**A thesis submitted to the Department of Environmental Sciences and Policy of the Central European University in part fulfilment of the Degree of Master Science**

# Ways to reduce the consumption of Bottled water at CEU: Analysis of the actual situation and Recommendations

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**Budapest**

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(Signed)
Arturo ORTEGA

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ABSTRACT OF THESIS submitted by:
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The global consumption of bottled water increase in thirty years in levels that the industry never imagine. The landfills in all the countries are full of plastic bottles and even when recycling is present this use a lot of petrol on the transportation of the plastic bottles because in many cases this are recycled in countries like India and China and the shipped back to the rest of the world.

This Master's thesis work aims to provide contribution to understand better the phenomenon of the bottled water making an analysis of how the industry started and evolve to become what is now and the reasons why at the CEU is a common practise.

The research take in consideration the regulation to the tap water vs. the ones for the bottled water, where is possible to identify that most of the time tap water is better monitored than bottled water.

Also on this thesis is done a series of recommendation of the things that can be done at CEU to reduce the consumption of bottled water, likewise is given an economic evaluation of how much the university expend in bottled water in order to step back and think twice where to spend money.

It is concluded that drinking water fountains seems like a good way to replace the use of plastic bottles, but is important to mention that the success of the water fountains at CEU depend of the strategically places where will be installed. Also to it is necessary to start a campaign to inform all CEU about the quality of the bottled water at the University.

**Key words:** Bottled water, CEU, water drinking fountains, economic evaluation, quality and consumption.

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To reach this point first I need to express my gratitude to Alan Watt, head of the Department of Environmental Sciences Policy and Management at the Central European University for his help, patient and willingness to help me in every single moment during this year, without him I would conclude this master.

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This was a wonderful year that wouldn't be possible without such a great classmates and professors, I am happy to be part of it and I need to congratulate all CEU to chooses such a excellent staff and great students.

Finally I want to thank to my family who always gave me support to continue pushing in the worse moments with nice Skype conversation or emails.

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## List of Abbreviations

| | |
|---|---|
| BTU | British Thermal Unit |
| CEU | Central European University |
| CREO | Campus Redevelopment |
| CO2 | Carbon Dioxide |
| EFBW | European Federation Bottled Water |
| EPA | Environmental Protection Agency |
| EU | European Union |
| FDA | Food and Drug Administration |
| GHG | Green House Gases |
| IBWA | International Bottled Water Association |
| LC | Life Cycle |
| LCA | Life Cycle Assessment |
| NGO | Non Governmental Organization |
| NPHMOS | National Public Health and Medical Officers' Service |
| NRDC | National Resources Council |
| OTH | Országos Tisztifőorvosi Hivatal - Office of the Chief Medical Officer of State |
| PET | Polyethylene terephthalate |
| U.K. | United Kingdom |
| U.S. | United States |
| WFD | Water Framework Directive |
| WHO | World Health Organization |

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# 1. Introduction

## 1.1 Background

According to Emily Arnold and Janet Larsen (2006) the global consumption of water from 1999 to 2004 was about 98 billion litres, this is causing all around the planet major problems of waste. It consumes a lot of energy for the fabrication of the bottles, and also in transportation of the water its self, this increases the price of the water, however the consumption of the bottled water is increasing in all countries.

To produce all the plastic bottles that we need is necessary to use huge amounts of oil, The United States use 29 billion tonnes of plastic bottles every year, in order to cover this demand it is necessary to use 17 million barrels of oil a month. NRDC reported that in 2006 approximately 2 billion tonnes of .500ml bottles were shipped to United States creating tons of emissions according with the organization in New York, 3800 tons of GHG were attributed just to the transportation of the bottles. (Olson, 1999).

After the bottle has been used the LC on most occasions is the landfill, even though it could be recycled, the National Association of PET Containers reported that just 29% of the bottles used in United States were recycled in 2010 (Napcor, 2011), globally the recycle rate is very low.

The use of drinking water from a bottle has been associated in many cases with a healthy life style, this is because in many cases people don't trust the quality of the tap water, however this is a myth because is has been proved that in many areas the quality is the same.

The use of bottled of water is a consumption trend and behaviour that must be changed, people often use plastic bottles because it is accessible and easy to find everywhere, however this is one of the major sources of waste on the planet.

CEU represents a perfect case study to understand this phenomenon and gain important knowledge and to take measures to hopefully overcome this issue and serve as a role model in other institutions.

Drinking water fountains seems like the best option to replace the use of plastic bottles, the installation of this drinking water fountains must be in

strategically points and with certain characteristics that can make the CEU community choose it, also it is necessary to make campaigns to inform the CEU community about the environmental global degradation, the economic impact of the bottled water at our facility and the amount of waste we generate.

The most important factor to consider is the quality of the water before installing any water fountain, the core of this thesis is review the current regulations in place which ensure the quality of it and also an analysis of samples taken at CEU by an independent laboratory.

### 1.2 The Aim of the Thesis

The overall aim of this thesis is to produce a document that can be used to create a more sustainable CEU, analysing in deep, the mindset and the reasons why bottled water is popular at CEU at the same time this research will be sent to local NGO´s in Budapest to help them to take actions and initiatives that could be beneficial to reduce the use of the bottled water.

Globally we are facing the major threat in all of our history named “global warming”, it is time to take action in all the activities, bottled water raises many ethical concerns with issues regarding with the right of water and the absurd idea to pay for something essential to live and environmental concern about the amount of fossil fuels used to produce the bottles, transportation and recycling also with the emissions during the recycling process.

Anything that can be done to reduce such impact will help to make our university a better place and will reduce the footprint of it, giving easy to follow recommendations, these are my efforts to do something that I hope will change the behaviour at CEU.



### 1.3 Objectives of the Thesis

The general objective is to create a thesis that can be useful for CEU in order to reduce the consumption of the bottled water.

Particular Objetives

- To understand the reason of why the people at CEU consume bottled water and the circumstances.

- Identify differences among certain groups and their believes or perceptions towards to the issue of drinking water.
- Evaluate which actions can be taken to promote to the CEU community to consume less bottled water.
- To understand how this 30 year industry began and how it boomed to a scale where we now have this plastic problem..
- Create useful data for the sustainable department at CEU and the CRIO department.
- Give recommendations and identify issues to create a more sustainable CEU towards the bottled water.

### 1.4 Scope of the Thesis

This research is built on a very specific context with well defined boundaries. The Geographical boundaries and the buildings Nador 9th, Nador 11th, Nador 13th and Nador 15th of the Central European University in Budapest, Hungary. This was decided because the buildings where is located the business school on Buda site and on Zrinyi do not belong to the CEU and part of the demodulation of the campus include moving in everything to the main campus, also it is not included the residence centre at Kerepesi Utca 87, this is because the research is focused on the staff and most the people who live at the residence centre are students, which will affect their behaviour to the current situation and the things they see on the main campus.

However it is important to mention that some of the actions taken based on the thesis can be applied across all CEU.

It is important to mention the fact that some of the offices which are moving in to the main campus were interviewed because they will be the future users of the new installation and in order to have a success it is important to take into consideration their impression about the water issue at CEU.

The building located on October 6th wasn't part of this research because mainly is the Open Society offices and even if they are created under Soros foundation as well as CEU are completely separate institutions.

## 1.5 Thesis Structure

The thesis is divided in eight chapters which will give the reader easy to understand steps to the phenomenon globally and then explore some solutions to the problem of the plastic bottles at CEU.

Chapter one is an introduction to the study and also to justify the importance of this thesis which will aim to serve CEU and the CREO department as a base to understand the situation of the plastic bottle at CEU.

Chapter two is an explanation of the methodology used for the research work.

Chapter three provide relible information on the global problem, and the evolution over the time the problem has been around.

Chapter four provides an explanation of the complex problem between the bottled water industry vs. the tap water began, and how the marketing has shaped the way we to think towards tap water.

Chapter Five provides information of the efforts to fight against the bottled water.

Chapter Six is an overview of the bottled water situation in Europe, Hungary and with special attention to the situation at CEU.

Chapter Seven summarizes the findings, explaining how complex the situation is at CEU with the perception towards tap water and the way that certain issues are managed at CEU and one set of recommendations that can help to walk towards a more sustainable university.

Chapter Eight are  the conclusion of the bottled water complexity and some possible solutions at CEU.

## 2. Methodology

This thesis is the result of the combination of three different methodology processes: scientific, quantitative and qualitative research. Combining all these tools was in my opinion the only way to create good results for the CEO to really try and get the best information to solve the problem.

### 2.1 Scientific Research

The purpose of the scientific research at CEU was to compare the quality of the Tap Water with Naturaqua (Owned by Coca cola company) and Szentkirályi the most popular bottled waters in Hungary, the aim was to verify the quality of the water and see if the Hungarian drinking water analysis are reliable and coincide the results with an external laboratory.

The benefits of doing a scientific research is that it is an effective tool to win the confidence of the people, this is because people tend to trust science, when something's proven or accredited by them, this is the same technique that the bottled water industry used to convince the people, as Schopenhauer (1907) says “Knowledge is power. The devil it is! One man can have a great deal of knowledge without it giving him the least power, while another possesses supreme authority but next to no knowledge”, science must work as base to start a campaign at CEU.

#### 2.1.1 Scientific Research Process at CEU

Two brands of bottled water “Naturaqua and Szentkirályi” were purchased from a retail store in Budapest in June 2012. The bottles were plastic with a blue cap. This waters were analyzed a couple of days after purchase. I considered that there could be varying lengths of time as to how long the bottle sat on the shelf.

In conjunction with this, water samples were taken at the CEU on Nador 9th and Nador 11th top floors, these samples were collected in plastic bottles and analyzed immediately alongside the samples of water purchased at the retail store.

The reasons why I chose to take the samples in these buildings are simple. Nador 9th is a modern building and according with the renovation done on this building, all pipes were replaced, if existed any contamination during the transportation of the water must appear on an analysis on the top floor. On the other hand Nador 11th is one of the oldest buildings at CEU and there currently exists a plan for renovation of the building, according with the CRIO department, probably most of the pipes would be replaced but is very likely that if any contamination of the water existed due to the pipe's quality in Nador 11th, proving it is the perfect place to take the samples.

Also the scientific results of this thesis can be taken as a base to produce future publications about the water quality in Budapest and campaigns to encourage the people to trust in public water fountains again.

### 2.2 Quantitative Research

The quantitative research was used to give me an idea how the CEU community satisfies there need for drinking water. The quantitative research helps to produce real statistics which can serve as a guide for further investigations. To make sure this Quantitative research reflect the reality of the CEU community it was necessary to survey as many people as possible.

The survey was done online using the website www.freeonlinesurveys.com which was selected because as Shelly Rowett Virgin Media Service Experience Analyst explains, “The website is easy to navigate and as an end user it is very efficient when pulling results”. Free online surveys offer integrated software which makes easier to present the results of the survey.

The survey was taken from other surveys done at other universities in the United States mainly and corrected to suit CEU, it is important to mention the fact that the survey was not reviewed by Tamara Steger and I made the survey without consulting her.

The following step was to contact the IT department and the coordinator of the environmental sciences department Alan Watt in order to get an authorization to send a spam email to all the CEU community during may 2012.

The data obtained in the survey helped to have a general idea about the perception of bottled water used at CEU. Also one of the first ideas towards the

rejection of tap water depends on cultural issues, for this reason it was important to verify this fact and the influence at CEU, the questionnaire can be found on the Appendix.

### 2.3 Qualitative Research

A qualitative research is necessary to provide information in order to understand the human complexities at CEU and the peoples perception of bottled water, as Tamara Steger explain “it is necessary to encourage the people to tell stories and that will give you the human side of the bottled water”. With a qualitative research is possible to identify intangible factors which are hidden in a quantitative research.

#### 2.3.1 Sampling for the qualitative Research

The sample method chosen is called snowball in which the person who was interviewed was asked to give some names of other persons at CEU that can be good to know their point of view, also another peculiarity of the snowball sample is that the research by itself will indicate when is the appropriate moment to stop interviewing more people, the so called saturation point.

In a meeting with Tamara Steger it was discussed who were good candidates to begin the research, during this screening process was clear target candidates for the interview that reflect best the situation at CEU today. Some of the things we identify was that it was necessary to include people from different countries, different departments and different buildings at CEU in order to cover as much as possible all the different ideas and perceptions as well as possible individual situations in some departments, in the cases where it was impossible to find the right person for the interview in a particular office was chosen someone else in order to compensate.



#### 2.3.2 Interview process

The interview candidates were contacted by email, and depending on the circumstances the interview was face to face or by Skype. Something that is important to mention was the willingness of the people to help collaborate with

the research, this clearly reflected that most of the people in our campus are aware of the situation and they are interested in doing something about it.

All the interviews where recorded using the software “Free Audio Recorder” available at http://www.accmeware.com/free_audio_recorder.html. Which was easy to use and can record without interruption for several hours.

The anonymity was the first step discussed on the interview in which was important to make clear that on the research anonymity will be kept and during the thesis period the only ones who can get access to the records of the interviews are Tamara Steger, thesis supervisor of the project and Arturo Eusebio Ortega Torre master student of environmental sciences department.

For the person to persons interviewed in person was given the following statement in a paper and they were ask to signed if they agree to continue with the interview. For the Skype interview it was also explained about the situation of anonymity.

> I _____ herby give my permission for Arturo Ortega, to interview me and quote my responses in a scholarly research paper. I understand that this research paper will be submitted to Tamara Steger professor at the CEU. I understand I waive any claim to copyright to this material should the student ever publish it in his Thesis. I understand that the author maintain my anonymity as a part of this interview. I hereby give my permission.
>
> Signature
> Date



### 2.3.3 Base questionnaire for the qualitative analysis

During the interview process it was encouraged to have a conversation rather that a formal interview. This was the clear intention as Denscombe, M. (1998) explain in order to get details, discover meanings and understanding

towards a determinate issue, is necessary earn the confidence of the interviewees, do not guide or impose an answer.

With assistance of Tamara Steger I created a questionnaire to conduct the research, however more questions were added or omitted depending on each interviewer and their role at CEU. The base question were as follow:

1) How would you describe the drinking water situation at CEU?
2) When drinking water, how do you decide what water to drink?
3) Is there any difference between bottled water and tap water? If so, describe.
4) In terms of drinking water at CEU, what would be your ideal situation?
5 What do you think about a water drinking fountain that can deliver sparkling water and soda?

### 2.4 Limitations and Challenges of This Thesis

This thesis presents a study of the bottled water at the CEU and since the beginning this was one of the biggest obstacles, most of the available literature within the bottled water is focus on United States and not in Europe, the problem is even bigger when comes to the moment to look for particular literature about the industry in Hungary where the information does not exist and where it is available it is published in Hungarian, this makes it impossible to include in this research.

Another limitation is the poor and reliable information that is available from IBWA and EFBW which argue the case that say bottled water is so harmful to the environment saying that PET is a 100% recyclable material and for this reason the industry is totally environmental friendly.

In the interview process it was impossible to contact any representatives of the bottled water industry in Hungary however this didn't affect the results about CEU perceptions towards the bottle water, however take into consideration how the industry sees the market in Hungary could maybe be helpful to understand better the complexity of this issue.

# 3. History of the Bottled Water

## 3.1 How the Bottled Water Industry Started

Looking back at the origin of the industry it is clear that began in nineteenth century. Rachel Black (2009) provide the most reliable information of how the bottled industry started, she describe on her article “Acqua minerale di San Gemini: the Italian mineral water industry finds a place at the table” the history of San Gemini (One of the firts bottled water companies) and how the industry evolved during the time.

In the nineteenth century the town of San Gemini in Italy was looking to become one spa destination due to the fact that a water spring was found and the municipality saw the possibility to swing the main economy towards to the tourism industry.

Since the beginning one challenge was to find a way to promote the tourism, one of the main initiatives was to bottled the water and sell it somewhere else in order to show the people that San Gemini water was therapeutic and attract them to the city spa (Black, R. 2009). Until this moment the idea of the bottled water as an industry for San Gemini didn't exist at all.

San Gemini didn't succeeded as a spa destination as there were other places of more fame and beauty houses spas. However the local authorities saw a chance to start an industry of bottled water, by the end of the nineteenth century it is reflected the intentions of San Gemini in their marketing strategy, Rachel Black (2009) describe the publicity where shows “an elegant lady sitting with a glass in hand at a table with a bottle of San Gemini water as she exclaims, ‘Oh, come e` gustosa, salutare, igienica!”. Below the advertisers claim that Sangemini is ‘an unbeatable table water’. Like most of the early brands San Gemini wanted to bring to the table the magic, health and sophistication of the spas to the common people who could not afford such luxuries (Wilk, R. 2006).

Since the beginning the industry noted the importance to use the sciences to ensure their future in the market and for this reason San Gemini hired a professor from the Universita di Perugia, Dr Sebastiano Purgotti who after making an analysis wrote a report in which he stated that the waters of San Gemini had a high level of oxygen, free of carbonic acid which made the

water as good as other brands. Also Purgutti mentioned that the was “light” this mean that the people can drink a lot and will help them to regulate the digestion (Purgotti 1850: 8).

It was clear that after such findings from the doctor Purgotti, Gemini industry positioned itself in the market as a table water offering medical advantages (Black R. 2009). Interestingly the fact that Purgotti published his findings comparing the results with other waters obviously helped them gain a competitive advantage among others bottled waters.

It is important to notice that in the nineteenth century and the first half of the twentieth century, Europe used to have a poor quality water supply and in many occasions the water was polluted, Italy was not an exception and at the same time it was clear that the Italians reduced their alcoholic consumption during those years (Temporelli 2003). In the other hand bottled water started to be seen as a cure to many gastrointestinal diseases, specially if this was supported with scientific evidence (Black R. 2009), this in turn represented a success for San Gemini and other bottled water companies.

By the 1960´s San Gemini was well positioned in the Italian market having a specific market for their products. For Rachel Black (2009) since the 1920´s hygiene and health became cooped ideas, and drinking mineral water from a safe bottle became a symbol of modernity especially in the big cities.
In Italy to drink mineral water from bottles represents a family tradition, this big legacy of more than 100 years of bottled water has resulted in that today Italy is one of the largest consumers of bottled water in Europe (Beverage Daily 2004).

### 3.2 From Europe to United States

Certainly the idea to sell water in bottles was originated in Europe, the case of San Gemini can be seen as the story of the first brands but it is in United States where the industry has the grown to a scale where now companies like Coca-cola include water as their future marketing plan (Kaplan, M. 2004).

In 1976 Gustave Leven who was the chairman of Source Perrier and one of the main investors for Pony and athletic-wear company visited Bruce Nevis who was working for Pony. In that meeting Leven presented the water bottles business idea to Nevis and ask him to be part of it. According with an

interview with Fishman (2007) Nevin at the beginning was not sure that the bottled water industry can be a success in the U.S. because the then the hole industry was “small and fusty” (Fishman, C. 2007).

Nevis studied all over the United States during the rest of the 70´s and noticed a small chance for the future of Perrier as a company in the States. The idea was not to sell just water. Perrier was a beverage and the only way to ensure the success was persuading the people to drink it changing habits of from cocktails or sodas. By the end of the 70´s the average person in the U.S was drinking 115 litres of sodas and other kinds of beverages which was leading to health problems, in that moment Nevis saw an opportunity where taking an small portion of the market was enough to secure the future of Perrier in the U.S. (Fishman, C. 2007).

Nevis since the beginning created a market plan where he noticed the need to use the science to convince people that Perrier was different from other waters. Before Perrier's started to been sold in U.S., Nevis flew 60 journalists to France to visit the place where Perrier was bottled with the pure intention to make them informed and help them tell their stories about Perrier spring and the health benefits. At the same time Nevis invested money to sponsor the New York Marathon, which is one of the most prestigious sport event across the U.S. His last move was the creation of TV commercials with celebrities with the intention to connect Perrier with them. 1978 was the year when the Americans met Perrier, in that year the company sold $20 million dollars of bottled water, the following year the sales tripled (Fishman, C. 2007).

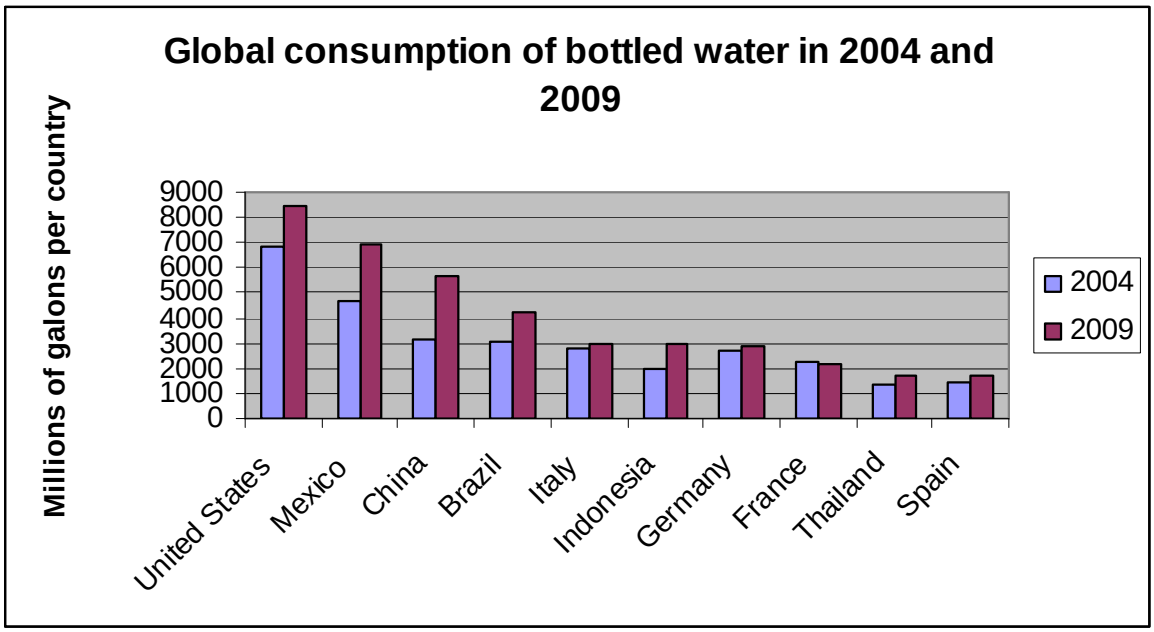
That was the moment when water became an anytime, anywhere beverage when a generation who grew drinking tap water started to drink bottled water and raise a generation that sees tap water like something bad (Fishman, C. 2007) and the big beverage corporations like Coca-cola and PEPSI wanted a share of the business in U.S and in the world with many brands in different countries wanting to do the same.

### 3.3 The Actual Situation of the Bottled Water

Today the industry is still growing globally according with the Beverage Marketing Corporation (2005) from 1999 until 2004 the bottled water consumption per person per year in the world passed from 16.4 L. to 24.2 L.

At the beginning of the 90´s the world was facing the incorporation of the Eastern European countries to the global economy and the bottled water industry was part of this market, in Hungary the consumption in litres of bottled water per person doubled from 29.5 L. In 1999 to 66 L. in 2004 (Beverage Marketing Corporation, 2005).

**Table 1 Top ten consumers of bottled water in 2004 and 2009.**



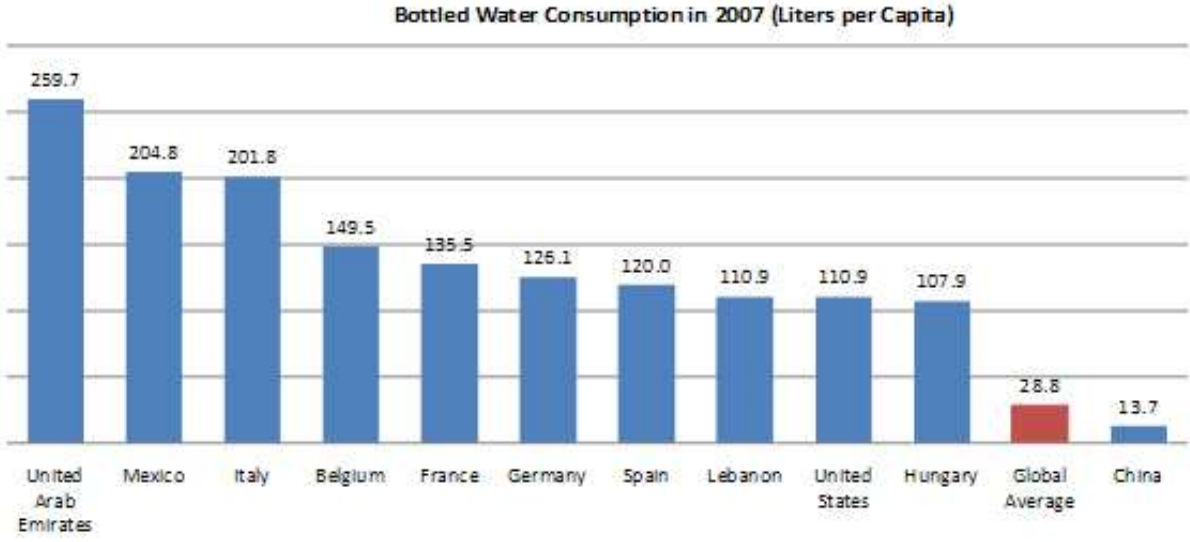

Source: Beverage Marketing Corporation

Today the industry is still growing just in United States alone more than a billion of bottles are consumed every week (Fishman, C. 2007). This increases the foot print of the whole industry due to the need to use massive amount of fossil fuels to transport it, these numbers are insane due to the fact that in North America and Europe where the water from the Tap is good quality. In Hungary the price for a m3 of water is 280 HUF and the price for 1.5 L. at the local supermarket where is cheaper the bottled water compare with any restaurant is 106 HUF making it 252 times more expensive. Sometimes the

price of the bottled water can be up to 1000 times higher than tap water (Ferrier, C. 2001). One issue is that in many occasions is that the consumption of bottled water can affect public drinking water revenues and this can limit the capacity for governments to continue providing to the service (Opel, A. 1999).

The bottled water industry in 2006 sold more than $15 billion USD (Fishman, C. 2007), the industry is not selling gadgets, it is just water, something that was considered by our parents as something you take for granted, now we spend more on water than ever before and this figure continues to increase, it is contradictory that the people spend so much on bottled water and on the other side of the world the people do not have access to it. With just a small portion of the money spent in bottled water could be enough to create an infrastructure needed to provide safe water to the entire world (Wilk, R. 2006).

**Table 2 Bottled Water Consumption in 2007**




Source: http://seekingalpha.com/article/81524-heckmann-corp-still-cheap

In an interview with Kim Jeffery who was the CEO of some of the biggest water companies in the United States by Charles Fishman (2007) Jeffery tells that the success of bottled water industry is “a force of nature”, this may be true because every single person in this planet needs water and the bottle makes it accessible anywhere at any moment. Fishman (2007) points out the fact that the consumption of bottled water increased immensely in just thirty years at levels that any market area could not believe.

The reasons why bottled water has become so strong globally are many but, from the point of view of Ahad Afridi vice president of Aquafina, "water has the right to move and enter in new markets easier than any other kind of beverage" (Fishman, C. 2007).

# 4. Impacts and Complexity of the Bottled Water Vs Tap Water

## 4.1 The Environmental Impact of the Bottled Water

According with a video on the IBWA “Bottled water is one of the most environmental friendly products we have today” (IBWA, 2001), the reason behind this argument is that they consider that the materials are 100% recyclable and for this reason it is harmless to the environment.

Today plastic bottles represent an environmental problem for the entire world to every corner of the planet, even if the bottles are made from 100% recycle material is impossible to collect all of them to be recycled and is highly likely most will finish in the landfill.

When we talk about the bottled water we must remember that is not as simple and harmless as it looks on the supermarket shelf or as the IBWA says. To have a good picture of all the problems it is necessary to consider the whole industry with millions of bottles getting manufactured transported from one place to another and all for a product that we use for just a few minutes and then discard.

One thing the IBWA does not say in their website intentionally is the amount of energy used to recycle the plastic, based on the study from Arnold and Larsen (2006) in 2004 in the U.S. 40% of the bottles were collected for recycling however in many occasions this process is not in United States, the bottles are shipped to other countries like China or India where the labour force is cheaper, this results in a lot of emissions from the transport for the industry.

I consider this a disrespect from IBWA to intentional oversee the issue that the bottles are shipped far away and reprocessed causing more emissions and then shipped back, this off course increases the footprint of the product, an industry which is doing this can surely not claim to be environmental friendly. If all this is compared to tap water from an economic and environmental point of view there is no need to consume bottled water (Saylor et al. 2011), commodity is not excuse to continue polluting the planet when safe water is available.

In many LCA it is reported the high quantity of pollutants that are emitted to the air during the manufacture process and the transportation are very high

for Limbaugh (2008) the impact of one bottle is equal to that of an average car driving almost 1 km, IBWA argue that they conducted and LCA in which they report that in 2007 in the U.S. the consumption of primary energy was 101,553,855 billion BTUs and the percentage of that being bottled water consumed represented just the 0.07% of all the energy, the waste generated on the same year was 254 million tons but, after recycling and recovery the amount of waste disposed in the landfills was 169.2 million tons, the IBWA adjusted their numbers and determined that only 1.08 millions of tons was accredited to the bottled water industry. Regarding to the GHG equivalents in 2007 were 7,947 million tons in the United States. Based on this data, the IBWA reported emit 6.8 million tons of CO2 that year, which compared in a country level is relatively small, what IBWA omit is that's those impacts could be avoided due to the fact that the tap water in U.S. if of good quality (IBWA, 2011).

The big corporations tend to make their bottled close to the plant where they will be filled up with water, this reduce the environmental impact in transportation of the empty bottles. The plastic bottles are made of PET which is a derivate of oil which connect the bottled water industry directly with the biggest polluters in the planet, although this kind of plastic that is 100% recyclable however is estimated that in United States is only recycling 23%, and the rest finish in the land fills just in U.S. (Fishman, C. 2007) in other countries is even less the recycle percentage which mean that the impact is bigger.

As Ferrier C. (2001) note 75% of the worlds bottled water is produced locally or the source is municipal water, for example Aqufina and Dasani in the U.S are just simple tap water for this reason they can open a plant in any place in the world offering the same product (Fishman, C. 2007), this stops them from having many bottled plants across one country or continent, this reduces the impact of the transportation, however 25% which in many cases is sold like exotic bottled water, thus increases the footprint of these brands.

It is important to remember that the water bottle industry in U.S. in 2004 only represented 15% of the global market and also the industry growth in the last decade about 6% per year and many brands are not produced and sell it locally therefore the footprint of the industry is enough to heavily promote actions to reduce it. We live in a world with ecological problems, social problems because of the continued increase in energy prices and with a global

warming alarm (Wilk, R. 2006), for this reason transport and consumption of bottled water in places where is water is plentiful becomes an unnecessary luxury.

Furthermore is important to include the environmental impacts caused by the use of water that is lost in the filtration and purification process which in many occasions account for two litres per one produced (Jermmott, 2008), besides these problem exist another aspect that some time is omitted as the Dr. Todd Jarvis, associate director for Water and Watersheds at Oregon State University says , “it takes about seventy-two billions gallons of water a year just to manufacture the empty bottles” (Jermmott, 2008).

In addition to all of these problems it is important to add the environmental damage that is caused by the extraction of the water on the local groundwater aquifers (Glennon, R.J. 2002), this is depleting more the confined water around the areas where the factories are and in many occasions this water can not be used for the local population due to the fact that the companies own the wells and have contracts with the authorities which enable them exploit it in an unsustainable manner, which can lead to the reduced flow of streams and lakes (Ferrier, C. 2001).

### 4.2 Social Pattern of Behaviour or Marketing

The bottled water industry has reached levels to which we never imagined. It is possible to find on the internet exotic bottled waters from about $30 USD or more, how has this happened? Why the need to show in public the need to drink a certain brand of water that makes us look better? In which moment did we start to think that a nice glass jar of water is less elegant that a dirty fossil fuel plastic one? Charles Fishman describe this type of behaviour as a silly in which we have the choice to be accepted or not (Fishman, C. 2007).

The first step to overcome the bottled water problem is to understand what are the social drivers which give the opportunity to the bottled water industry to position itself in the market and establish itself where it is now, this is the only way we have to overcome this problem.

The idea of paying for water is something new that came with the bottle, the fact we don't pay for the municipal water is a right we have what we pay is a compensation for the purification of the water and the pipe lines, Richard Wilk

(2006) explained that the idea, this new idea for paying is estrange and in many cases offensive, which has more political, economic and environmental roots.

A quote from Tony Clarke a Canadian activist reflect how the issue of the bottled water goes beyond human rights:

> "As water is absolutely essential to life, it is morally imperative that it not be co modified as a product to be bought and sold on the market. Once this happens, water distribution itself becomes a matter of life and death. Those who have the ability to pay can access the source of life, those who don't are denied access."

Other authors agree with Clark point of view, particularly as Peter Singer explained that must be unacceptable and a "superfluous luxury" to drink bottled water where the tap water is good. Also he says that it is important to make a difference between artisanal products and water, where the artisanal products represents in many cases a tradition and a way of living, he mentioned in the case of the French wine, where we can see that the price is quite pricy however we not only bought the wine we support a tradition and ensure this tradition will continue (Fishman, C. 2007). In the case of the bottled water there is nothing behind the bottle just a bunch of corporations making money with something that should be a given right in every society.

Andreasen (1995), McKenzie-Mohr and Smith (1999) recognizes that the only way to change the behaviour through a social marketing campaign requires a clear understanding of the mindset of the people as well as the driver who make them to choose the bottled water over the tap water. They recommend to focus in a target population and identify their knowledge and beliefs, also it is important to identify the barriers that could face changing to the desired behaviour, they agree that a social marketing campaign can increase the benefits of the desired behaviour.

Besides the environmental concern about the bottled water industry it is necessary to understand the words of John Moallem (2007) that "bottled water might be seen as to be good for the health of the individual, but it has ravaging effects on the health of the environment". This was very palpable in the CEU community where bottled water seems to have many good health reasons over

the tap water. This goes hand in hand with the other aspect when bottled water is seen like a tradition. Mineral water in Italy started in the times where public drinking water was unsafe, the Italian bottled water industries started a promotion making themselves as good for the health, this helped to shape what it is today where in most of the houses in Italy is a matter of tradition (Black R. 2009).

Probably the marketing produced for the bottled water industry help a lot to create the problem we have now but it is necessary to point out that bottled water represents a commodity of drink “safe and pure water” anywhere at anytime without the hassle of carry always a bottle.

The major success for the bottled water as Richard Wilk 2006 described is an interaction between public and bottled water, which are included many private interest, legacies and opportunities. When the governments fail to deliver safe water then the confidence of the public decreases and the bottled water industry becomes stronger (Kaplan, M. 2008).

In accordance with many research there are two drivers for the public to choose bottled water, one is dissatisfaction with tap water, in many occasions this does not mean that the water is bad for the health in other words the drinkers just don't like the taste, this is called organoleptics, the second reason is related to the health issues (Doria, M. F. 2006).

Bottled water has a double approach to pitch to the market, one where they use the marketing forces arguing that the technology makes the water safe, the second approach is when the technology is perceived as something bad they market their product as 100% natural from places without human activity (Wilk, R. 2006), all this protected inside a plastic bottle from the factory from a pristine mountain straight to our hands, this is what the industry wants us to believe.

Kim Jeffrey (mentioned before) says “A lot of people tell me, you guys have done some great marketing to get customers to pay for water”, “but we aren't that smart. We had to have a hell of a lot of help from the consumer” (Fishman, C. 2007) it is true that's the bottled industry invested huge amounts of money in marketing but in the other hand this wouldn't be possible without the help of the consumers who accepted it as a part of our normal lives.

It is possible to observe two situations that develop together, both are worrying as the bottled water is viewed with the idea of its purity and safety and public drinking water has lost trust from the people even when the tap water is monitored all the time (Wilk, R. 2006) and the standards are getting more and more strongly regulated (DWI. 2003). In Budapest the government produce safe and reliable tap water that is monitored on site at every moment and also the government test around the city throughout the year to ensure the quality of their product. Something that the people must be aware is that many analysis in laboratories prove that around the planet between 40-60% of the bottled water is just simple tap water in a bottle (Canadean, 2004).

The bottle water industry owes its success to the fear of the public towards tap water, the history of the bottled of water started like this (Magiera, 1994; Olson 1999). However not all the bottled water is good and in many cases the bottled water is just simple tap water with higher price.

Bottled water can not claim that is better then tap water, this depends in a specific location comparing an specific source of tap water against one brand of bottled water in a certain period of time (Hunter, 1993, Olson 1999, Lalumandier & Ayers 2000, Saleh et al. 2001).

**Figure 1 Label Design**


NOTE: Label Design by Monica J. Lincon for Aqua Mist which is a water purification and bottling company, not as the designer try to convince “fresh, clean and natural.
Source: http://monicalincoln.com/special/AquaMist.html

The industry makes drinking water from bottles a fashion, a social phenomenon. Its is a paradox that we ship water from exotic places in order to sell it on the other side of the globe, Fiji water in United States is a clear example of this paradox, it is sold with the idea of giving a taste of pure and pristine, when in fact most of the people in Fiji do not have access to safe water and would change many things to get tap water as good a quality as in North America where most of the Fiji water is sold (Vendantam, 2008).

Bottled water represents a phenomenon of globalization which has attached the idea of pure and unique like its claim on the figure 1 offer an option to try to drink something safe where the civilization haven't harmed the environment. Taussing (1993) says that humans tend to build values around relations which with the time given to them identity over other objects.

In one hand globalization has broken all the frontiers in the other water bottle industry and in many occasions it is been attached to isolated island and glaciers, which gives them a magical scene (Wilk, R. 2006).

Maybe one of the reasons why the people choose bottled water is based on the fact that the advertisement in many occasions claims with scientific evidence to have some kind of minerals that are good for their health, a clear example of this is “eVamor alkaline artesian water which works to neutralize acid and delivers antioxidants and minerals that burn fat” (Beverage Industry News, May 2003).

Marketing is an essential part of the industry, “in the early 1990´s, the bottled water industry was spending about $43 million dollars per year in advertisements” (Olson 1999), today we found that only one company can spend as much as $20 million dollars publicity (Petrecca & Kramer 1999).

Continue consuming bottled water does not help the economies, half the price of a plastic bottles goes to the retailer, approximately one third goes to the distributor in order to pay the transportation of the product, the municipality takes about 10% of the value of the final product for the concept of the water and permits the operatation. The rest is the profits for the company (Fishman, C. 2007). Also the bottled water companies do not generate a lot of employment around the world.

Many people recognize the environmental damage that this industry is causing, local and international NGOs are fighting against the big industries,

www.banthebottle.net, and the Polaris Institute are producing facts and research which help to awake the consumers mindset, but the big industries are still winning this battle. The values that are symbolized with regard to public drinking water are forgotten now and the only way to make a vote against this industry is the idea of a refillable bottled (Wilk, R. 2006).

### 4.3 The Perception of Tap Water

The perception of risk can play an important role in the way that the people see tap water, people always look for what they think is safer and healthier. It is been documented that after contamination events people tend to consume more bottled water even years later when the problem has been solved (Parag and Roberts 2009, Anadu and Harding 2000) this creates fear in tap water and a mistrust of drinking fountains, this leads to uncertainty and "worry sells", combining with a good marketing strategy, the industry of the bottled water seems having ensured a big success in our daily life (Wilk, R. 2006).

It is necessary to mention the fact that in a research made by the NRDC of 103 different brands of bottle water less than one third contained levels of Bacterial or chemical contamination, this can put in predicament the safety of the bottled water over the tap (Jemmott 2008), also in many places tap water is monitored all the time, Olson (1999) explains that tap water is analysed continuously. But in the other hand the industry argue that they use the most advanced technology and for this reason it is not necessary to monitor as much as tap water, they also mention the fact that the water in the bottles is safer because the duration of the transportation of tap water can lead to a contamination of it (DWRF, 1999).

However this last statement can be put into debate, because drinking bottled water is not always safe "If water bottles are stored under very warm conditions, chemicals can leech out of the plastic into the water. Prolonged exposure to hot environments, such as a bottle left in an enclosed car, speeds up the process even faster" (Yanoshik, 2008), we don't have any idea how much time the water spends in the bottle until we drink it, a label with the date of bottle must be necessary in order to reduce the risk of drinking bottles which have been stored for too long a period.

In many occasions is been reported by different authors the fact that bottled water is marketed as pristine and pure and is in fact just filtered tap water, Yanoshik (2008) documented the case of Dasani. part of Coca-cola corporation which was sold as “spring water” and it was discovered that the reality was that it was coming from the municipality supply, he also mentioned that Aquafina owned by Pepsi was in the same position when the authorities checked the plant in Detroit, United States.

In the words of Yanoshik (2008) “People deserve to know what they are drinking, but companies are not forced to comply with any standards in the U.S.”.

Also it has been documented that another reason why people do not drink water from the tap, is the fact that it is believed in certain groups that exist a “right wing conspiracy theories about fluoridation, and the beverage industries interests in encouraging water purchase”. Clairmont and cavanagh see this as part and parcel of privatization, an attack by corporate capital and its political associates on public-sector enterprises, in which “consumers are being moulded by multi-billion dollar advertising campaigns to repudiate public sector tap water” (1988) also the water bottles corporations with the billions of profit they made when they buy and control the water supplies including dams, aquifers and municipal systems in many countries (Clarke, T. 2004; Roddick and Biggs, 2004; Shiva, 2002). This ensures the future of their industry while they take away the chance for many populations to get access to safe public water.

The bottled water is one novel with two parts, the first one is the governments whose job is to provide its people with safe water, the governments must be transparent in order to make available to the public the quality of their water, the second part is the “bottled industry which encourages us to put our faith in a corporate entity, which is disciplined by the market” (Trentmann, 2001).



### 4.4 The Importance of Bottled Water for the Big Industries

In a conference in 2003 called “The only global all-beverage executive conference” was clear the importance of bottled water on the future strategy. The conference was divided in sections, one of them was health and wellness

where water was the core of this section, it was introduced as follows: “Health and wellness are the buzzwords of today's consumer aptitudes” (Kaplan, 2004.), the beverage industry noted the importance that health and nutrition have today and people spend more time just sitting on their regular jobs and health becomes an issue, the people need to compensate those long hours with more healthy food and drinks and what can be more light than water?.

As it was seen in 2003 that water has a huge importance for the corporation and it was important to promote it like virtuous (Fishman, C. 2007), with all the health problems of obesity water can have access to markets that others don't and by 2003 it became the second most popular commercial beverage in the U.S and that trend seems to be happening in the rest of the world according with the Beverage Marketing Corporation (2003). The global business has richer levels that the people never expected and the good news for the industry and bad for the environment is that this trend seems to continue as the market expands and more brands become available.

Thirty years ago it was unimaginable to think in the idea to extract water from deep-sea, desalinated it, bottle it and then transport to Japan and make profit out of it, today Kyoto USA Corp. is producing about 200,000 bottles a day and sell it in Japan for $4 to $6 USD (Associated Press. 2004).

As we've said before bottle water represent for big corporations an important segment in their future. Martha Kaplan (2008) points out the rise in the consumption of bottled water and the decline of confidence in public water is coupled with the bottled water industry and in most of their labels use images of the purity and exoticism like mountains, lakes or places far away like Fiji.

So it seems like the bottled water industry does not have to do much to convince the people to consume it. Robert Foster who worked for Coca-cola company in many places around the world who was in a personal communication with Kaplan M. (2008) pointed to the fact that Dasani (Bottled water own by Coca-cola) achieved a huge profit in the markets just because of the fact that was there, available anywhere in anytime.

In United States the bottled water market is controlled by big transnational's. Aquiafina (owned by Pepsi), Dasani (Owned by Coca-cola) controlled most of the market (Fishman, C. 2007), We can see the same trend around the world with these corporations which control different brands around

the world, according with the Beverage Marketing Corporation (2004) in 2003 the top ten brands of water controlled 53.6 percent of the U.S. market, the rest of the market was made up of more than 900 brands.

This is because the most of the bottled water is sold by retailers and for the small companies is hard to meet their demands and then receive just a small profit, however it is important to mention that the people who drink water usually don't care about the brand according with Richard Wilk (2006) only 25% of the people have preference for a specific brand.

The labels on the bottles do not change, the marketing is always similar, the big corporations use the same techniques regardless of the country where they evoque the nature and purity of their product, as Lofgren (1999) noted they especially use images of mountains and usually the colour of the labels are blue, and bottles are almost always transparent in order to show to the public how pure the water is.

Water nowadays represents a determined market with cultural and gender distinctions. The basic social distinctions of age and gender are also reflected in the marketing of water for male athletes, water specially formulated for a woman's special needs, and brands for children (vitamin-fortified Kid Fuel in small bottles for boys and pink for girls) and active teens (Wilk, R. 2006).

The market has notice that a fear towards tap water is better for their industry (Annadu & Harding 2000), cases of serious accidents make stronger the bottled water companies in a determinate area. These accidents can have a long lasting impact on the industry even years later and after the problem has been resolved (Slovic 1993), for example in Sydney, Australia in 1998 there was a tap water accident, this lead to in that year the sales increasing up to 40% and even years after the accident the sales were still increasing (Sydney Water Corporation 2000).

One fact that is important to mention is that some companies promote the fact that tap water is bad and in some cases "directly and openly market to consumers by highlighting tap water contamination problems and offering their product as safer alternative" (Olson 1999). Even if this has been recorded it is important to mention the fact that IBWA in their guidelines prohibit the bottled water industry to market against tap water (Howard 2003).

# 5. Fighting Against the Bottled Water

## 5.1 The Case of Fiji and the Similitude With the Hungarian Context

In 2001 Fiji exports were estimated in F$1 Billion, the interesting thing is that this represents the whole industry in the country, if we check if the bottled water is a monopoly and represents F$24.7 million (Keith-Reed, 2002). "The bottles are made on site and the water goes directly into them. Cartons are produced locally and the water is untouched by humans during all of this process, for this reason they are promoted like pristine because you will be the first human come into contact it. The success of the water companies in Fiji relies on the success of Fiji's indigenous people or their actual political plans more than it does on global consumer's hopes for (or fantasies about) Fiji's well being, and perhaps the desire to connect with them" (Kaplan, M. 2008).

Interestingly it is a fact is that Fiji as also many other water brands label themselves focusing on nature, purity and pristine. In the case of Fiji it far from the truth (Wilk, R. 2006). However contrary to this the bottled water companies are related to the fossil fuel companies which are not the most pure and pristine (Fishman, C. 2007).

Having a bottled water factory does not represent an economic benefit for the populations in Fiji, for example water production is expected to grow to become the number one export of the country however they only employ 200 people, in the other hand sugar cane employ about 40,000 (Fishman, C. 2007).

## 5.2 Fighting Against Bottled Water

The bottled water industry is well positioned in the market and it is impossible to make an step back from this in a short period of time, so it seems like they will continue expanding regardless of the environmental crisis that we face in the world today, and as Richard Wilk (2006) points out in the old days the governments just could pass a law to ban the plastic bottles, but this nowadays is impossible and will bring another social problems. In the case of a University campus, company, etc. To create a law against the plastic bottle is possible, in many Universities in Canada and United States it has been the

case, however we live an open society and regulations like that can bring internal problems.

Risk and benefit is something that comes together in the water industry (Finucane et al. 2000) depending the area consumers may choose bottled water for the health benefits or trust of the public tap water (Doria, M. F. 2006).

The only way to fight against the bottled water industry is with more clear and transparent governments where the citizens can get reliable information about the testing and quality of the tap water, (Wilk, R. 2006) combining this transparency is necessary to understand the mind-set of the target population we want to change, the reasons for the consumption is not as clear as seems, it depends from the background of the population and their level of education, consumer surveys show many possibilities that can play an important role in the consumption of bottled water (Doria, M. F. 2006), it is important to remember that in many cases nationality differences do not apply for this phenomenon (Doria, M. F. 2006).

It has been documented that in many studies based on blind test (Falahee & MacRae, 1995), in which it is clear to see that most of the public prefer water with high mineral content, this study was made in U.K. where the tap water contains high levels of minerals.

In United States is been documented in many blind tests on TV shows and interestingly the results showed that people preferred tap water over the bottled water, even more interesting was the fact that the show was done in cities like New York and Cincinnati where the bottled water consumption is very high (Good Morning America, May 2001; Cincinnati Enquirer, July 2001).

The world crisis also affects the water bottle industry, and more and more individuals are aware of the environmental situation. this opens an opportunity to do something about it. many authors have documented that environmental awareness campaigns may create a change in the behaviour of the consumers (Block, B. 2008; Laumer, J. 2009; Trigaux, R. 2011 ).

Charles Fishman (2007) explains that if we found a way to make the people understand the negligence of the action of buying bottled water, they will reflect about that the industry and they will try hard to look at that bottle in a different way".

### 5.2.1 The Bottled Water Industry in United States, Case Study for Reflection

Taking United States like case study it is very important due to the fact that is there where the industry developed to become what it is today, and it is where we should expect better regulations, however the reality is different.

An interesting point about the bottled water industry was made by John Mackey who is the CEO and cofounder of whole foods market, the national organic-and-natural grocery chain in United States. He explains that there is two ways of seeing the industry, one is to compare with the tap water taking into account all the environmental concerns around, but if you compare the bottled water industry with other beverages, the result of the conclusion is different. He explain that "It is unfair to say bottle water is causing extra plastic in landfills, and it's unfair to say bottle water is causing extra plastic in landfills, and it's using energy transporting it", "there is a substitution effect –it's substituting for juices and Coke and Pepsi". (Fishman, C. 2007).

Probably the answer to this issue is the fact that water is not a luxury like any other beverage, water must be a right for all the people on the planet, it is true that the ideal situation is not to consume any beverage in plastic, however bottled water as I explain has only existed in the last thirty years, however against all the expectations at the beginning, it is now is a multimillion dollar industry and the trends indicate that will continue.

It is important to mention that the International Bottled Water Association is not as international as it claims, they only take into account the industry in United States, in Europe all the plastic bottled companies are associated to the European Federation of Bottled Waters, two different organizations that share the same aim, to convince the public that bottled water is good and is environmental friendly.

One of the most controversial problems with the bottled water in the world is the fact that bottled water "frequent references to tap water contamination problems" (Constance 1998). This has been changing in the world within time, especially with the big corporations now taking over the small brands in a country. However, it has been reported cases nowadays.

Other problems with bottled water is that most of the time the information in the labels do not reflect the reality, many waters persuade the consumers to think

that they come from a pristine source, with images of mountains or valleys when in fact is comes form public water supply.

In the United States it is plausible to change the bottled water regulations, but is important to mention the fact that the changes occurs in slow motion, one example is the case of many volatile organic chemicals which was regulated by the year 1994 in tap water. By 1996 a Safe Drinking Water act forced the bottled water industry to adopt the standards of the EPA for tap water (Olson, 1999).

However as Olson (1999) mentions not all the bottled water in United States is regulated, shocking but a reality is the fact that it is only regulated to the waters that fit into their definition of bottled water. A company can avoid the regulation just simple labelling the bottle with something different as the FDA definitions of bottled water. The table 3 show what is considered as bottled water regardless if more water is sold in bottles, paradoxical, this principle is also applied in Europe.

**Table 3 Types of bottled water by labelling according with the FDA**

| TYPE | DEFINITION |
|---|---|
| Artesian Water | Water from a well tapping a confined aquifer in which the water level stands at some height above the top of the aquifer. |
| Mineral Water | Water containing not less than 250 ppm total dissolved solids that originates from a geologically and physically protected underground water source. Mineral water is characterized by constant levels and relative proportions of minerals and trace elements at the source. No minerals may be added to mineral water. |
| Purified Water | Water that is produced by distillation, deionization, reverse osmosis or other suitable processes and that meets the definition of "purified water" in the U.S. Pharmacopeia, 23d Revision, Jan. 1, 1995. As appropriate, also may be called "demineralized water," "deionized water," "distilled water," and "reverse osmosis water." |
| Sparkling Bottled Water | Water that, after treatment and possible replacement of carbon dioxide, contains the same amount of carbon dioxide that it had at emergence from the source. |
| Spring Water | Water derived from an underground formation from which water flows naturally to the surface of the earth at an identified location. Spring water may be collected at the spring or through a bore hole tapping the underground formation feeding the spring, but there are additional requirements for use of a bore hole. |

Source: Bottled Water Regulation and the FDA. http://www.fda.gov/downloads/Food/FoodSafety/Product-SpecificInformation/BottledWaterCarbonatedSoftDrinks/ucm077094.pdf

Another issue that is related with the FDA in United States is that, "relies upon water bottler self-testing and self-selection of laboratories, and has refused to require lab certification". This has been reported by Olson (1999)

who gives enough reasons to understand that the bottled water industry does not want to be regulated by a third party, which can make the people think that the industry in many occasions does not complain with the safety standards so not having a certificated lab make them continue with business as usual.

Olson (1999) notes that the FDA standards are more conservative in the United States than in Europe and if bottled water is exported from Europe it can fall into some of the standards proposed for the FDA. As With many other products it is for sure the United States will prohibit them to be sold until they meet the requirements, but contrary to this with bottled water is exempt.

One of the biggest criticisms for the bottled water industry is the fact that the testing's are done at the water plant (Olson, 1999). As mentioned before one of the problems is the fact the bottles are left in storage and in time it is possible that there can be some growth of microorganisms, further more is not an international regulation for a company to give information of when the bottles are packaged, so the consumer makes a blind decision without knowing how long the water has been in the bottle. The bottled water industry argue that bottled water "is not a good source of nutrients for most microorganisms" so its is not necessary to take precautions about it (Olson, 1999).

Taking as a base the study made by Olson (1999) the NRDC recommend to change the labels of the bottles where the user has the following information, also I believe this must be copied as a base in all the countries.

- The level, expressed in whole numbers, of any contaminant found in the water at a level in excess of a health goal.
- Fluoride level (because of this element's asserted public-health benefits at low levels and, at high levels, its detrimental effects), sodium level (to assist those seeking to reduce their sodium intake for health reasons).
- The health goal and allowable level for those contaminants, and fluoride and sodium, found in the water, in the same units.
- A statement as to whether the bottler is in substantial compliance with state and federal regulations

- A one-sentence layperson-readable summary of the health effects associated with any contaminant found at a level in excess of a health goal.
- The specific source (e.g., "Houston public water system") and treatment (e.g., "reverse osmosis and ozonation") of the water.
- The bottler's street address, phone number, and Web or e-mail address for further information.

# 6. An Overview of the Bottled Water in Hungary and CEU

## 6.1 Brief Description of Hungary

Hungary is located a in Central Europe, it is predominantly flat and is a land locked country, the population is about 9 million, the capital is Budapest which is also the largest city. Budapest is divided in Buda and Pest by the river Danube which also divides the country.

**Figure 2 Map of Hungary**


Source: world atlas

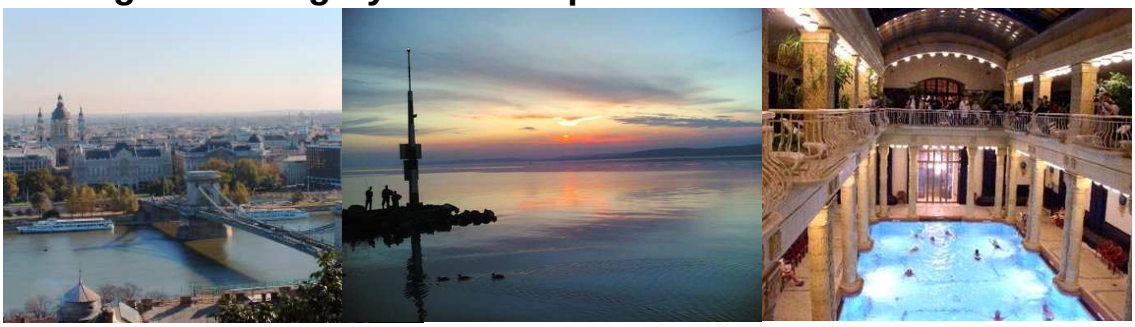
The history of the country is related with water, Hungary can be considered the Richest water country in Europe, estimations show that the surface water represent more 11 000 m3/cap/year per person (Somlyody, L. And Simonffy, Z. 2004) and where ever you are it is plausible to see the connection with the water.

The River Danube, can be seen as the core of the Hungarian history, but is not the only river, twenty-three more rivers also bring water for the country. In the south-east is located the lake balaton which is the largest freshwater lake in

central Europe, but the most important fact to mention about Hungary is the thermal waters which are present all around the country, Budapest is know by many people around the world as “the world spa”.

The thermal baths in Hungary are synonyms of curative powers, any Hungarian describes them as rich in minerals and is one of the best things that Hungary can offer, the people in the old days  believed that the thermal waters are good for drinking and can be the solution for many diseases.

**Figure 3 Hungary and Budapest connection with water.**



Today millions of people from around the world visit Budapest and do not make a connection with the water, either enjoying the view from Buda side of the Danube with the parliament on the side or visiting one of the spas.

Somlyody and Simonffy the Hungarian (2004) authors of “Water in Hungary: with Tradition and Unique Problems to the EU”, identify some situation in Hungary related with water, the first one “water is a resource, a public and an economic good, a risk factor, a national asset or a source of beauty, all at the same time, the second fact is water related objectives on various scales are often ambiguous and contradicting, and problem owners and users are rather diverse. Third, many different needs of the society, ecosystems, nature conservation and various sectors should be simultaneously fulfilled”.

### 6.2 EU Drinking Water Management

Hungary belong to the EU and for this reason the Hungarians need to adopt all the EU regulations, which brought to Hungary more planning and monitoring concepts, as well as stricter standards. This is something good for Hungary because the new drinking water standards are stronger than the ones

before. The EU WFD entry enforced in 2000 a plan and the central goal was to ensure the good status the water in 15 years. “The European law basically influences water management practices in Hungary for the coming decades” (Somlyody, L. And Simonffy, Z. 2004)

The drinking water comes mainly from groundwater (94 %), and in other sectors the use of groundwater has been increasing. According with Somlyody (n2004) “this situation is non-sustainable when preparing river basin management plans according to the EU WFD”. In Budapest the water supply is taken from the river Danube, the estimated total capacity is large in this sense some authors point that's it is about 1800 million m3/year (Somlyody, L. And Simonffy, Z. 2004).

We can say that in Hungary the population have full access to water, the network is formed by 90,000 km of pipes which supply 550 millions m3 of water a year (Székely, T. 2010).

It is been detected some problems with the Groundwater quality in Hungary, with some mineral concentrations higher than the standards, particularly in porous aquifers. “The Hungarian register of point sources of pollution contains 15000” items, out of them almost 15 % represent real pollution (Somlyody, L. And Simonffy, Z. 2004).

### 6.3 Drinking Water in Hungary

Comparing the old standards with the new ones proved it was necessary to make 75% more additional treatments, with a high economic cost included in the replacement of old pipes which cause high losses.

It is important to mention that water treatment and purification plants are owned by the states in Hungary, however it is possible to find private ownership but, this is low. Hungary have many challenges regarding with the water management as Somlyody, L. (2004) mentions “lack of resources, professional knowledge and clear development plans, unclear setting in financing, abuse of subsidies and others”.

### 6.3.1 Water Quality Supplied in Budapest

Today Hungarian standards for drinking water are based in the guidelines of WHO, this was done with the Government Decree 201/2001 (Székely, T. 2010). It is important to mention that the quality of water in Hungary can vary depending on the territory, this is due origin of the water, for example the North and south lowlands are highly affected and it is possible that you will find arsenic, boron and fluoride because of the aquifer utilised (Székely, T. 2010).

In the last decade the water diseases decreased, Hungary has an excellent case-based reported by the doctors to the National Public Health and Medical Officers' Service (NPHMOS), for many illness in which is included water diseases according with the Appendix 1 of Act XLVII of 1997. In data from 2008 it was reported 828 cases of gastroenteritis and according with official data only 1% was waterborne diseases, it is clear that in Hungary the tap water is safe of contamination during its distribution but, sometimes exist faecal contamination (Székely, T. 2010).

#### 6.3.1.1 Quality of waters used as sources for drinking water in Budapest

The WFD on their guidelines explain that is necessary to ensure 10 m3 drinking water supply for 50 people per day, with this premises it is highly important to have proper sources to cover such needs. The water system in Hungary comprises 1770 sources divided in 16 surfaces (Budapest depend of surface water), 92 bank-filtered water resources and 1662 groundwater bases (Székely, T. 2010).

The 16 sources of surface water can be divided into three sections, 6 are from reservoir, 7 from the lake balaton and 3 are taken directly from streams, like the case of Budapest which takes the water from the Danube.

The sources are evaluated and depending of the vulnerability are scheduled for sampling, in the case of surface water it is daily or weekly sampling. The Hungarian management of the water also which is supervised by the Ministry of Environment and water, and they determined how much water can be extracted for human consumption in order to ensure life conditions for

fishes and another species is not affected Decree 6/2002. (XI. 5.) of the Ministry of Environment and Water.

## 6.4 CENTRAL EUROPEAN UNIVERSITY

### 6.4.1 Sustainable CEU

CEU is located in the heart of Budapest, and represent as John Shattuck says a “new model for international education, a centre for regional and global studies, and a source of intellectual support for building open and democratic societies that respect human rights”.

Our university was founded in 1991 with the aim to help in the transition to democracy in Central and Eastern Europe and Central Asia. CEU is progressive in many aspects, promoting values that will make the students better professionals and persons.

One of the main aspects about CEU is the focus on contemporary challenges and building open societies. From this point of view the sustainability about the use of water is very important, the better use of the natural resources is something that must be transmitted from CEU to all the staff, students and community.

CEU is and active member for local initiatives and is linked in promoting public health, with this point of view promoting the use of tap water fits in this goal, from the economic, environmental and health point of view (CEU, N.D).

Sustainable Policy at CEU has the vision to promote awareness and encourage activities, and will work towards the principles of sustainable development in all aspects of its own activities. Also CEU must work with local, national and global bodies to help to build sustainable learning communities and enhance their well being (CEU, N.D).

CEU recognize that the only way to make a change is through education, promoting values which address the environmental problems and development towards to a fight to such problems. It is essential to foster environmental awareness throughout all the CEU communities, to overcome many of the problems we are facing now. The use of the water is one of the most important aspects in this decade and it must be addressed, and the key point to be more sustainable.

Bottled water at CEU is seen for many as something harmless, but we live in a world that cant permit such luxuries and is necessary to step back and think twice before spending our money at any at the vending machines or at the cafeterias, this paper must serve as base to foster this pattern of behaviour to create a CEU free of plastic bottles.

### 6.4.1 Plastic bottles at CEU

We can say that the plastic bottle problem at CEU is a single problem with four different branches, one the cafeteria located in the faculty tower on the top floor, the ground floor and the basement, second the vending machines around the campus, third the conferences and final the different departments at CEU which spend part of their budget on plastic bottles.

#### 6.4.1.1 Cafeterias at CEU

**Figure 4 Dzesm CEU**

The bottled water consumption depends on the season, however in average it is needed from 24 bottles of .500 ml. up to 36 bottles of still water and from 12 to 24 bottles of sparkling water for each restaurant, this makes something between 78 to 180 bottles per week, it is important to mention that the restaurant on Nador 13th is not mention in this thesis because is open also

to consumers outside of the CEU and is hard to track how much is consumed just by the CEU community.

From the economic point of view the water bottle does not represent a big part of their sales and they wont be harmed if the consumption of plastic bottles is reduce. At Dzsem and the ground floor they provide tap water for the consumers and this initiative according with the managers of the cafeterias is really good, most of the students and staff like the idea and the people in the restaurant are happy to promote it.

#### 6.4.1.2 Vending machines

Are controlled by an external contractor and are located in Nador 9th, 11th and 15th, the water like in the cafeterias, the sales vary with the season, also there is a difference with the sales of each machine, the one located on Nador 9th is the one which sells more and based on observations the sales of water increased when the big bottle water dispenser, located a few meters away is empty (This is something that happens often because is changed 2 times a day, this represent just 40 litres a day).

Another important fact to mention is that the business of the vending machines is mainly soft drinks, data about the monthly sales is not available but an estimate on observations that is consumed around 27 bottles of water a day in average during the second week on may 2012. This create a weekly consumption of 135 bottles a week.

#### 6.4.1.3 Conferences at CEU

The conferences at CEU represent a major challenge to overcome, during the conferences it is necessary to order a glass bottle of water of 0.33 ml per person (this is because there is not a plastic bottle of this size). For small events are used plastic bottles, the price of adding per bottle on the events is 140 HUF, also it is important to mention that on many occasion there are other soft drinks for the events, when this happened is consider half amount of bottles compared with water bottles.

The events are divided in coffee breaks with an attendance of between 15-30 people, reception or seminars that could be 60-150 people or

conferences with more than 150 people (during the academic year 2011-2012 there was one conference with 500 people).

The price of 140 HUF seems insignificant as a single bottle of water looks harmless at the supermarket it is important to think of the whole industry, and it is necessary to look the whole picture.

According with the official events calendar at CEU (see: https://www.ceu.hu/events) from September 1st to December 31st CEU will be hosted 9 Conferences. It is impossible to give a real number of the amount of bottles used per year because the events organized by different faculties, and it is impossible to track the information of the bottles used in all the events but an approximation can be made by the amount of events are made for example from April 30th to June 3rd 2012 CEU organized to follow the events, in the case of lectures, concerts, workshops, panel discussion, round tables and workshops bottled water is not always given for this reason it will given the lowest amount of bottles considered by each event.

**Table 4 Bottles of water needed to cover the events realized from April 30th to June 3rd 2012**

**MINIMUM AND MAXIMUM CONSUMPTION OF PLATIC BOTTLES DURING EVENTS AT CEU**

| Events | Kind of Event | Min. No. Bottles | Max. No. Bottles |
|---|---|---|---|
| 6 | Seminars | 360 | 900 |
| 3 | Concerts | 45 | 90 |
| 1 | Conferences | 150 | 500 |
| 3 | Panel discusión | 45 | 90 |
| 12 | Lectures | 180 | 180 |
| 2 | Round Table | 30 | 60 |
| 2 | Workshop | 30 | 60 |
| | TOTAL NUMBER OF BOTTLES NEEDED | 840 | 1880 |

Source: Group Wise CEU

#### 6.4.1.4 Departments and faculties at CEU

At CEU every department controls its own budget, and they can spend it on what they consider necessary, for most of the departments, bottled water represents an usual expense in their budget, the numbers vary for each department but in average they estimate one bottle of water of 1.5L per day per person, however many people around CEU use tap water for drinking purposes and this reduces the need for bottled water, if we consider the data from the quantitative analysis in which of the 60% of the CEU community drink water from bottles, we estimate that 1600 Litres per month are consumed by the different departments, this number is just an estimation based on the interviews, in the other hand the CREO department calculated a consumption of 2200 Litres per month in average.

### 6.4.2 Final economic and environmental impact of the bottled water at CEU

The estimation about the bottles of water used by CEU is based on the interviews for the qualitative research, the quantitative research and observation across all CEU, it is important to mention the fact that this numbers being used are taking the most conservative and the worse case scenario with the object to have a clear idea of the entire picture.

**Table 5 Average total consumption of bottles at CEU**

**Consumption of bottles of water at CEU per month**

| | Minimum | Maximum | Minimum HUF | Maximum HUF |
|---|---|---|---|---|
| Cafeterias | 312 | 720 | 31200 | 72000 |
| Vending machines | 135 | 135 | 13500 | 13500 |
| Department and Faculties | 1066 | 1466 | 85280 | 117280 |
| Conferences | 840 | 1880 | 117600 | 263200 |
| **TOTAL** | **2233** | **4081** | **247580** | **465980** |

The table 5 show the total consumption per month at CEU, the worse scenario is very unlikely to happen due to the fact that not all staff and professors drink bottled water regularly. The real environmental and economic impact is some value between such numbers.

This table is divided in colours, the green one represent the direct cost to CEU per month, if we think in a full academic year taking into consideration the vacations and summer that CEU is not as busy and it is then correct to multiply this number by ten.

CEU is consuming a year about 32,000 bottles of water (maybe more) and expending directly (not taking in consideration the cost of the bottles of water sales in the cafeterias and through the vending machines which is directly absorbed by the individual who purchased) more than 4,500,000 HUF.

This is number is shocking and is something that CEU didn't pay attention to before, at the start of this thesis I never imagined how big the problem was, I hope this thesis represents the beginning to further actions.

# 7. Recommendations Towards a Sustainable use of Drinking Water at CEU Based on the Research

## 7.1 Scientific Research Results

The results are expressed on the Table 6 In which is clear that the tap water at CEU is safe, the waters were tested for the most important chemical compounds that can be dangerous for the health and the results showed that CEU water is suitable for everyone, even better than Szentkirályi who showed high levels of Ammonium (0.4 mg/l). This shows that the drinking water at CEU is as good in quality as with the most of the well know brands in Hungary and should be promoted for drinking, the testing substances were recommended by the laboratory which makes the analysis as the basic substances, to test to know if a given water is safe for drinking purposes.

The full report can bee seen on the appendix.

**Table 6 Water analysis results**

| | pH | Total hardeness (dgH) | Ammonium (NH4) | Ammonia (NH3) | Nitrite (NO2) | Nitrate (NO3) | Iron (Fe) | Copper (Cu) | Total Soluble matter TDS (NaCL equivalent) |
|---|---|---|---|---|---|---|---|---|---|
| Limit safe values | 6.5-9.5 | 5-35 | 0.2 (0.5 * ) | | 0.5 | 50 | 0.2 | 2.0 | 2500 |
| Naturaqua | 7.6 | 21 | 0.04 | 0.0009 | 0.01 | 0 | 0.01 | 0 | 302 |
| Szentkirályi | 8.2 | 15 | 0.4 | 0.03 | 0.025 | 0 | 0 | 0 | 228 |
| CEU Nador 9th | 7.6 | 12.5 | 0.03 | 0.0005 | 0 | 4 | 0 | 0.3 | 195 |
| CEU Nador 11th | 7.5 | 12 | 0.03 | 0.0005 | 0 | 3 | 0.05 | 0.3 | 198 |

NOTE: When the levels of Ammonium are between 0.2 and 0.5 is recommended treatment.

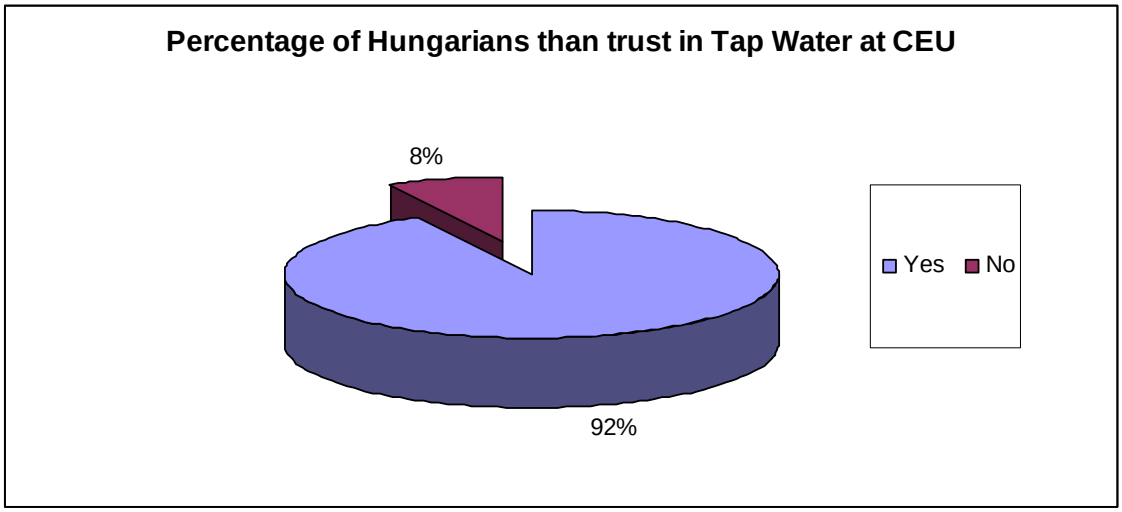
**Figure 5 Analysis of the water samples of CEU, Naturaqua and Szentkirályi.**


### 7.2 Quantitative Analysis Results

As a part of the research work, was sent an email to all the CEU community to invite them to participate on the qualitative research, the response was of 262 persons, this is a sample big enough that we can be sure reflect the reality of the CEU. One fact that it is important to mention is that many members of this institution ask the researcher to share the results of the questionnaire and others sent articles, information or ideas of how to overcome to this problem without asking for. This shows commitment and interest to take actions to become a more sustainable CEU and the chances that the CREO department to have success towards drinking water issues.

The results of the quantitative research showed that there exists a great chance to improve the situation at CEU also the for the locals NGO this research provides interesting and motivational results by Hungarians perception towards their public drinking water.

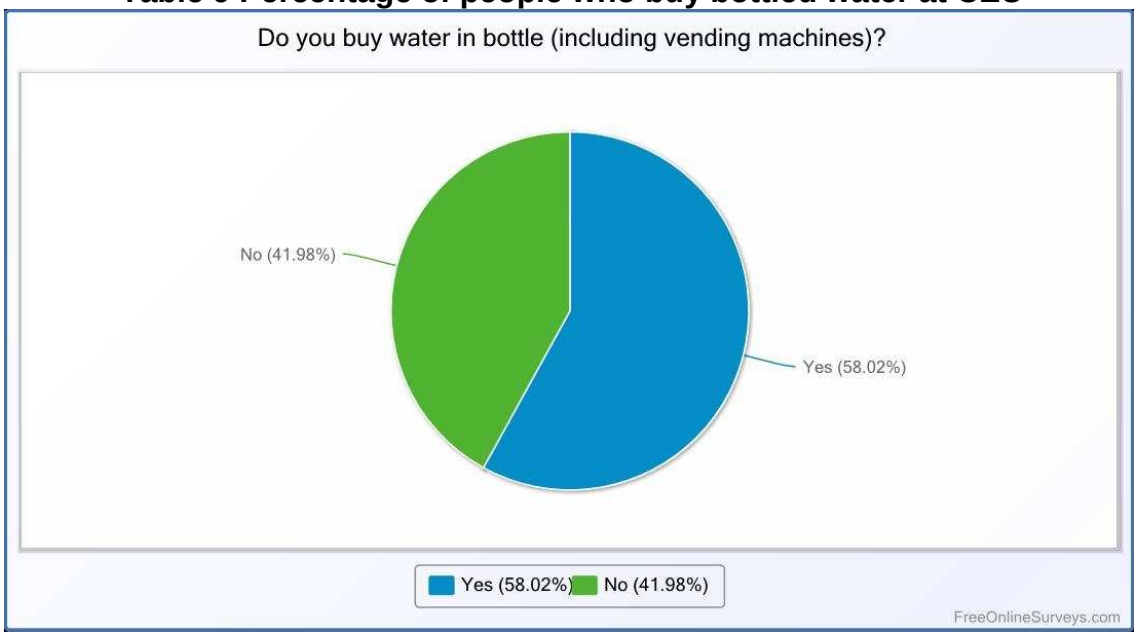
**Table 7 Perception of Hungarians at CEU towards public drinking water**




For CEU it is possible to see that with the simple fact of providing access to tap water at different parts of the university will reduce the need for plastic bottles by 50%, this is possible to see on the table 8 and 9, which reflect that more than double of people who not trust in tap water consume regularly bottled water.

**Table 8 Percentage of people who trust on tap water at CEU**

**Table 9 Percentage of people who buy bottled water at CEU**

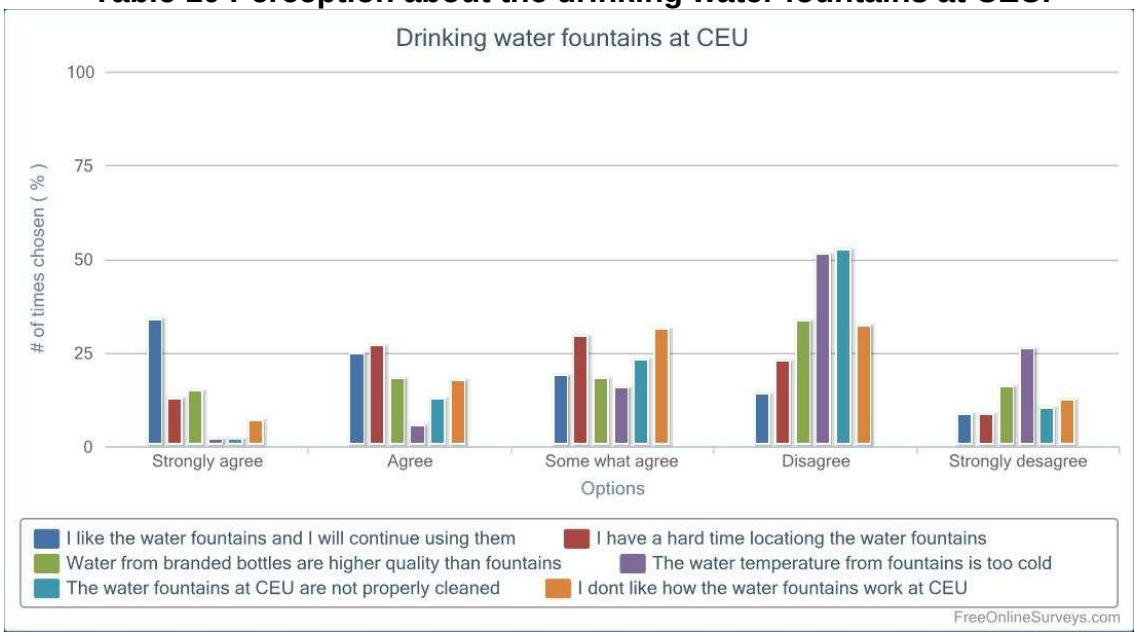



The survey showed two important facts that CEU must take into account, one is the temperature of the water, one is the fact that for more than 50% of the CEU community agree that the water is not cold enough for drinking purposes, this issue was also noticed on the qualitative research. The second issue that CEU must take precaution on is the fact that apparently the drinking water fountains are not properly cleaned, this issue can decreases the use of them which will lead to more plastic bottles used at CEU.

The new water fountains must be cleaned regularly to increase the confidence in tap water and also it is necessary to create a proper signal in order to get the best results.

According with this research one of the priorities for the CREO department is the installation of drinking water fountains on the basement, ground floor and 1st floor of the faculty tower as well as in the octogon at the monument building. The full results of the quantitative research can be seen on the appendix.

**Table 10 Perception about the drinking water fountains at CEU.**




## 7.3 Qualitative Analysis Result

Were conducted 32 interviews inside CEU and two outside, one of these with a local NGO and the other one on the field trip on April 2012 to the purification plant in Budapest.

The Figure 6 represent the complex situation of drinking water at CEU., at the moment there exists only two ways to cover the drinking needs, one is bottled water and the other is tap water, these two options interact with three perceptions towards to water.

The ones who think drinking Tap water is good, these individuals have different reasons at CEU however the result is that when they have the option they drink tap water.

The ones who think Tap water is bad or also bottled water is from “lower quality than tap water “ these individuals can be subdivided in two sub-groups in which the first ones think tap water is dangerous, usually this people have that perception because something happened to them in the past, this was plausible for some Hungarians who come from an specific region in Hungary close to the border with Romania where it was identified from the interviews that the tap water contained high levels of Arsenic in the 90´s and so this caused a change of preferences, similar situations were identified in other staff members from

other countries where safe drinking water is not available. The second sub-group have a perception that bottled water is good for the health, this is attached to the history of the bottled water that was explained in the previous chapter, it was clear that most of all the Hungarians have this believe, during the interview process it was interesting that 3 people took the bottled and told me “look how many mineral it has, they are substances that your body needs”. The table 11 is the information that Naturaqua present on the label that the interviewers pointed.

The problem with this is that they only mention six substances, this can hide some aspects, one is that the fact that it can be lower in other substances or can be hidden high levels of another substances that can be harmful to health.

**Table 11 Naturaqua Water Label**

| **NaturAqua összes oldott ásványanyag-tartalom** | **627 mg/l** |
|---|---|
| Kalcium | 82 mg /l |
| Magnézium | 41 mg/l |
| Hidrogénkarbonát | 327 mg/l |
| Szulfát | 108 mg/l |
| Nátrium | 18 mg/l |

Source: Naturaqua

The bottled water delivered or undelivered they choose what to publish and what to omit on the labels(Olson, 1999). This can raise many arguments towards to the safety of water, or in most of the occasions the bottled water can be safe and good, but equal to the quality of tap water.

The third subgroup is the people who trust in tap water, but for different circumstances they choose to drink water as a commodity, this preferences can change depending on the place and time, for example when they are at CEU they drink bottled water, but at home they drink water from the tap, the reason for this could be because bottled water at CEU is free, they are working and they don't want to spend time looking for a glass.

It Was identified the drivers that interact between tap and bottled water are three main aspects:

- Environmental
- Economic
- Health

We can assume that these drivers not are only a part of CEU just, this are the same drivers that can be identify in any society and must be taken as a base factors to consider, trying to make a change to reduce the bottled water perception.

Finally with these three drivers exists an interaction of some issues.

- Access: is to ensure there is water for drinking purposes
- Availability: the way the tap water is provided (from the sink, water fountain, etc.)
- Perception: Probably the most important aspect because this is different in every single person here the three drivers play a role together with what the people think about access and availability is essential.

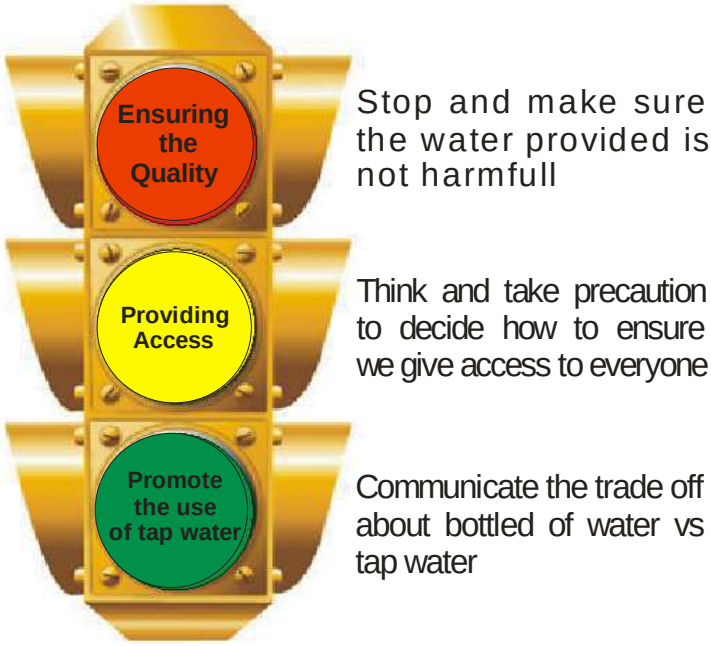
As Tamara Steger pointed once the most important thing is to listen to understand what the people think about something in order to take actions based on this circumstances, if we say tap water is good and is install taps around the campus probably not much is going to change with the situation.

**Figure 6 Water drinking complexity at CEU**

## 7.4 Recommendations based on the research

Most of the recommendations are based on the literature review combining the findings on the qualitative research, it is important to mention that the initiatives describing in this section comes directly from the CEU community who were interviewed. Some of the interviewer were ask “If CEU gives you a new position in which your task were to make CEU consume less bottles of water what you would do and how?”. The steps to follow are represented in the Figure 8, which represent the three steps towards a more sustainable use of water at CEU.

**Figure 7 Steps to follow for more sustainable use of water at CEU**




### 7.4.1 Ensuring the water quality

The first and most important step to walk towards a sustainable CEU was made on the scenic analysis of the water at the university. This was an important action to take in order to know the changes that CEU has make to provide safe drinking water coming directly from the public water system of Budapest or also to know if it is necessary to install filters to purify the water.

### 7.4.2 Providing the water

The second step is to provide the water at a reasonable distance, understand this is hard because dependant of the perception of every person and also can vary with the time.

From the interviews it was clear that people have a different perception of willingness to walk to get drinking water from the tap while some individuals move to a different floor, others simple choose to drink bottled water because is easier to have it closer in one office pick it up and then just keep it next to their desk.

From the research it was clearly understood that it is necessary to have drinking facilities in every floor in every building at CEU, also the water facilities must be located in strategically locations, trying to locate them no further than 20 meters from the father desk, or at less at the same distance where the bottled waters are stocked.

This can be difficult to meet because the distribution of the floors at the CEU campus vary, specially on Nador 11th the staff expressed that even if the kitchen is on the same floor and they have preferences for tap water they take a bottled water because it is a time consuming walk for a drink at the kitchen and back to their desk to continue working, the good news is that this building is well restored and the economic cost of the installation of water facilities can be taken into account and this will reduce their price.

One aspect that comes hand in hand at the moment to provide water is how this will be done, this options already have been explored by the CREO department which consider four possible scenarios with two possible options:

Scenarios

- BAU: Bottled water 1.5L
- Bottled water dispenser with bottled water of 19L
- Water Fountain
- Water Filter Machine (Like the one located at the cafeteria on the ground floor)

Options

- What would be the price per litre in 10 years in case CEU invest in renting bottled water dispensers or a water drinking.
- What would be the price per litre in 10 years in case CEU invest in renting bottled water dispensers or a water drinking.

This scenarios were considered for 5 and 10 machines. The full report is contained on the appendix.

The economic result show that the best option for CEU is to buy water drinking fountains, however this ones has the most expensive investment.

From the environmental point of view drinking water fountains are also the best option because the water dispenser still has the empty bottle and needs to be refilled and this creates emissions during the transport, another problem is that it is necessary to have an storage space for the plastic containers and finally, someone must be in charge to monitor it all the time in order to have water all the time.

The water filter machine seems they can compete with the drinking water fountains or at less was impossible to demonstrate the opposite because it was impossible to find literature comparing this alternatives.

#### 7.4.2.1 Implementation of the drinking water fountains

At CEU it is possible to locate some drinking water fountains on the faculty tower, the advantages of them is that they provide water continuously,

Problems with the drinking water fountains at CEU

In general the service is good, but perhaps there are things that must be done in order to improve the service, are three concerns with use of the water fountains at CEU, the temperature of the water that according with the research a small proportion of CEU consider is not drinkable (especially the staff coming from North America), beside that it is important to pay attention about the amount of water that is wasted while using the water fountains and the last one is that it is hard to refill the bottles.

The first issue is hard to solve and it is important to know that is more a cultural fact in which we should give preference to the majority who think that the water temperature is fine like now, the rest of the people they will have to get used to drinking like that.

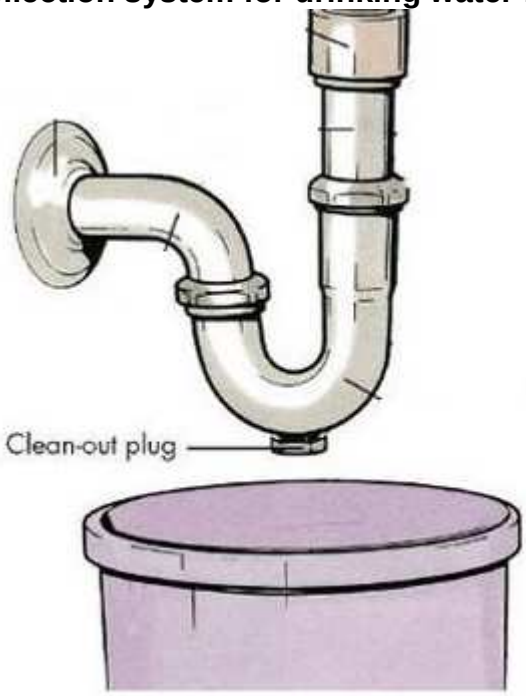
For the other two issues we can take some actions:

- Regulating the pressure of the water equal in all the water fountains at CEU
- Installing water collection systems.
- Installing goosneck spout in the actual drinking fountains and consider them as requirement for the new ones.

The pressure of the fountains must be checked regularly, it is important to have regulated the water coming out of the water fountains, many times it is too high and the users get their face wet and the water goes out of the water fountain sink, other times the water pressure is to low this force the users to put the mouth to close to the mouth piece, this is a reason in many occasions why people stop using in it and get bottled instead.

The use of water drinking fountains produce a lot of waste of water, the people usually leave it to run for few seconds before they start to drinking, this water goes directly to the drainage. This can be solved installing a water collection system on the drinking water fountains, these do not exist in the market but can be easily designed one as is shown in the figure 8.

**Figure 8 Water collection system for drinking water fountains at CEU**




Source: ehow

This water can be used later for cleaning purposes, watering the plants or other uses at CEU, the pockets can be designed with any specifications of the size will fit perfectly the water drinking fountain and also must be something that looks nice.

The last modification must be to install a gooseneck spout to the water fountains to make easier to refill bottles, this will enable less waste water and at the same time will encourage CEU to get refillable bottles.

**Figure 9 Goose neck spout**

Source : The GW Hatchet

#### 7.4.2.2 Refillable Aluminium Bottles

In other university campus around the world the university provide free aluminium bottles to the students, a conversation with the CREO department was discussed this issue and the result was very expensive and in many occasions the students lost them, perhaps CEU can use a top down approach in which CEU provides the bottles to the staff and faculty members. This can be more effective as role model, the students being a year or two at CEU and will notice it will more expensive to provide bottles every year, instead of that they can see professors using it all the time and they will copy this behaviour.

CEU can sell aluminium bottles with nice designs and messages at the cafeterias with a small profit margin for the cafeterias that can work as compensation for the water bottles they wont sell, also it can be promoted as well the sale of powder flavours for water, to make more attractive the use of the bottles.

**Figure 10 Aluminium refillable bottles**


Source: waltmart

Conferences at CEU

This one represents a major challenge for the CREO department and this thesis and CEU in general towards to a more sustainable CEU, here is where more bottles of water are consumed and the most important fact is they are consumed in a really short period of time when after an event all the people go and grab a bottle which in many occasions they take one or two sips and then they are left, the rest of the water is thrown out.

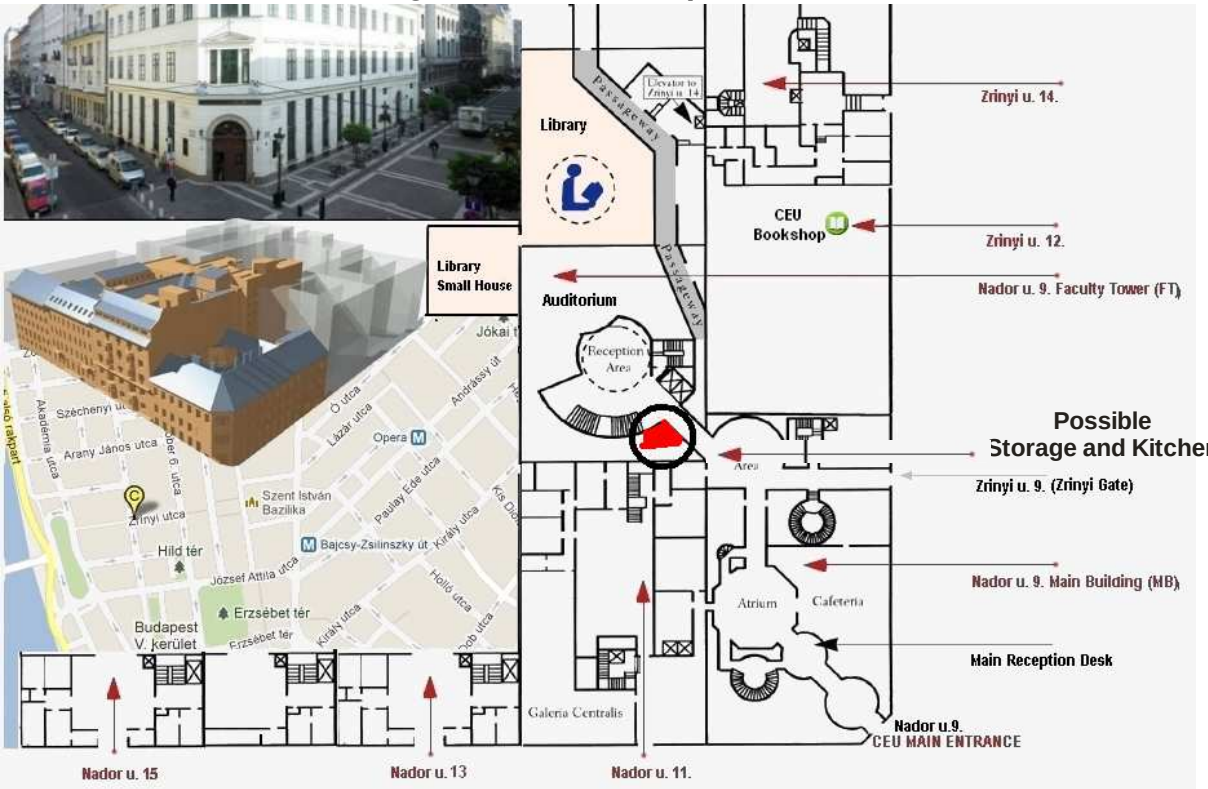
It is important to highlight that some departments like medieval studies and sometimes the centre of art and culture uses jars and glasses to provide water for the participants.

This is something that can be followed in some events with less than 60 people, however the problem is when CEU organize large events, because is impossible to have plenty of jars and glasses to satisfy all the people.

The best way to do this is to have a kitchen or storage close to the auditorium in order to provide quick access to drinking water, the closer location that seems favourable for this is the locker room located before the stairs, this room can be also equipped with some tables and chairs converted into small coffee rooms when CEU host any kind of event, this initiative was already spoke

about with the CREO department who liked the idea and will make a more in depth analysis of the situation and move the locker room to the basement.

**Figure 11 CEU floor plan**




Source: CEU

Conferences at the Monument Building

The monument building is one of the locations at CEU that host some other events, the CREO department and some individuals express that for law it is impossible to make major changes in the building because is protected, the best way to overcome the problem is to install a water drinking fountain in the closest bathroom and kitchen.

CEU entrance

To locate any drinking water facility at the entrance is essential as was pointed out with some interviews, these are the areas where everyone should transit at the University also most of the people who visit CEU do not move from

the ground floor. In order to have the best results it is important to locate them close to the entrance in a visible place. At Nador 9th some interviewed expressed that it would be nice idea to enable the fountain to be located in the atrium (see figure 13), to be used as water drinking fountain, if the water at CEU is safe as is shown in this research there is no reason not to do it.

**Figure 12 . Water fountain located at the Monument Building**


One concern from some staff members about this fountain is they think there will be queue of all the students to refill their bottles and it is not something they would like to see, however if there existed a network of drinking water facilities at CEU this wouldn't be a problem.

For Nador 11th, 13th and 15th the case is different and it is necessary to install a water drinking fountains close to the entrance.

Library

The library is located on the 1st floor on the faculty tower, it is the place with more concentration of people per hour at CEU. The closest drinking facility it is located few meters outside of the library, in a form of a water bottle dispenser 19L. Plastic bottles container, that 90% of the time is empty, the reason of this is because it is only changed two times per day.

According with observation realized on may 2012 it is clear that the people first look for water on such container and when it is impossible to refill a glass from it the people decide to walk to the vending machine and purchased a bottle of water or soda, supporting this observations is the fact that the vending machine has more sales than the on that is close to the library.

From the economic and environmental point of view the installation of a drinking water fountain on this floor must be one of priority at CEU, it is probably the place that will make the biggest impact for the reduction of plastic bottles from the vending machines.

### 7.4. 2.2 Sparkling Water

This is probably one of the reasons why buying bottled water at CEU is popular, for many people drink only sparkling water, the reasons vary from taste, health benefits, etc.

Stopping buying sparkling water could represent a problem for CEU because of the complaints or just discomfort of some members of the staff that are used to drinking it regularly.

In order to overcome this problem exist two options available:

Blupura drinking water fountain

This is a drinking water fountain which provide sparkling water, and is made by the Italian manufacture Blupura. The advantages that it has is that can be designed with specific requirements by CEU and enable to use the CEU id cards to purchased sparkling water, working similar than the printing machines around the campus.

**Figure 13 Blupura public drinking water fountain**


Source: Blupura

However working with the CREO department came across two issues, the water drinking fountain needs to meet the regulations by the government and they also need to have a so called “OTH” number, which is hard to get it if the company is not operating in Hungary, this makes it hard to import this drinking water fountain.

The second issue was that Leda Barta part of the CREO department and I tried to contact the company by email and phone for several months and found it was impossible to reach them, in order to get information about the specification and prices of it.

Soda Stream Machine

This is could be a more simple option to replace the need of sparkling bottled water at CEU.

The soda stream machine use cylinders made from aluminium which contain CO2, this cylinders can be refilled. The soda stream machine use tap water and inject the CO2 to make sparkling water, each filter provide up to 130 litres, additional benefits are that it is possible to get at the moment 37 different flavour syrups that can help to reduce the use of bottles of soda.

This soda stream machines can be purchased by department in all CEU the price range between 17500 HUF up to 30000 HUF depending of the model and the CO2 cylinder is  about 9000 HUF and it produce 150 L per cylinder, perhaps in the long run this could become cheaper because the cylinders can be refilled.

**Figure 14 Soda Stream Machine**


This machines can be purchased by every department and located in the kitchens and used exclusively by the staff and professors, it can also be recommended to the cafeterias inside CEU, they can sell the drinks cheaper than the soda, but in a long turn they can get more profit than the soda itself.

### 7.4.3 Promote the use of tap water

This is the last step towards to a more sustainable use of drinking water at CEU.

It is necessary to inform first CEU community that the water is safe, second is also important to make them to know all the efforts that CEU have done to provide safe drinking water to all the campus.

This must start transmitting to the staff and professors because they are the ones who stay at CEU, the students come and go and they adapt to the things that are established at CEU, also the student budget is low in most of the cases, showing them that the water is safe will make them adapt to the actions implemented at the university.

The medieval studies department is an example that must be followed by the all CEU, it is the only department that do not use the money to buy bottled water.

During the interview process this department selected with the idea of they were probably the department that will be against a change because “they are in love with the past and they wont like new ideas” however the interview was a pleasure and it was discovered that this was just a myth, medieval studies today is the “most environmental department at CEU” related with drinking water issues. They took the decision of stop buying bottled water based on two pillars, economic and environmental.

Some stakeholders at Medieval department notice the amount of money they were spending on bottled water and based on this they decided to inform all their department that for economic reasons it is better for them to stop buying bottled water and use the money for other purposes more important for their department, this is something important to highlight and must be transmitted to all at CEU.

Based on this actions CEU must create a campaign where they inform all the economic and environmental damage that is produced by the use of bottled water at the campus, by the hand informing the safety that it is safe to drink water from the tap and this has been proven with samples made inside CEU.

Also it is recommended to create labels for the drinking water fountain informing the analysis made in order to win the trust of the people who rely on science.

One factor that can be a determinant to change CEU is the role that can play the important figures like Geoge Soros, when they visit CEU, it is extremely important to make them to know that drinking water from the tap is safe and make them integrate as part of this initiative to have a campus free of bottled water.

Most of the people at CEU expressed that a nice jar and glasses can be more elegant that bottled water, ironically many expressed since when giving a bottled water is more elegant.

**Figure 15 George Soros  Drinking Tap Water campaign**


Source:E-Boom Finance

Also the campaigns must create awareness of who to believe the industry who is making millions with a bottled of water that they claim is safe with a labels that in many occasions are hard to understand or tap water that have met the requirements by European law and is monitored all the time.

### 7.3.3.1 The role of making a campaign at CEU

Talking with the CREO department and communications department it is clear that it is essential more communication between departments in order to transmit all the achievements made by  CREO, as was expressed by the communication department this is not part of their task but maybe a semester meeting with both departments and the Sustainability Advisory Committee can lead to a satisfactory outcome.

It can also be created a group between students from the environmental department which their task can be to design a campaign in CEU to promote the use of tap water, this campaign can be supported by business students who can contribute enormously to better understand how to market environmental issues better.

#### 7.4.3.2 The earth day

This event can be used to boost the consumption of tap water, based in the two pillar addresses by the medieval department, economic and environmental.

Blind test: tap water vs. bottled water can be prepared to show the people that most of the time it is a perception of flavour of the water made by the marketing.

Collection of bottles: this should be done weeks before collecting bottles from every single department in every single building and putting them on the octagon showing the community the damage and impact we are doing and that everyone at CEU contributes to that when they buy a single bottle.

Posters: this can include real economic data of how much CEU spend in bottled water, it is important to include data from the four areas of consumption: cafeterias, vending machines, departments and conferences in order to have the real economic value of the all bottled industry at CEU. Also can be included the environmental damage.

## 8. Conclusions

Bottled water is an unnecessary luxury in areas where tap water is good, the issue of the bottled waters goes further than environmental concern, access to water is a right for every single human being on this planet.

Bottled water doesn't make sense, in many occasions water is bottled and in areas where the people do not have access to safe drinking water, it is shipped to the other side of the planet where the public drinking water has to comply to strong standards.

Bottled water is sold with an image of purity and pristine however in most of the occasions it is just simple water, similar to that coming from the tap, in Hungary Naturaqua is been connected with the History of a nation “bottled from groundwater at Balaton”, but as we can see it is not a big difference compared with tap water at Budapest.

The media has shaped the idea of bottled water in Hungary and that it is rich on minerals and this will improve the health of the people, maybe this statement is true, but what they don't say is that tap water in Hungary contains the same minerals and is monitored every hour to ensure its quality.

The IBWA and EFWA want us to believe that their impact is almost invisible and they are one of the most environmental sustainable industries in the world due to the fact that all the bottles are made from 100% recyclable materials, recycling still means transporting empty bottles to countries like China and India, processed and shipped back to the rest of the planet, thus adding more CO2 emotions to the atmosphere, also it is well know that it is impossible to collect all the plastic bottles and most of them will end in a landfill.

The multinational corporations make millions selling bottles of water and this trend seems to continue into the future, it is necessary to step back and think twice before buying a bottle of water.

Overall it could be stated that bottled water and tap water in Budapest is safe for human consumption however is important to take precautions when the babies drink Szentkirályi because of the high levels of Ammonium (NH4), however it is necessary to pay attention on the fact that are many analysis depending how many substances are tested, the price could be up to 4000 Euros per sample.

CEU use bottled water as a principal source for drinking purposes, based on the values of the institution is necessary to change this trend and become more sustainable.

CEU is working through the CREO department to provide water around the campus, and the best way to do this according with the qualitative research and economic evaluation is with drinking water fountains, once this water fountains are installed it is necessary to start a campaign to promote the use of such drinking water fountains based on three important aspects

- Water quality at CEU
- Environmental
- Economic

In order to reach this it will be necessary to create a group in charge to communicate the achievements of the CREO department.

It is necessary to complement the drinking water fountains with options to replace the sparkling water, the research assurance two options the bulupra drinking water fountain and the second that seems more convenient at the moment to buy a sodastream machine for every department, and for the cafeterias, this also can bring extra benefits because they can help reduce the amount of sodas consumed at CEU and will reduce in general the plastic bottles.

At the university there already exists awareness about the situation and this is an advantage at the moment to implement new ideas to fight against this pattern of behaviour, also the idea of banning the bottles of water seems like big mistake, because is taking away the possibility to make decisions to CEU community and the problem just be transported outside of CEU where they can get their water in bottles.

The aim must be to raise awareness in order to have the best results.

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# Appendix

## Questioner qualitative research

1) Where are you from?

2) Do you trust the tap water in Hungary?

Yes
No

3) In your own words what can be done to improve the water service at CEU?

4) Do you buy water in bottles (including vending machines)?

Yes
No

5) Do you bring water from home?

Yes
No

6) If the answer is yes in which form you bring water from home?

Reusable bottle water
Purchased brand name water bottle (ex. Naturaqua)

7) Do you ever refill a water bottle at the water fountains at CEU?

Yes
No

8) How often do you drink water from drinking fountains or tap water at CEU?

Never
Once a month
More than once a week
Once a day
More than once a day

9) Choose the best option

| | Strongly agree | Agree | Some how agree | Desagree | Strongly desagree |
|---|---|---|---|---|---|
| I like the water fountains and I will continue using them | | | | | |
| I have a hard time locationg the water fountains | | | | | |
| Water from branded bottles are higher quality than fountains | | | | | |
| The water temperature from fountains is too cold | | | | | |
| The water fountains at CEU are not properly cleaned | | | | | |
| I dont like how the water fountains work at CEU | | | | | |

10) Where do you think is needed a water fountain at CEU?

No needed
Indicate location

## Results scientific research “water samples”

**Water Test Results ***

Origin of samples: Szentkirály;

Date of sampling: 2012. 09. 12

Responsible for sampling: **Hérics Nándor**

Customer:


www.viztisztitos.lapunk.hu

| Analyzed components | | Measured values | Potable water limit of value** | Limit of values*** | Water testing methods |
|---|---|---|---|---|---|
| pH | pH | 8,2 | 6,5-9,5 | - | colorimetric, by instrumental |
| Total hardness (°dGH) | °NK | 15 | 5 - 35 | 5 - 45 | colorimetric |
| Ammonium (NH4) | mg/l | 0,4 | 0,2 (treatment of 0,5) | 0,2 | colorimetric |
| Ammonia (NH3) | mg/l | 0,03 | - | - | calculated from pH and NH4 |
| Nitrite (NO2) | mg/l | 0,025 | 0,5 (!) | 0,5<br>0,1 for babies | colorimetric |
| Nitrate (NO3) | mg/l | Ø | 50 (!) | 100<br>50 for babies | colorimetric |
| Iron (Fe) | mg/l | Ø | 0,2 | 1 | colorimetric |
| Copper (Cu) | mg/l | Ø | 2 | - | colorimetric |
| Total soluble matter TDS *(NaCl equivalent)* | mg/l | 228 | 2500µS, kb.1250 mg/l | - | electronic TDS instrument |
| *Variable (carbonate) hardness* | *mg/l* | | - | - | colorimetric |
| *Arsenic* | *mg/l* | | 0,01 | - | colorimetric |
| | | | | | |

(!) [nitrate, mg/l]/50 + [nitrite, mg/l]/3 ≤ 1 If this is not met, for babies should not be given!
*If necessary, examining the separately order.*

* Measurement are not an accredited.

**Limit values of 201/2001. according to the Government Decree.

***Limit values for individual water supply systems ont he quality water OTH-918-4/2002 according to regulation.

2012. 09. 12

samples the water Hérics Nándor
06 70 5495590

## Water Test Results *

Origin of samples: Naturaqua

Date of sampling: 2012. 09. 12.

Responsible for sampling: **Hérics Nándor**

Customer:


www.viztisztitos.lapunk.hu

| Analyzed components | | Measured values | Potable water limit of value** | Limit of values*** | Water testing methods |
|---|---|---|---|---|---|
| pH | pH | 7,16 | 6,5-9,5 | - | colorimetric, by instrumental |
| Total hardness (°dGH) | °NK | 2,1 | 5 - 35 | 5 - 45 | colorimetric |
| Ammonium (NH4) | mg/l | 0,04 | 0,2 (treatment of 0,5) | 0,2 | colorimetric |
| Ammonia (NH3) | mg/l | 0,0009 | - | - | calculated from pH and NH4 |
| Nitrite (NO2) | mg/l | 0,01 | 0,5 (!) | 0,5<br>0,1 for babies | colorimetric |
| Nitrate (NO3) | mg/l | Ø | 50 (!) | 100<br>50 for babies | colorimetric |
| Iron (Fe) | mg/l | 0,01 | 0,2 | 1 | colorimetric |
| Copper (Cu) | mg/l | Ø | 2 | - | colorimetric |
| Total soluble matter TDS *(NaCl equivalent)* | mg/l | 302 | 2500µS, kb.1250 mg/l | - | electronic TDS instrument |
| *Variable (carbonate) hardness* | *mg/l* | | - | - | colorimetric |
| *Arsenic* | *mg/l* | | 0,01 | - | colorimetric |
| | | | | | |

(!) [nitrate, mg/l]/50 + [nitrite, mg/l]/3 ≤ 1 If this is not met, for babies should not be given!
*If necessary, examining the separately order.*

* Measurement are not an accredited.

**Limit values of 201/2001. according to the Government Decree.

***Limit values for individual water supply systems ont he quality water OTH-918-4/2002 according to regulation.

2012. 09. 12

samples the water Hérics Nándor
06 70 5495590

## Water Test Results *

Origin of samples: Budapest, Vador u. 11.

Date of sampling: 2012. 09. 12.

Responsible for sampling: **Hérics Nándor**

Customer: _____

FÜGGETLEN VÍZTECHNIKAI TANÁCSADÓ
H2Orvos
HÉRICS NÁNDOR

www.viztisztitos.lapunk.hu

| Analyzed components | | Measured values | Potable water limit of value** | Limit of values*** | Water testing methods |
|---|---|---|---|---|---|
| pH | pH | 7,16 | 6,5-9,5 | - | colorimetric, by instrumental |
| Total hardness (°dGH) | °NK | 12,5 | 5 - 35 | 5 - 45 | colorimetric |
| Ammonium (NH4) | mg/l | 0,03 | 0,2 (treatment of 0,5) | 0,2 | colorimetric |
| Ammonia (NH3) | mg/l | 0,00005 | - | - | calculated from pH and NH4 |
| Nitrite (NO2) | mg/l | Ø | 0,5 (!) | 0,5<br>0,1 for babies | colorimetric |
| Nitrate (NO3) | mg/l | 4 | 50 (!) | 100<br>50 for babies | colorimetric |
| Iron (Fe) | mg/l | Ø | 0,2 | 1 | colorimetric |
| Copper (Cu) | mg/l | 0,3 | 2 | - | colorimetric |
| Total soluble matter TDS *(NaCl equivalent)* | mg/l | 195 | 2500µS, kb.1250 mg/l | - | electronic TDS instrument |
| *Variable (carbonate) hardness* | *mg/l* | | - | - | colorimetric |
| *Arsenic* | *mg/l* | | 0,01 | - | colorimetric |
| | | | | | |

(!) [nitrate, mg/l]/50 + [nitrite, mg/l]/3 ≤ 1 If this is not met, for babies should not be given!
*If necessary, examining the separately order.*

* Measurement are not an accredited.

**Limit values of 201/2001. according to the Government Decree.

***Limit values for individual water supply systems ont he quality water OTH-918-4/2002 according to regulation.

2012. 09. 12.

samples the water Hérics Nándor
06 70 5495590

**Water Test Results ***

Origin of samples: Budapest, Vádor u. 9.

Date of sampling: 2012. 09. 12

Responsible for sampling: **Hérics Nándor**

Customer:

FÜGGETLEN VÍZTECHNIKAI TANÁCSADÓ
H2Orvos
HÉRICS NÁNDOR

www.viztisztitos.lapunk.hu

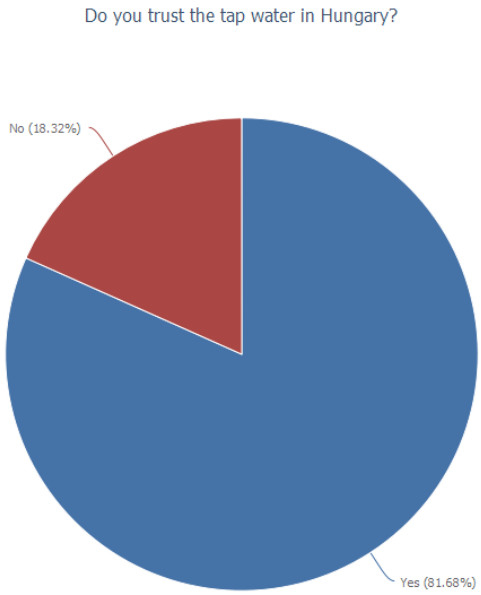
| Analyzed components | | Measured values | Potable water limit of value** | Limit of values*** | Water testing methods |
|---|---|---|---|---|---|
| pH | pH | 7,5 | 6,5-9,5 | - | colorimetric, by instrumental |
| Total hardness (°dGH) | °NK | 12 | 5 - 35 | 5 - 45 | colorimetric |
| Ammonium (NH4) | mg/l | 0,03 | 0,2 (treatment of 0,5) | 0,2 | colorimetric |
| Ammonia (NH3) | mg/l | 0,0005 | - | - | calculated from pH and NH4 |
| Nitrite (NO2) | mg/l | ∅ | 0,5 (!) | 0,5<br>0,1 for babies | colorimetric |
| Nitrate (NO3) | mg/l | 3 | 50 (!) | 100<br>50 for babies | colorimetric |
| Iron (Fe) | mg/l | 0,05 | 0,2 | 1 | colorimetric |
| Copper (Cu) | mg/l | 0,3 | 2 | - | colorimetric |
| Total soluble matter TDS *(NaCl equivalent)* | mg/l | 198 | 2500µS, kb.1250 mg/l | - | electronic TDS instrument |
| *Variable (carbonate) hardness* | *mg/l* | | - | - | colorimetric |
| *Arsenic* | *mg/l* | | 0,01 | - | colorimetric |
| | | | | | |

(!) [nitrate, mg/l]/50 + [nitrite, mg/l]/3 ≤ 1 If this is not met, for babies should not be given!
*If necessary, examining the separately order.*
* Measurement are not an accredited.
**Limit values of 201/2001. according to the Government Decree.
***Limit values for individual water supply systems ont he quality water OTH-918-4/2002 according to regulation.

2012. 09. 12

samples the water Hérics Nándor
06 70 5495590

**Results qualitative research**




In your words what can be done to improve
the water service at the CEU?
-to have drinking water in front of the library

---

-water fountains should be changed more often when they are empty

---

-filtering Systems on water taps

---

-tap water is good according the experts but at CEU is warm

---

-less or ideally bottled water, more drinking fountains and/or water filters installed throughout the buildings

---

-more drinking fountains

---

-increase public awareness on water consumption

---

-more water fountains

---

-more water fountains

---

-more drinking fountains

---

-cold water facets in toilets should be installed because it is only warm water now-not so tasty. more water fountains are needed

---

-more drinking fountains

-filtres

-no improvements needed

-to install a filter system

-put a tap outside the library and in/near the octogon

-academic units should not order 1,5 litre bottled water, but rather office-size bottled water, also they should apply more water fountains around CEU

-to install more water fountains

-i think is ok

-more bottled water in common spaces

-more and VISIBLE fountains.Awreness information, free reusable bottles(with CEU logo)

-more taps,more fountains

-more water fountains

-the water from the taps is too hot, it would be great if it were colder and with less chlorine in it

-the drinking fountains have huge water residue and the water that flows from them is warm. There aren't enough of them and the water pressure sucks. Filters and cooling equipment build into the water fountains would be awesome

-campaign to male people understand that the water from the tap is the same as the water from the fountain, they don't have to waste time filling from the slow stream of the fountain. if they understood that it was the same, they would refill bottles instead of buying

-improve water quality, drinking fountains it doesn't taste good

-there is nothing to improve

-add some drinking water sprinklers, especially next to places like the library and increase the pressure a bit

-more Clearwater machines, colder tap water

-install more drinking fountains

-its Hood

-more frequent refill of the water cooler

-nothing

-nothing because I do not trust water treatment station and pipes within the city. its not CEU's responsibility

-we need cold water taps in all buildings

-I would place more drinking fountains around the university premises

-install more water containers

-check the water fountain for dissolved metals(like copper)

-ok at the moment, water in bottle provided

-nothing can be done at CEU.its an issue at the municipal level

-more water coolers, less or no more plastic bottles BYO bottles

-MORE FREE SOURCES OF WATER WOULD BE GOOD NOT JUST THE ONE IN THE LIBRARY

-DOES C.E.U. HAVE WATER SERVICE?

-FILTERS

-MORE WATER FOUNTAINS

-IS FINE LIKE NOW

-HAVE MORE DRINKING GLASSES AT THE KITCHENS

-WATER FOUNTAINS IN ALL UNIVERSITY

-NO IDEA

-WE SHOULD HAVE SOME WATER FILTERS OR DESIGNATED TAPS WITH FILTERED WATER

-WE NEED DRINKING FOUNTAINS IN ALL THE CAMPUS

-THERE SHOULD BE WATER BALLONS AT THE MAIN BUILDING WHERE THE STUDENTS CAN DRINK WATER FOR FREE

-PROVIDE BOTTLE WATER SUBSIDIZED ON WATER RATE

-A LOT OF THE TAPS ONLY PROVIDE WARM WATER AND FOR FILLING YOUR BOTTLE THERE SHOULD BE COLD

-I cannot understand why is it necessary to provide only hot water in the toilets. It is not environmentally friendly, not necessary and not economic either.

More drinking taps would be good!

-WATER FOUNTAINS ARE OFTEN BROKEN AND THE WATER DISPENSER IN FRONT OF THE LIBRARY IS ALWAYS EMPTY AND SHOULD BE REFILLED MORE OFTEN

-WATER FOUNTAINS ARE OFTEN BROKEN AND THE WATER DISPENSER IN FRONT OF THE LIBRARY IS ALWAYS EMPTY AND SHOULD BE REFILLED MORE OFTEN

-NO IDEA

-THERE SHOULD BE WATER FOUNTAINSON EVERY FLOOR.NO WATER FROM PLASTIC CONTAINERS.MAYBE EVEN STILL WATER SHOULD NOT BE SOLD FROM THE VENDING MACHINE.(PROVIDING INFORMATION THAT THE QUALITY OF TAP WATER IS GREAT

-THERE IS NEED TO PUT MORE WATER IN FRONT OF LIBRARY.THIS IS GONE VERY QUICKLY.THERE SOULD BE WATER FOUNTAINS ON EACH FLOOR IN EACH BUILDING WHARE ARE THE CLASSES.

-WATER FOUNTAIN INSTEAD OF WATER TANK NEXT TO COFFEE MACHINEIN FRONT OF LIBRARY

-THE FOUNTAINS THEY DONT WORK WELL AND NOT COLD WATER ON TOILETS,SO WE NEED MORE COLD WATER ON THE TAPS

-TAP WATER IS GOOD

-MAYBE HAVE MORE COOLERS OR AT LEAST KEEP AN EYE ON THE COOLER AND CHANGE THE BUCKET ONCE ITS EMPTY

-FILTER IT

-FILTER IT

-CHILLED DRINKING WATER WIDELY AVAILABLE

-MORE WATER FOUNTAINS

-MORE FOUNTAINS

-WE NEED TO HAVE CENTRAL REFILLABLE WATER SERVICE AND NOT BE RELIANT ON THE LITRE SIZED BOTTLES. THE WASTE IS TERRIBLE! Esp for thos eof us who work here. We need the litre sized bottles for events maybe, but in general, we should have the 5 gallon refillable bottles and glass

pitchers so this water can be used for events as well. more fountains would help, but a fulltime staff person, we need these office set-ups, not just more fountains.

-PROVIDE FILTERED TAP WATER INSTEAND OF PLASTIC WATER

-LOWER LEVERS NADOR 9

-MORE DRINKING FOUNTAINS

-less OR IDIALLY NO MORE BOTTLE WATER, MORE DRINKING FOUNTAINS AND OR WATER FILTERS INSTALL THROUHOUTTHE BILDINGS

-ACCORDING TO MANY HUNGARIAN SCIENTIST IT IS HEALTHY.NOTHING TO IMPROVE BUT IN C.E.U IT IS WARM AT THE CAMPUS BILDINGS

-FILTERING SYSTEM ON WATER TAPS

-WATER FOUNTAINS SOULD BE CHANGE IT WHEN THEY ARE EMPTY

-TO HAVE DRINKING FOUNTAIN IN FRONT OF THE LIBRARY

-TO HAVE DRINKING FOUNTAIN IN FRONT OF THE LIBRARY

-More drinking fountains in the CEU buildings.

-There is no need to act

-1. More water fountains.
2. More water dispersers available in the buildings.

-more water balloons. Like the one in front of the Library.

-More fountains and places to fill water bottles in key locations (library, octogon, near the computer labs.

-water coolers

-install a water fountain next to the library!

-Install more clear water canisters in the CEU buildings, same as in the ground floor restaurant is.

-Install more drinking fountains.

-To set up more water tanks

-regulate stream of drinking fountains

-I am sorry, but I have no idea (this is an area of infrastructure I am not familiar with);
as to the water fountains at CEU - I did not yet realize that there are some...

---

-We need better fountains, more fountains, and by fountain I do not mean "watercooler" jug filled with water. We need public water fountains.

---

-more water fountains conveniently located.

---

-There should be more public water taps available for drinking water. It may also help to set up water filters all over campus, so that the water coming from any or most taps would be drinkable. More awareness-raising on campus about the benefits of drinking tap water vs. bottled water would be great - this should probably include simple calls to action to the community, like 'spend 500 ft on a water bottle/travel mug and refill it with clean, fresh, filtered water for free from any tap on campus."

---

-I'm glad the kitchens have sinks, because that is where I usually got my water. The water fountains were much slower.

---

-More water fountains

---

-good but really cold water(tap) is missing

---

-There might be more clear-water stations in the building complex where we could tank in cold water. Anyway, the water coming from the taps is clear and have good taste.

---

-More Clearwater machines would be fine, for smaller offices as well.

---

-Stop stealing electricity!

---

-It would be good to have more places with free (filter-cleaned) water available for drinking for the public.

---

-I dont know.

---

-More drinking water disposal machines

---

-filter the tap water

---

-fill in the free water machine near the lib more frequently

---

-- more water fountains or taps from which we can get a cold water (need to be higher and colder than the current ones)in the restrooms

---

-There are only few places to get purified water which I prefer to drink.

---

-Provide more drinking water such as in front of the library - and change the big bottle when it's empty.

| |
|---|
| -I would suggest more public fountains |
| -More drinking fountains around campus |
| -I would install running water fountains (the ones that are supplied from the after system like taps) in many places around the campus |
| -Install additional filters to make it less hard. It really dries the skin. |
| -I don't know. You need to clarify what you mean by "water service". |
| -Nothing. Its fine. |
| -I am satisfied |
| -They are all right. |
| -There needs to be a water fountain somewhere on the ground floor of Nador 9, possibly the first floor as well. |
| -There should be more fountains. |
| -More bubblers / drinking fountains rather than having to rely on bottled water from the machines. |
| -Serve tap-water outside of the library, not bottled water. CEU has to stop serving and selling bottled water. It is so bad from an environmental perspective. Install a tap outside of the library and on every floor in every building. People should be encouraged to drink tap water. Signs and e-mails needed. I know a lot of people have a problem accessing water at CEU and they have complained about it. CEU should also stop selling Coca Cola products. They can be exchanged with environmentally and ethically sustainable alternatives. |
| -Install water filters at least on some taps. |
| -more filter water tanks |
| -- more water fountains and/or water machines<br>- more frequent refill of water machine tanks (many times when I go there they are empty)<br>- cold water should be available in the ladies/men's rooms as well, now there is only warm water there; also, now you can not fit your bottle under the taps because sinks are too small<br>- from the water fountains water comes very slowly, it takes ages to fill your bottle - this could be improved somehow |
| -Nothing |

-Improve the design of the drinking taps in the corridors, they are really uncomfortable!

-put a water fountain on the same floor as the library is (next to it), install a kitchen (for making tea) which is accessible to students near the library

-drinking fountains in FT are crappy; no drinking fountains elsewhere

-cold water is needed in restrooms; drinking fountains need to be full all the time

-Nothing

-Fill the coolers more often

-Nothing.

-Get more fountains

-Not to buy those thousands of industrial-commercial water bottles.

-Much more water machines;drinkable, COLD water from the toilet tubs

-Replace both the water and cups more often.

-More drinking faucets should be placed covering most of the public places

-put more water fountains to more place

-No idea, but the taste of the tap water is bad.

-to put filters on pipes

-to get more water fountains

-Drinking fountains

-taps could be installed on the ground floor. and to make sure that water in those taps goes through filter.

-to clear it from sediments. Yet, even in this case I would have more arguments for the bottled water. The changes of chemical composition of the water is a little bit stressful for the organism. Too many changes can even lead to health problems (weakening of immunity as so on). Therefore the brand name bottled water is more preferable for me, because at least in theory it has more or less the same chemical composition.

-I did not know that there was a problem

-- apply mechanic filters on the taps

-Sometimes the water in the fountains are not so tasty after passing time in the tubes.

-providing dirnking water at more places, not just in front of the library. And refilling more often that bottle.

-well in Hungary I do drink tap water. but at CEU tap waters are warm, they are not drinkable. don't know why is that so. + they have some machines that have free drinkable water, but they should be more and also CEU should take care that they are full and working

-there should be cold water in the bathrooms, not only warm (Nador 11 bathrooms have only warm)

-mb add some more fountains

-We need more water distribution points

-More water fountains. Water filters in the dormitory so that we will be able to drink the water from the tap

-More water coolers and fill them up more often! The water in the water fountains tastes horrible.

-Replenish water more often.

-The service as it is is ok.

-Install some taps under which the water bottles can easily fit, or some other water supply solutions (like the one in front of the library) from which one can easily and cleanly refill your reusable water bottles.

-The drinking fountains are useless (I find the whole concept flawed, I always get water sprayed on myself AND manage to get almost none in my mouth), so I always go to the kitchens on the upper floors of the Faculty Tower to drink.

-More water fountains

-Option for both hot and cold water in all bathrooms. Easier access to water at the fountains (e.g., to fill a bottle).

-the water from the drinking fountain on the way to the Japanese garden tastes like rusted pipes. maybe they should check it.

-Increase the availability of water fountains/tanks; improve the quality of water provided

-nones

-Some of the restrooms don't have cold water.

-Get rid of the metal taste in the water fountains that are in the corridors. It's unpleasant.

-More taps to refill drinking water bottles with.

-They definitely put something in the water in order to keep it sterile. They Could stop it.

-Water filtering machines

-To filter it from heavy metals or other stuff first

-Fine with it

-i don't know if there's anything wrong with it actually.

I drink tap water.

-Since in the washrooms we only have warm running water, so that's not drinkable, the watertank at the library should be replaced/refilled more often and/or more water tanks on the CEU premises should be installed. I personally prefer the watertank to fountains.

-Be more of it. The tap water in the bathrooms is too warm.

-Refill the water tank more often. Add more water tanks

-NOthing

-I don't know.

-There should be water basins to drink from. It is not pleasant to drink warm water from the rest room.

-more fountains, esp. on the ground level

-Do not know. I do not see an issue with the water service at CEU, so I cannot provide with answer what can be done to improve it.

-Change boilers in time.

-install filters

-Purchase more dispensers

-To provide drinking water (in the library area) more regularly.

-more fountains

-More drinking fountains (so we fill less bottles and use less cups at the mineral water tap)

---

-Water fountains like in front of the library, properly maintained, easily accessible.

---

-Water in the dorm is great. However, water on the campus in the fountains on each floor is disgusting.

---

-First of all, someone should test the quality of water in the philosophy/political science PhD lab, Nador 11, room 116. Water in there has a very bad taste. Second there should be cold drinkable tap water on every floor, instead of only hot water in the toilets.

---

-more taps

---

-No idea

Regarding the likert-scale questions below, and regarding locations of water fountains, I didn't even know these existed at CEU and that this was an issue. Thus I cannot answer these questions.

---

-more fountains needed, cups provided.

---

-Install water coolers

---

-no opinion

---

-better sprinkles with actual preassure

---

-I really have no clue. All I know is that the water has negative effects on my skin (I feel the shift more in the first weeks of switching between places, ex. Romania-Budapest). plus I always keep tap water in a bowl until it evaporates so as to have a more humid atmosphere in my room - guess what it leaves behind when it evaporates, a thick whitish layer of something which I bet is not merely salt.

---

-It's ok generally but some fountains don't work very well.

---

-Install public drinking fountains, American-style (less waste with plastic cups, etc.).

---

-that there is more often water or plastic glasses in front of the library

---

-reduce waste (100s of plastic glasses a day), tap water is fine and bottles brought from home are perfectly being refilled at the tap

---

-Similarly to the cafeteria, the water for drinking can be put in machines all over CEU.

---

-make it possible to have either cold or hot water in the bathroom taps!

-more accesses to cold water as in the toilets the water is always kind of warm, and on the floor pipes it's very unclear till 4th floor, up it gets better.

-more fountains

-nothing

-more fountains Could be installed

-Nothing

-No idea, I am drinking own cleaned water.

-more water stations, always refill it in front of the library

-fountains

-No suggestion.

-refill more often the bottles in front of the library

-Don't know

-Maybe put tap fountains in Nador 11 too, otherwise it's pretty much perfect.

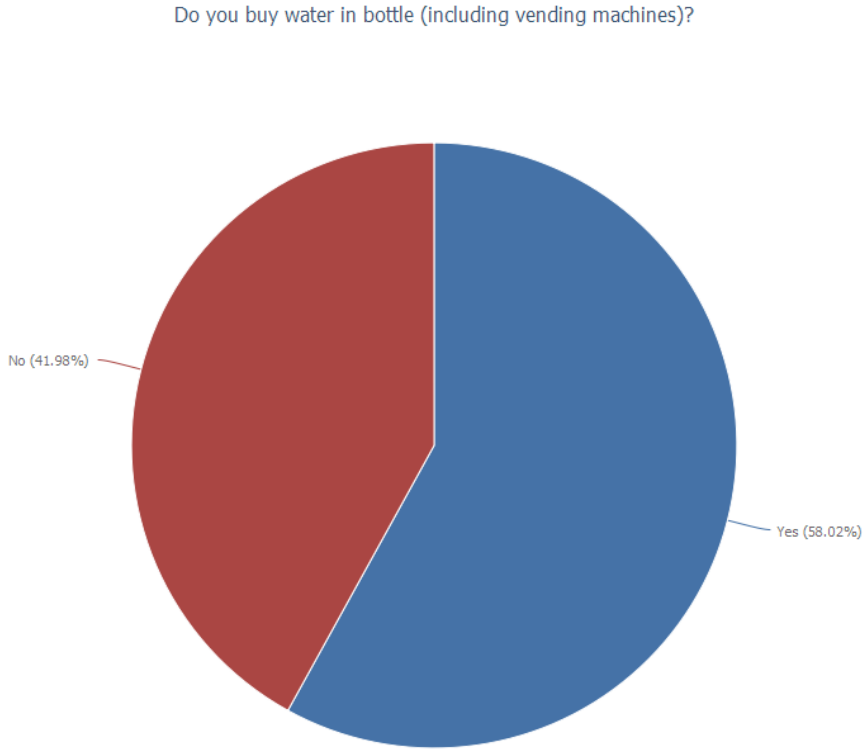
-More drinking fountains.

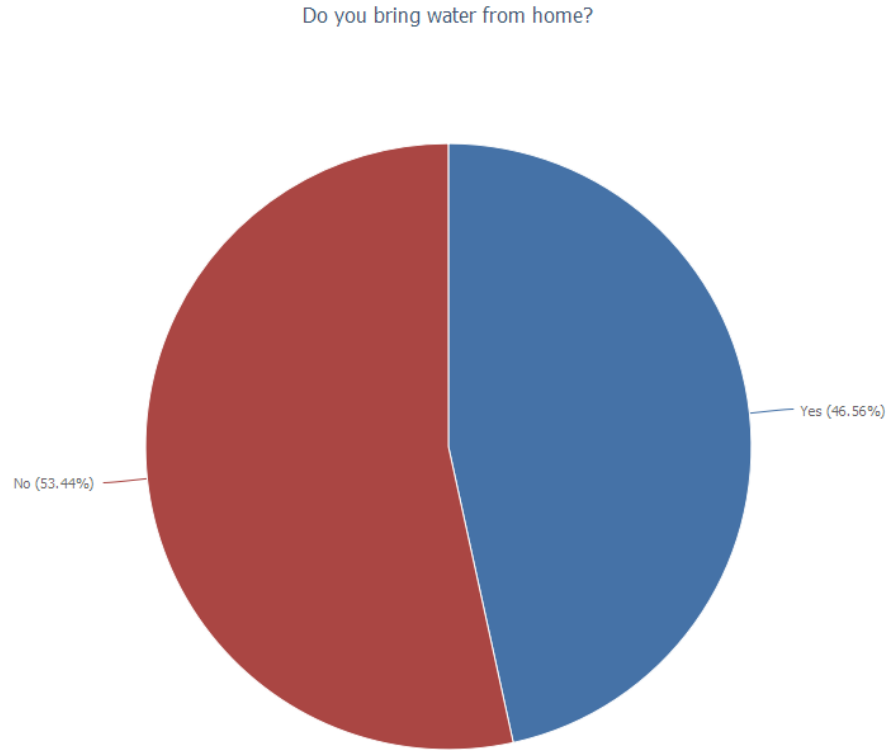
-More water

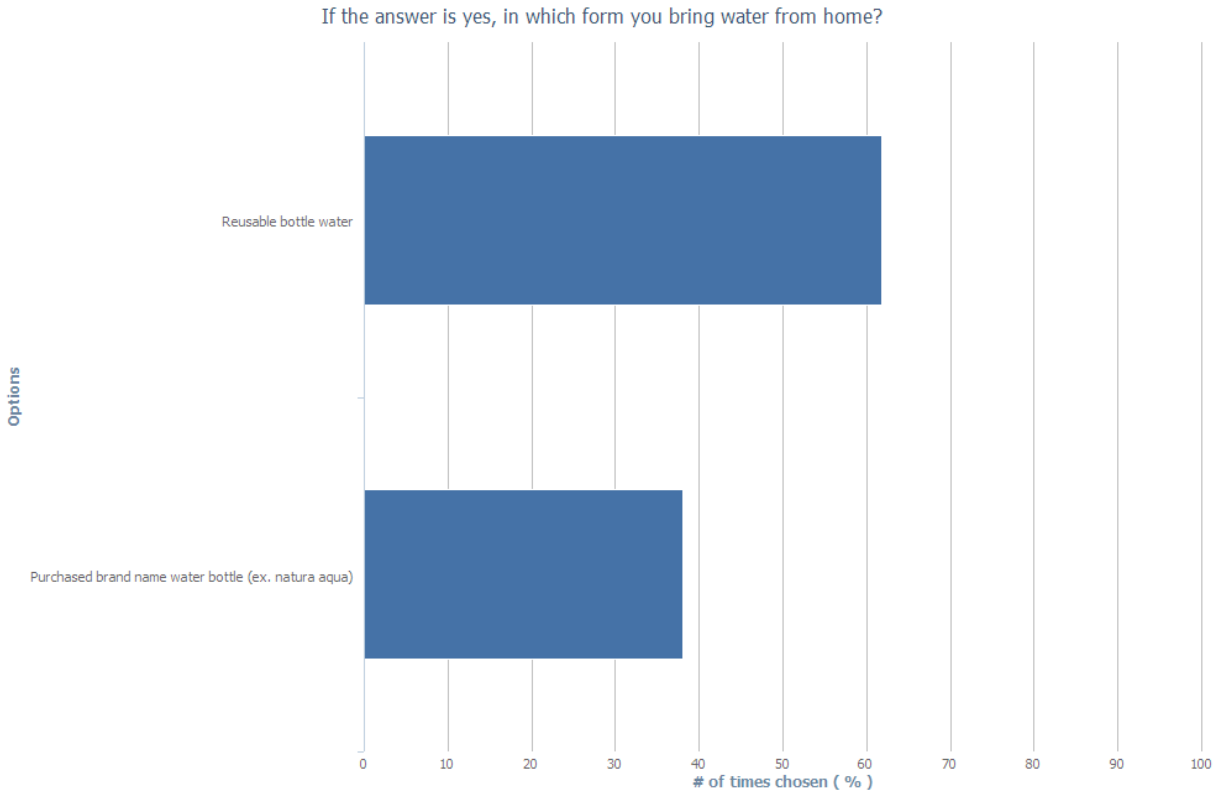
-More of it

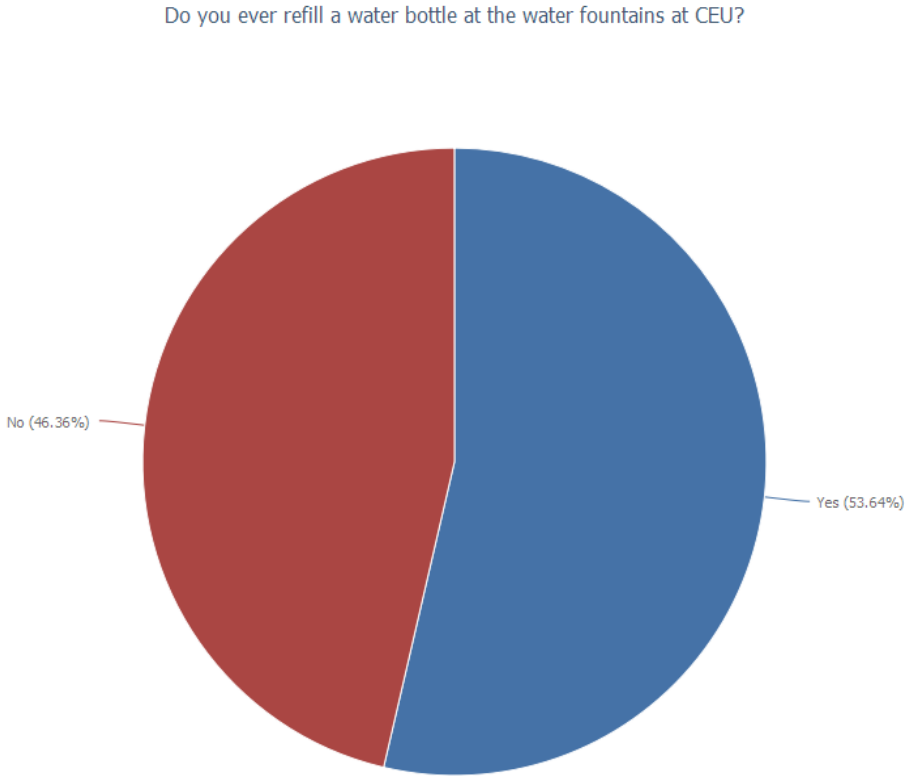
-cold water plx

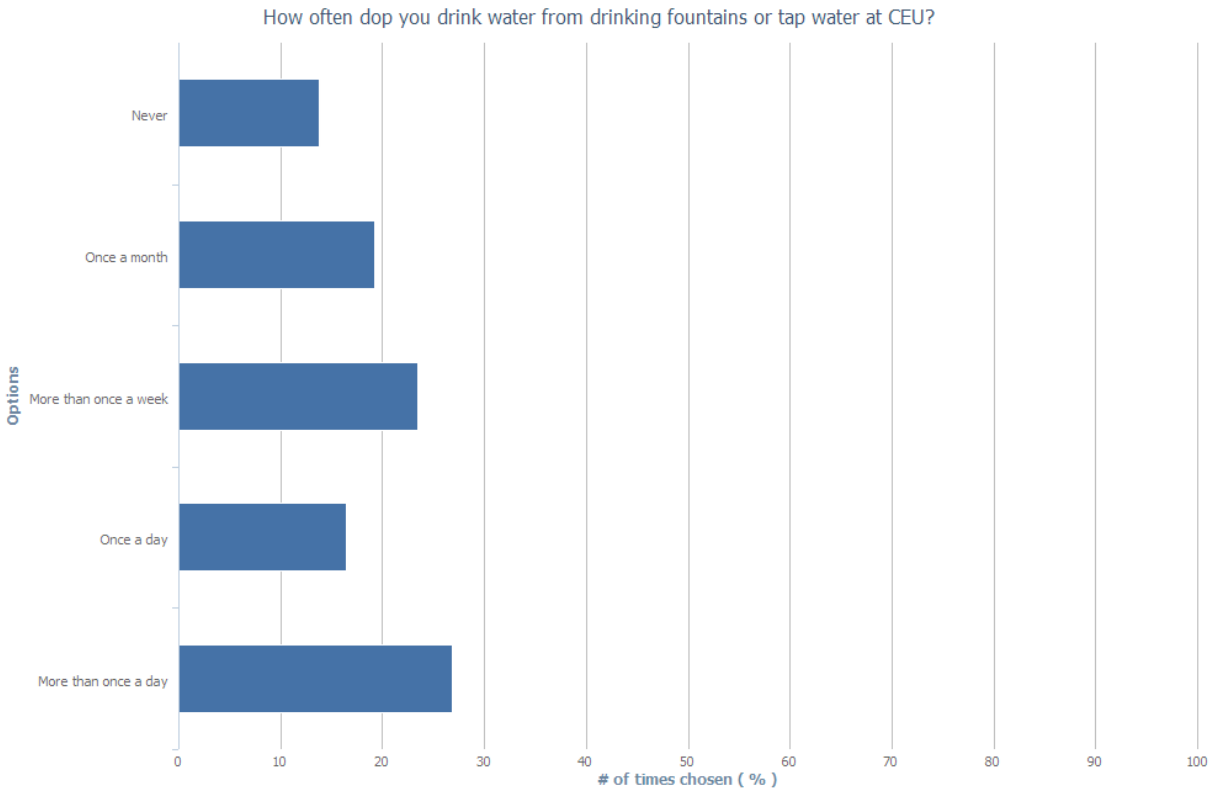
-I never drink tap water at ceu

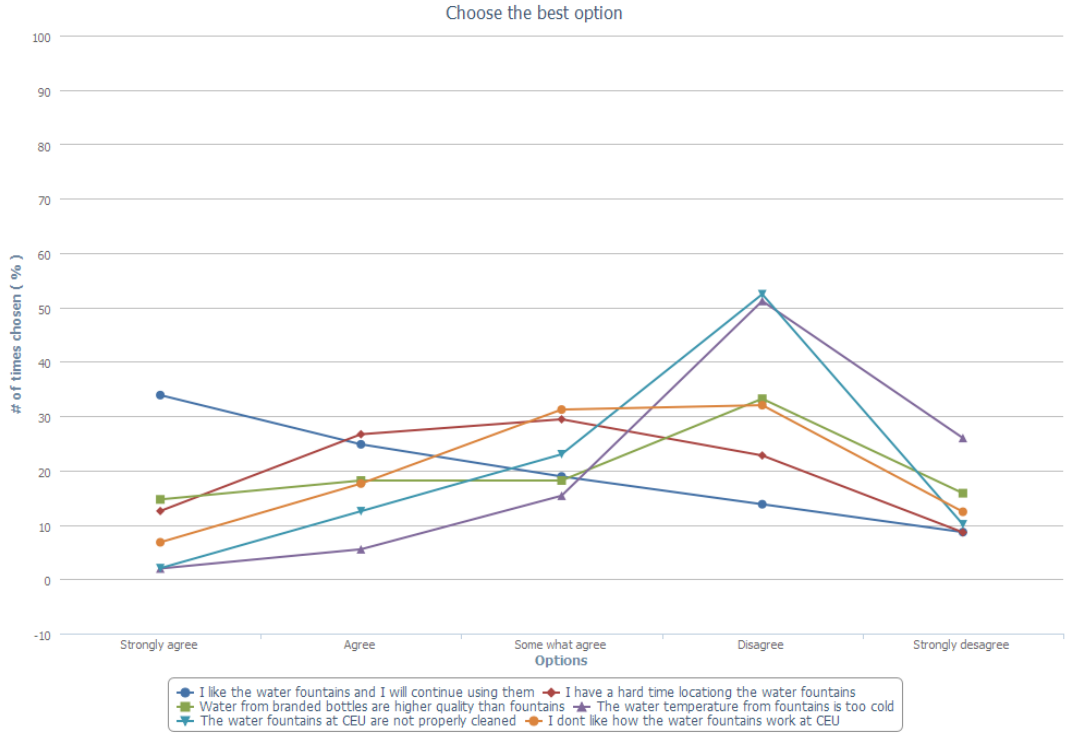






**Where do you think is needed a water fountain at CEU?**

-in front of the library and octogon

-every floor

-every floor and entrance

-each floor

-near octogon,lap top area,outside the library

-around classrooms-like 201,202,in the monument building,nador 11,13,15

-first floor and ground floor

-near library,first floor

-nador 9 basement

-near library

-first floor and near the library

-key points and lap top area

-every floor,library,labs,near octogon

-nador 11,13,15

-all the buildings,all the floors

-in the main floor

-ground floor and basement

-corridors and community places like octogon

-nador 11 building

-library area and octogon

-every floor,every common area

-every floor

-library

-outside computer labs

-everywhere that in not in the faculty tower

-nador 11

-near the food points

-two at the library

-entrance and outside of the library

-library, lap top area,groung floor and basement

-OCTOGON NADOR 11 ENTRANCE

-NEAR ALL THE BATHROOMS

-ON EVERY FLOOR IN EVERY DEPT

-AT THE LIBRARY

-I PREFER TAPS TO FOUNTAINS

-IS NOT ABOUT LOCATION BUT SHOULD BE MORE WATER FOUNTAINS

-IN FRONT OF THE LIBRARY

-OCTOGON

-NEAR EACH ENTRANCE ONE PER FLOOR BY ELEVATORS

-ALL OVER THE PLACE CLOSE TO THE OFFICE,CLASSROOMS,LIBRARY,BUT NOT THE KIND WE HAVE AT C.E.U BUT MORE CONVENIENT TAPSWHERE ALSO YOU CAN FILL YOUR BOTTLES

-IN ALL HALLWAYS

-NADOR 11,NADOR 13,NADOR 15 AND THE GROUND FLOOR OF MONUMEND BUILDING

-GROUND FLOOR NADOR 11

-GROUND FLOOR NADOR 11

-FHILOSOFHY DEPT

-FIRST FLOOR,GROUND FLOOR AND BASEMENT

-IN ALL HALLWAYS WITH CLASSROOM

-NEXT TO THE COFFEE MACHINE IN FRONT OE THE LIBRARY

-GROUND FLOOR,MONUMEND BUILDING

-ZRINYI 14

-OCTOGON

-EVERY FLOOR

-NADOR 11 LOBBY

-ZRINYI 14

-NADOR 11,ALL FLOORS.NADOR 9 AND GROUND FLOOR

-AT THE ENTRANCE TO THE ALL BATHROOMS

-NADOR 11 BILDING.THERE A NONE THERE

-FIRST FLOOR,MAIN LEVEL

-EVERY FLOOR

-OCTOGON

-OCTOGON

-public spaces, library, near the cafeteria, coffeehouse, on each floor of the ceu building

-Nádor 15

-Octogon area

-Close to computer labs, open wifi areas, close to big classrooms

-library, octogon, near the computer labs, entrance of all buildings and study spaces

-water cooler on all floors

-Library

-In all CEU premises

-Octagon, courtyards, near the elevators

-entrance, in front of the library, ever floor

-Octogon and Lap top area

-Outside the library, in the laptop area, in the cafeterias.

-mezzanine, staff who works in offices goes to the toilet to refill teapot with water...

-In all laptop areas, right outside the Library, on every floor of every CEU building, Nador 13 lobby/ground floor area

-On the ground floor near the laptop area and near the library.

-Close to every main entrance in all buildings

-more, everywhere!!!

-don't know. Actually, I didn't know about the water fountains, as our office is located outside of the Campus, in Oktober 6 street.

-Close to common places

-Nador 13, 5th Floor :)

-Department of Sociology and Social Anthropology

-near the lib

-each floor of the FT and may be Octogon

-Octakon area and every lap-top areas

-2nd floor monument building

-at all levels and corridors

-Ground floor, laptop area, every floor, other public area

-in the octogon area

-Outside Bambus Bar

-At the library level

-On each floor with plastic cups always.

-Ground floor of Nador 9

-the more places the better

-In the main corridors - near the Oktagon, library and laptop areas.

-taps are needed, not fountains. on every floor VISIBLY in every building

-Octogon

-High traffic areas

-on each floor at least

-Nador 11 entrance

-laptop areas

-Laptop area

-next to the library

-every hallway

-Japanese Garden

-oktogon

-Oktogon

-No water fountains, please; rather machines on every floor

-In front of the library.

-all public places. there's still room to place at many places

-oktogon, laptop area

-ideally, on every floor, or at least in the buildings and floor where student lounges/computer labs/library are located

-octogon, nador 11 lobby

-anywhere at the ground and first floors of Faculty Tower

-ground floor: Octagon and laptop are; in front of the Library; on the foyer leading to OSI building; Nador 11 reception area!!!

-Oktogon, Japanese Garden

-near the library, lab and erc

-in the building in Zrínyi, in Octogon

-everywhere, but not the kind they have in the faculty tower

-next to the library

-Every floor

-first floor

-We just need more of them and for the water to taste better

-zrinyi 14

-I need normal TAPS!

-All around the university

-In the yards, Japanese Garden, Zrinyi building, 10th floor

-oktogon

-near library

-laptop area

-Another one outside library and maybe one on ground floor

-Lobby

-Not only in faculty tower

-anywhere

-At each department (floor). The one in front of the library is empty most of the time. They only use 2 barrels per day, I have the impression, and it is obviously not enough.

-oktogon? phd labs? in front of computer labs?

-On the ground floor, at the basement

-everywhere outside Faculty Tower

-Just where they are now

-Nador 11

-Nador 11 building

-Nador 11 entrance hall

-Close to the library maybe 2 would be better

-each floor

-On the ground and first floor (somewhere close to the library) where most of the people move around.

-On each floor

-Basement, ground floor, and near the library entrance

-every floor in every building, including the new ones.

-no opinion

-nador 11

-octogon could be a good location, in addition to one on the first floor, library area

-on every floor

-around library and in basement, since the bottle water is almost always missing.

-octagon

-library

-at the Auditorium, in the passageway between FT and OSI

-in all buildings, and at different floors

-On every floor, and especially near the library

-Japanese garden

-In the Monument Building

-Nador 11

-Nador 13

-In front of the library

-Naodr 11 building

-Beside each washroom

**Results on the economic evaluation about**

**drinking water at CEU made by CREO department**

| all prices and costs are given in net HUF | Categories | Bottled water (1,5l) | Bottled water (19l) dispenser | | Water fountain | | Water filter machi |
|---|---|---|---|---|---|---|---|
| | | Fixed | Minimum | Maximum | Minimum | Maximum | Minimum |
| PRICE (net HUF) | per liter | 53 | 66 | 98 | 0 | | 0 |
| | per bottle (1.5l) / (19l) | 80 | 1.427 | 1.880 | | | |
| | Rental agreement per month | | 2.441 | 7.500 | | | 10.000 |
| | only cold | | 3.200 | | | | |
| | cold-warm | | 3.300 | | | | |
| | cold-fizzy | | 7.500 | | | | |
| | cold-warm-fizzy | | 7.500 | | | | 15.000 |
| | per machine | | 100.000 | 250.000 | 256.800 | 337.800 | 160.000 |
| | only cold | | | | only cold/room temperature | | 160.000 |
| | cold-warm | | | | | | 330.000 |
| | cold-fizzy | | | | | | 250.000 |
| | cold-warm-fizzy | | | | | | 250.000 |
| Additional expenses (net HUF) | delivery costs | arranged by CEU | usually free/bottles (19l) arranged by CEU | | usually free | | usually |
| | installation/building costs (once) | | 2.000 | | 35.000 | | 35.0 |
| | installation costs (once) | | individual price | | individual price | | 6.500 |
| | maintenance costs (semi-annual) | | 5.500 | 16.000 | individual price | | individua |
| | other (CO2) (multiplied by 7,25) | | 2.550 | 5.400 | | | individua |
| | other (deposit/bottle (19l)) | | 0 | 2.000 | | | |
| | other (plastic glasses - 100piece/package) | | 390 | | | | |
| | other (filter - semi-annual) | | 10.000 | | cleaning annually | | 7.500 |
| | Total expneses per month (excluding one-off costs) | | 21.071 | 43.483 | | | 24.450 |
| Efficiency | per capita (2 dl/capita) | | 95 /bottled water (19l) | | | | 20-maximum |
| | liter/day | | | | | | 50-200 lit |
| | average consumption 2,200 liter/month | | 116 bottled water (19l)/month | | | | |
| WATER expenses/month | average (2,200 liter/month consumption) | 116.600 | 145.200 | 215.600 | 427 | 427 | 427 |
| OTHER costs/month | rental agreement per month | 0 | 21.095 | 46.817 | nincs | nincs | 36.658 |
| TOTAL EXPENSES per month | water + rental agreement/month | 116.600 | 166.295 | 262.417 | nincs | nincs | 37.085 |
| OTHER expenses/month | per machine | 0 | 121.238 | 293.650 | 259.717 | 340.717 | 187.908 |
| TOTAL EXPENSES per month | water + per machine (investment in 1 machine) | 116.600 | 266.438 | 509.250 | 260.144 | 341.144 | 188.335 |
| | | | plus ELECTRICITY | | | | plus ELEC |
| average consumption (liter) at CEU/month | 2.200 | | | | | | |

| in 10 years | in case of buying 5 machines | Bottled water | Bottled water dispenser | | Water fountain | |
|---|---|---|---|---|---|---|
| | | Fixed | Minimum | Maximum | Minimum | Maximum |
| 1 | | 1.399.200 | 2.580.367 | 4.533.767 | 1.303.707 | 1.708.707 |
| | per liter | 53 | 98 | 172 | 49 | 65 |
| 2 | | 2.798.400 | 4.596.688 | 7.686.250 | 1.308.828 | 1.713.828 |
| 3 | | 4.197.600 | 6.591.938 | 10.795.250 | 1.313.950 | 1.718.950 |
| 4 | | 5.596.800 | 8.587.188 | 13.904.250 | 1.319.071 | 1.724.071 |
| 5 | | 6.996.000 | 10.582.438 | 17.013.250 | 1.324.193 | 1.729.193 |
| 6 | | 8.395.200 | 12.577.688 | 20.122.250 | 1.329.315 | 1.734.315 |
| 7 | | 9.794.400 | 14.572.938 | 23.231.250 | 1.334.436 | 1.739.436 |
| 8 | | 11.193.600 | 16.568.188 | 26.340.250 | 1.339.558 | 1.744.558 |
| 9 | | 12.592.800 | 18.563.438 | 29.449.250 | 1.344.679 | 1.749.679 |
| 10 | | 13.992.000 | 20.558.688 | 32.558.250 | 1.349.801 | 1.754.801 |
| | per liter | 53 | 78 | 123 | 5 | 7 |

| in 10 years | in case of buying 15 machines | | | | | |
|---|---|---|---|---|---|---|
| 1 | | 1.399.200 | 3.792.742 | 7.470.267 | 3.900.877 | 5.115.877 |
| | per liter | 53 | 144 | 283 | 148 | 194 |
| 2 | | 2.798.400 | 5.809.063 | 10.622.750 | 3.905.998 | 5.120.998 |
| 3 | | 4.197.600 | 7.804.313 | 13.731.750 | 3.911.120 | 5.126.120 |
| 4 | | 5.596.800 | 9.799.563 | 16.840.750 | 3.916.241 | 5.131.241 |
| 5 | | 6.996.000 | 11.794.813 | 19.949.750 | 3.921.363 | 5.136.363 |
| 6 | | 8.395.200 | 13.790.063 | 23.058.750 | 3.926.485 | 5.141.485 |
| 7 | | 9.794.400 | 15.785.313 | 26.167.750 | 3.931.606 | 5.146.606 |
| 8 | | 11.193.600 | 17.780.563 | 29.276.750 | 3.936.728 | 5.151.728 |
| 9 | | 12.592.800 | 19.775.813 | 32.385.750 | 3.941.849 | 5.156.849 |
| 10 | | 13.992.000 | 21.771.063 | 35.494.750 | 3.946.971 | 5.161.971 |
| | per liter | 53 | 82 | 134 | 15 | 20 |

| in case of rental agreement | | | | | | |
|---|---|---|---|---|---|---|
| **in 10 years** | **in cas of renting 5 machines** | n/a | | | | |
| **1** | | 1.399.200 | 3.008.100 | 5.396.220 | n/a | n/a |
| | **per liter** | **53** | **114** | **204** | | |
| **2** | | 2.798.400 | 6.016.200 | 10.792.440 | | |
| **3** | | 4.197.600 | 9.024.300 | 16.188.660 | | |
| **4** | | 5.596.800 | 12.032.400 | 21.584.880 | | |
| **5** | | 6.996.000 | 15.040.500 | 26.981.100 | | |
| **6** | | 8.395.200 | 18.048.600 | 32.377.320 | | |
| **7** | | 9.794.400 | 21.056.700 | 37.773.540 | | |
| **8** | | 11.193.600 | 24.064.800 | 43.169.760 | | |
| **9** | | 12.592.800 | 27.072.900 | 48.565.980 | | |
| **10** | | 13.992.000 | 30.081.000 | 53.962.200 | | |
| | **per liter** | **53** | **114** | **204** | | |

| **in 10 years** | **in case of renting 15 machines** | n/a | | | | |
|---|---|---|---|---|---|---|
| **1** | | 1.399.200 | 5.539.500 | 11.014.260 | n/a | n/a |
| | **per liter** | **53** | **210** | **417** | | |
| **2** | | 2.798.400 | 11.079.000 | 22.028.520 | | |
| **3** | | 4.197.600 | 16.618.500 | 33.042.780 | | |
| **4** | | 5.596.800 | 22.158.000 | 44.057.040 | | |
| **5** | | 6.996.000 | 27.697.500 | 55.071.300 | | |
| **6** | | 8.395.200 | 33.237.000 | 66.085.560 | | |
| **7** | | 9.794.400 | 38.776.500 | 77.099.820 | | |
| **8** | | 11.193.600 | 44.316.000 | 88.114.080 | | |
| **9** | | 12.592.800 | 49.855.500 | 99.128.340 | | |
| **10** | | 13.992.000 | 55.395.000 | 110.142.600 | | |
| | **per liter** | **53** | **210** | **417** | | |