all the countries more than 30% of the



people have a water cleaning system at home, except for Spain, where 60% uses one at home.

In the poll we asked the people what amount of money they can spend on applying a new water cleaning system. The results showed that an average Dutch family could spend more than 30 Euros on this equipment while the people of the other countries would not spend a great deal of money on it (still they do not have water cleaning systems).

## 5 Chemical analysis of water

We made an examination of the quality of tap water in Tata. We wanted to prove that the quality of tap water is good. Therefore we tested tap water for several basic components with the help of an independent laboratory (named WESSLING Hungary Kft.) in Budapest. Some of the measurements had to be done in the laboratory under special circumstances but the pH value and the conductivity were measured by us. There was a sampling in our secondary school (EJG water), at a home in Tata (TATA-1) and in the same household from a water-cleaning system (TATA-T).

We wanted to expand our researches on the water of the wells too, but as it belongs to the Észak-dunántúli Vízmű Zrt. they did not permit sampling and examinations for us. In spite of this they were very helpful and gave us the results of their own examinations. These results with the limit values that refer to tap water, are summarised (Appendix 3).

We grouped the possible consequences on the basis of the measured and collected data. First we observed the data of the tap water taken from three places in Tata. As the results obviously show, the water from the taps is a good quality drinking water. It contains calcium, magnesium and

hydrogen-carbonate in a relatively high quantity because its source is located in a limestone mountain, the Gerecse. Comparing these lists of data with those of the clarified tap water (TATA-T) we cannot find significant differences. It shows that clarification does not change the composition of its mineral content, it only filters the components (for example chlorine) causing the unpleasant taste and smell.

Secondly we compared the data of tap water with those of the well (TB XIV/A), which were provided by the Vízmű. As we expected there were no significant differences here, either. Therefore we can state that the quality is excellent.

## **6 Health**

Water is the most important component of our body. Most of the human body consists of water although the water content decreases with ageing. This water has to provide all of our body with liquid. Water has an extremely diverse physiological function in the human body. It is essential for blood circulation, dissolves, absorbs and transports nutrients; regulates blood pressure. It also influences the composition of the blood and it has a temperature-regulating role. Low water intake can have negative effects on the kidneys and finally a kidney stone can form. It can also cause a headache so we have to pay attention to it.

Can we replace the water need of our bodies with any kind of liquid? The answer is certainly no. The daily water need of our bodies is 2-3 litres of water. In developed societies it is often believed that tea, coffee, alcohol and different types of soft drinks are the appropriate substitutes for pure, natural water. Although there is water in these beverages, they also contain dehydrating materials. A glass of cola distracts 2 glasses of water from the body.

We were curious whether people can drink tap water in the schools or in restaurants or not (Appendix 2). If yes, it would serve a healthy lifestyle and a developing of consciousness of people. We can see in Hungary that in our school and in most of the schools there are no drinking taps except in the toilets. This is the same in all the countries from where we collected data. Although we can ask for tap water in restaurants, it is not common to do so at all. From the answers we got to know that in the other countries it is the same. People are not encouraged to drink tap water.

## **7 Economy**

When we buy a bottle of mineral water (1.5 litres), in general it costs about 30 Eurocents. From the additional questions (Appendix 2) we got to know that a litre of bottled mineral water in the other European countries is around 30 cents (only in Turkey and in Spain it is a bit higher – 50 cents),too. We collected the data in Euros to make the comparison easier. According to the answers to question 2 the price of tap water lags behind that of mineral water in all the countries, it is about 0.15 cents per litre.

As the required liquid intake is 2-3 litres a day, the liquid needs of a family of four is around 10 litres a day. This quantity is about 300 litres per a month which costs 90 Euros. 300 litres of tap water for also a family of four is 45 Euro cents, which is much less, in addition we use it for cooking, watering the plants and for having a bath too, not just for drinking.

Another economic effect of buying mineral water is that bottles are not refundable, thus tones of waste originate from it. Moreover, the production of bottles and the transportation of mineral water to shops need energy so the energy generation pollutes the environment. During these processes not only the environmental pollution but the high energy consumption causes problem.

The additional questions 9-10-11 dealt with the recollection and usage of the appearing waste. In 3 of the countries – Germany, Italy, the Netherlands – they recollect the bottles and refill them. It results in less garbage. Nowadays in all the countries there is a developed selective collection of these plastic bottles so their presence in the garbage is not so significant. However, from the answers it turned out that in Turkey, Hungary, Lithuania and Spain we can find them in the garbage. This can be because the tradition of selective collection is not so old there.

All in all, we would be more environmentally friendly if we drank tap water.

## **8 Summary**

In the centre of our project, the water consuming customs of the European teenagers and the examination of drinking water of Tata stand. To prove or refute our hypothesis we collected data not only from our school but from 6 other grammar schools in Europe, in 6 different countries. We experience in our surroundings that our age group mostly drinks soft drinks and juices. Many of them drink mineral water as well but almost none of them drink tap water. According to our

hypothesis, people living in these European countries have a different cultural background and have different water consuming customs.

We made a questionnaire to explore the habits of the consumers. The questions are in thematic order. First we focused on the customs of liquid consumption. There were questions about the consumption of different types of liquid and about the drinking of mineral water as well. Finally questions in connection with tap water consumption and domestic water cleaning followed. This was uploaded onto the homepage of our school to make it easier to fill in.

The other examination of our work is about the quality of water. We collected data about the quality of the “Tatabánya XIV/A” well, which provides the tap water in Tata, we were sampling and examining 3 types of tap water in Tata, and finally we put the results into a table. We concluded that the quality of the tap water in Tata is excellent. This is backed by the fact that it was qualified as mineral water in 2009.

We are planning to popularise this information in the future, on the basis of the results of our questionnaire and the chemical analysis. We worked out how to campaign for the consumption of tap water in our school and in the primary schools of Tata, in the form of presentations. We believe that the changing of the people’s view would result in a healthier, more economical and environmentally friendly life style for them. We are planning to collect some data about the water quality in these countries also, which could be a further step in our work.

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## 10 Contestants' introduction

My name is **Claudia Li**. I am 18 years old and I attend a bilingual class in the Eötvös József Grammar School in Tata. I am fond of working in teams, making friends and building international relationships. My favourite subjects at school are Chemistry, Physics, Mathematics and languages. In 2012, I took part in the Comenius Project that gave us the opportunity to make presentations about water and perform them in Jaca, Spain with students from 7 other countries. I am in a students' exchange programme, too. Last year I hosted a Dutch girl and I am going to the Netherlands this May. I am very pleased to have the opportunity to be in these projects.

My name is **Nikolett Sebestyén** and I attend an English-Hungarian bilingual class in Eötvös József Grammar School. I am interested in Biology, Chemistry and foreign languages, and I am keen on doing exciting projects. I have already taken part in a Comenius project and exchange program in connection with water. In that project I learnt a lot with my fellow students. I decided to join the Stockholm Junior Water Prize, because I find it important to call youngsters' attention to the significance of water consumption.

My name is **Lívia Mayer**. I study at Eötvös József Grammar School in Tata. I attend a bilingual class because I think that learning foreign languages is essential nowadays. I am interested in Biology, Chemistry and Physical Education as well. I play handball so water consumption is very important to me. I pay attention to my daily water intake. That is why I decided to join the Stockholm Junior Water Prize competition and also it is a good way to improve my English.

## 11 Appendix

### Appendix 1.

#### Questionnaire

1. Age (years):            Gender (male, female) :            Country:

2. *How much liquid do you think an adult person needs a day?*

less than a litre                      between 1 and 2 litres

between 2 and 3 litres                between 3 and 4 litres

more than 4 litres

3. *How much liquid do you usually drink a day? (water, tea, milk, soft drinks altogether)*

less than a litre                      between 1 and 2 litres

between 2 and 3 litres                between 3 and 4 litres

more than 4 litres

4. *What biological effects do you know the poor consumption of liquid can cause?*

hypertonia                      kidney stone

headache                      diabetes

5. *Do you think that water can be substituted by other liquid that serves the human body?*

yes, if it does not contain alcohol                      yes, if it does not contain carbon-dioxide

no

6. *What do you usually drink when you are thirsty?*

tap water                      bottled mineral water                      soda

natural fruit juice                      syrups                      bottled soft drinks

tea                      milk

7. *Do you know the biological effects of drinking sweet and fizzy liquids?*

hypertonia                      kidney stone



**15. Have you got a water-cleaning system at home?**

**Yes**

**No**

**16. How much does a family spend on tap water per month (in Euro)?**

**less than 10**

**between 10 - 20**

**between 20 - 30**

**above 30**

**17. How much does a family spend on mineral water and fizzy drinks per month (in Euro)?**

**less than 10**

**between 10 - 20**

**between 20 - 30**

**above 30**

**18. How much could a family spend on a water-cleaning system (in Euro)?**

**less than 10**

**between 10 - 20**

**between 20 - 30**

**above 30**

## **Appendix 2.**

### **Additional questions**

1. How much does a litre of mineral water cost in general? (given in Euros)
2. How much does a litre of tap water cost? (given in Euros)
3. Where does the tap water of the town originate from?
4. Do they treat the water in any ways, or not?
5. If yes, what methods do they use?
6. How modern is the water pipe system?
7. Does it have any effects on the quality of the water in any ways?
8. Do they have to change the chemical composition of the water?
9. Do they recollect the bottles for filling them again?
10. Do they collect bottles selectively?
11. Are bottles significant in the garbage?
12. Are there any possibilities to drink tap water in your school?
13. Are there any possibilities to drink tap water in the restaurants?

### Appendix 3.

#### Chemical analysis

Component	Unit	Limit of tap water	Sign of sample			
			TB XIV/A	EJG Water	TATA-T	TATA-1
pH	–	$\geq 6.5$ and $\leq 9.5$		7.21	7.27	7.23
Conductivity	$\mu\text{S}/\text{cm}$	2500		764	768	766
CODps	$\text{mgO}_2/\text{dm}^3$	5.0		<0.5	<0.5	<0.5
p-Alkalinity	$\text{mmol}/\text{dm}^3$	–		<0.1	<0.1	<0.1
m-Alkalinity	$\text{mmol}/\text{dm}^3$	–		8.0	7.6	7.9
Hydrogen-Carbonate	$\text{mg}/\text{dm}^3$	–	464	488	463	485
Carbonate	$\text{mg}/\text{dm}^3$	–		<6	<6	<6
Hydroxide	$\text{mg}/\text{dm}^3$	–		<2	<2	<2
Fluoride	$\text{mg}/\text{dm}^3$	1.5	0.2	0.2	0.2	0.2
Chloride	$\text{mg}/\text{dm}^3$	250	4.8	2	2	2
Bromide	$\text{mg}/\text{dm}^3$	–	0.04	<0.1	<0.1	<0.1
Nitrate	$\text{mg}/\text{dm}^3$	50	0.4	1	1	1
O-phosphate	$\text{mg}/\text{dm}^3$	–		<0.06	<0.06	<0.06
Sulphate	$\text{mg}/\text{dm}^3$	250	72.5	56	55	56
Nitrite	$\text{mg}/\text{dm}^3$	0.5	0	<0.01	<0.01	<0.01
Ammonium	$\text{mg}/\text{dm}^3$	0.5	0	<0.02	<0.02	<0.02
Iron	$\text{mg}/\text{dm}^3$	0.2	0	0.05	0.03	0.05
Manganese	$\text{mg}/\text{dm}^3$	0.05	0	<0.0005	0.0007	0.0007
Potassium	$\text{mg}/\text{dm}^3$	–	1.65	7.0	7.0	6.9
Sodium	$\text{mg}/\text{dm}^3$	200	5.6	1.6	1.6	1.6
Calcium	$\text{mg}/\text{dm}^3$	–	97	96.3	91.9	95.9
Magnesium	$\text{mg}/\text{dm}^3$	–	48.0	48.0	47.8	49.0
Total hardness	$\text{mgCaO}/\text{dm}^3$	min. 50 max. 350		246	239	247