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Water crisis - beyond the destruction

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Abstract

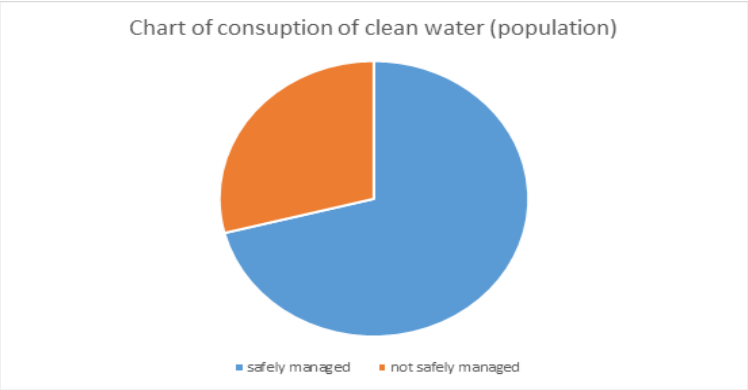
A major issue related to the environment, is namely the lack of water and in general the reduction of clean water supplies over time, mostly in our days due to climate change. Through the projection of scientific data, we want to raise the issue and above all to make people feel the importance of the situation. Then, under the context of awareness raising, we present suggested solutions that we have found to solve this serious problem. We also need to add our own solution for an economical method of water desalination and purification. This will reduce the feeling of water scarcity without however being a definitive solution.

Keywords

Water crisis, desalination, purification

Introduction

Unfortunately, we live in a society where water scarcity, has a serious impact on the life of people in many countries. Some notable examples are countries such as Jordan, Egypt, Yemen, Sudan, and Djibouti, who are in a horrendous position, while at the same time South Africa has predicted a general lack of clean water [1]. Furthermore, poverty in Africa often cause lack of access to clean, safe water and proper sanitation. Nearly one billion people do not have access to clean, safe water - that is the equivalent of 1 in 8 people on the planet! For these people, poverty is a way of life.



Actually, only 2.5% of the world's water is fresh and even then, only 1% of fresh water is easily accessible. So, we have to find a different source of freshwater before it's too late.

Furthermore, we have to understand that approximately 2 billion people are living without access to improved sanitation while at the same time the lack of water isn't the only factor of the problem. Even though we live with state-of-the-art technology, it is very difficult to collect drinkable water. According to water.org, women and girls spend 200 million hours every day collecting water. And even if this problem wasn't a sharp cause of suffering all over the planet and we weren't already persuaded, we have to think that every year more and more people die as a result of the lack of water (1 million people die each year from water, sanitation, and hygiene-related diseases), and of course a shocking data that made us understood the depth of this problem is that a child dies approximately every 2 minutes from a water-related disease. As far as the facilities are concerned, research has shown that 22% of health care facilities have no water service, 21% has no sanitation service (Diarrhoeal disease is the second leading cause of death in children under five years old. It is both preventable and treatable.) and 22% have no waste management service.

This undesirable situation puts in danger our future as predictions about water crisis warn us that if the usage of clean water is not changed by 2030 then the world's water supplies will be down by 40%, equivalently to the needs of the future. By 2035, the world's energy consumption will increase by 35 percent, which in turn will increase water use by 15 percent, according to the

International Energy Agency. If we continue doing what we are doing today, by the year 2040, there will not be enough water in the world to quench the thirst of the world population and

keep the current energy and power solutions going, according to Seametrics. Believe it or not, destruction is coming and by not doing anything, it is difficult to avoid it. The time for accusing has passed, now we must defend ourselves if we don't want to be eliminated [2], [3], [4].

Having the opportunity of seas, it would be such a waste of a solution if we hadn't taken into account that saltwater is, of course, not drinkable, however, we can easily make it so. We humans can make good use of desalination in order to accommodate our needs. A very important factor is time and water quality. We are going to work on these factors and on what we can improve on in order to have at least a decent supply of water in any desirable occasion.

1) Massive mortality rates as water is one of the most precious resources on the planet.

2) Pollution. Usage of water like there is no tomorrow or waste leads to general water pollution, a fact that affects all of us, as the food chain will have been harmed forever. A massive destruction, for animals' microorganisms, plants.

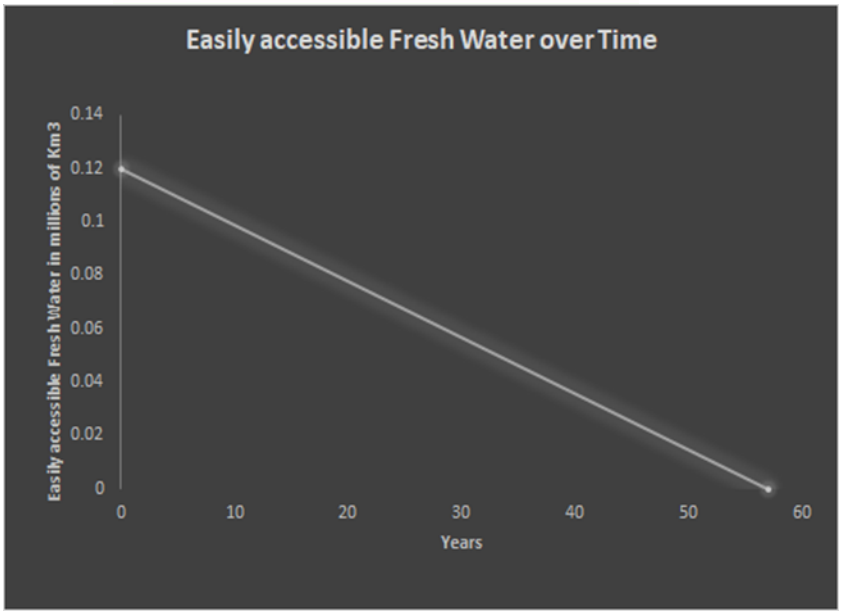
3) Sanitation problems and diarrheal diseases, as it is already mentioned.

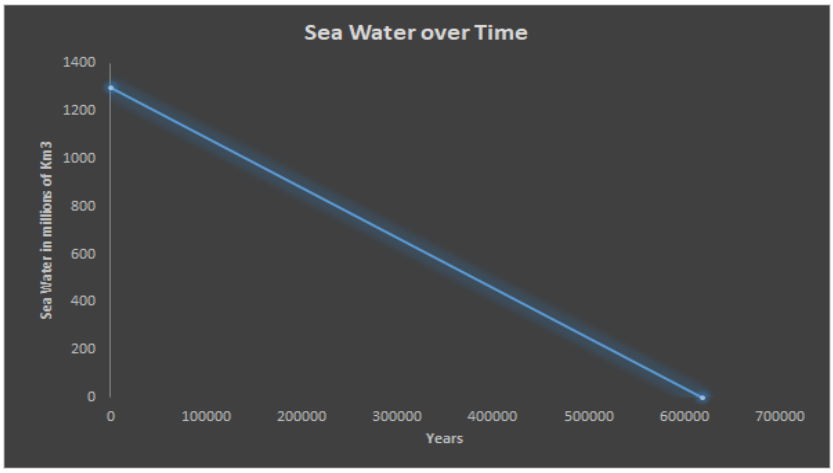
4) Hunger. Water shortages have a direct impact on crops and livestock, which can lead to food shortages and eventually starvation. As well, because of water shortages some people cannot shower, wash their clothes or clean their homes properly.

Moreover, water scarcity can cause serious problems in the daily life of everyone as many children in the poorest countries cannot go to school because of sicknesses and weakness, or even the parents cannot work in order to earn the living for the same reason. So, we understand that the lack of water is a very serious problem that has to be taken into account.

Water crisis: Real data and problem

There are 1338 million Km3 of water on Earth. However, only about 35 million Km3 of this is fresh. Furthermore, if we don't count the water shielded in glaciers, icecaps and underground which are not easily accessible we are left with only 120 thousand Km3 of easily accessible water [4]. Additionally, humans consumed around 2100 Km3 fresh water in 1995 [5], [6], [7]. Let's assume that the amount of fresh water we consume per year stays the same then we can create a function showing as how many years are left before freshwater "extinction" [8], [9].





As you can see, from the diagrams, if we start using seawater, we can solve the water crisis problem for more than 600.000 years, provided that the consumption remains the same. Giving enough time for humanity to find a permanent solution.

Methodology

In order to gain a better insight into the possible solutions in water scarcity, this research makes use of a form. We will add a form so everybody who is interested and want to participate, is able to add relative information about the problem, but in advance, he has to sign up to the website and offer a very small amount of money to us so we can continue the hard work. As we have earned a promising amount of money, we are planning to give out a specific number of brochures. We are planning to take a really small interview with some people in the streets and according to their answers we will give or not give the brochure about the problem, so our work is efficient. As you understood we aim a specific group of people who in the majority will help

end continue with us the hard work. In essence, we would like to cooperate online with environmental organizations, so the water crisis problem will spread even more and faster, as a lot of people read about the actions of these huge organizations. Lastly, we would like you, who read this text to motivate and do whatever you can, to offer for this problem's solution.

Questionnaire

Questionnaires were chosen for this study because they are a quick method to collect data in an efficient and timely manner. So, for the purposes of this research we made a small questionnaire. We made a small questionnaire/survey with easy and fast answers so it would be easy for the audience to apply, which with it, we aim the information of the people in our close community.

How many people worldwide live without a source of clean water near their house?

More than 785 million

How many deaths are caused annually due to lack of drinkable water and diseases caused by the consumption of dirty water?

More than 6 million

How many people are infected annually with these diseases?

Around 220 million

How much money do you think should be invested to provide clean water to African countries with a water shortage?

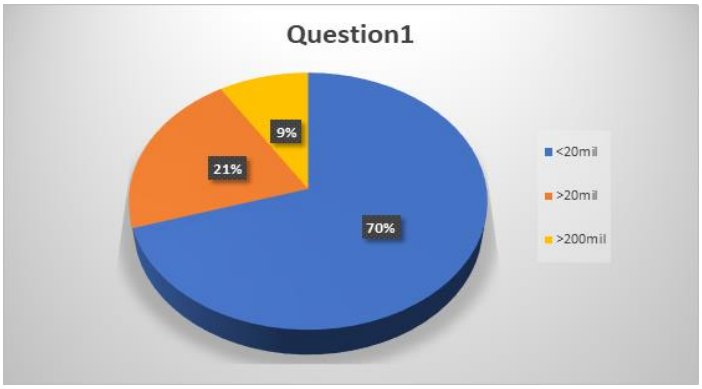
An estimated 210 billion USD

Have you ever donated money to an organization whose goal is to provide clean water to developing countries?

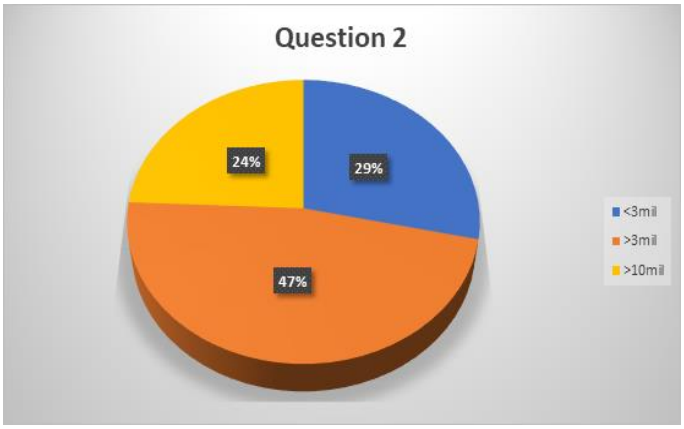
We gave this questionnaire to 144 people. The sample we took includes teenagers and adults from urban areas and adults from rural areas.

The results we got were very interesting.

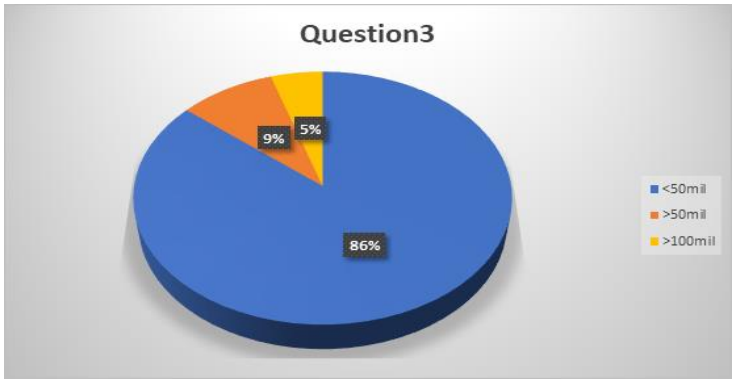
Regarding the first question 87 people answered less than 20 million, 46 answered between 20 million and 200 million, while only 11 answered with a number above 200 million.



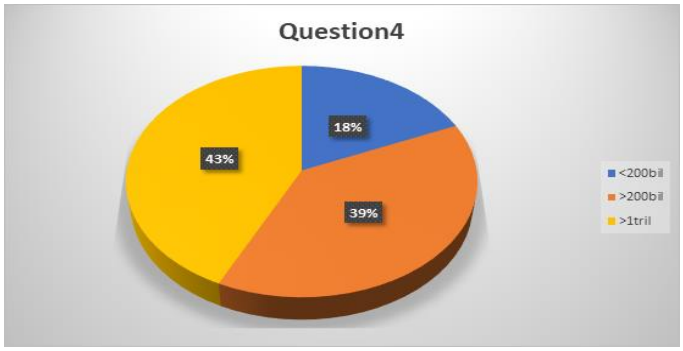
Regarding the 2nd question 41 people answered below 3 million, 68 answered between 3 million and 10 million and 35 answered above 10 million.



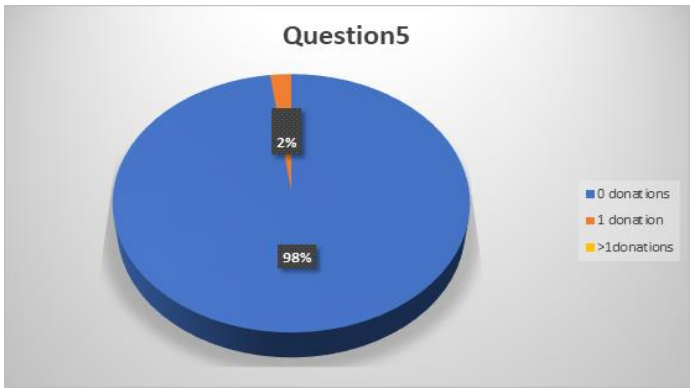
Regarding the 3rd question 124 people answered below 50 million, 13 answered above 50 million and only 7 answered above 100 million.



Regarding the 4th question 27 people answered below 200 billion, 54 answered above 200 billion while 63 answered above 1 trillion.



Regarding the 5th question, 141 people answered that they have never donated money and only 3 have donated money to an organization out of which none has donated more than once.



Judging from the results of the survey/questionnaire it is obvious that the general public is heavily misinformed on this topic. This is the reason why we should spread awareness to more people about this problem and encourage them to help us save these people.

Captivity-Solution-Product

As a team, we can demonstrate a system that consists of desalination action and at the same time is a water purifier in order for all of us to have fresh and clean water. The procedure of desalination might be thought to be difficult and probably with no chance to be achieved. [7] The easiest, cheapest and least time-consuming method is the''natural'' or solar desalination. With this method more and more people can produce their own water and be independent of the water crisis. A negative thought would actually be about the limitation of the water supply seas. However, a decent consumption of water would give us at least 300.000 years of wealthy life as far as the water is concerned, when without the proper desalination the planet's deadline would be in just 25 years. However, the desalination would be just the beginning of the method of making seawater drinkable. Even if the salt is removed, the water won't be drinkable because of

the micro bacteria and other ingredients that harm us. Our solution goes for a water purifier [10].

He cheapest water purifier can be constructed if we use active charcoal, natural sand, and cotton. Generally, in a plastic bottle, every material has an equivalent quality of ⅓ of the bottle. Water's smell and taste are often removed by active charcoal carbon filters. However, they aren't as effective in removing other materials like salts. Slow sand filters produce high-quality water without the use of chemical aids. Passing flocculated water through a rapid gravity sand filter strains out the floc and the particles trapped within it, reducing numbers of bacteria and removing most of the solids. The cloth filter is a cost-effective and appropriate method for reducing the contamination of drinking water. It is easy to maintain and can be used anywhere. Inexpensive cotton cloth or a sari cloth, folded four to eight times, provides a filter of approximately 20-micrometer mesh size. Also, other materials that can be used for the same purpose might be ceramics, diatomaceous earth. As far as the ceramics are concerned, the dirty water is pushed through the ceramic, and the ceramic captures impurities like arsenic and microbes. MIT says ceramic filters are popular in many countries due to their cheap construction costs. Diatomaceous earth is the decayed form of a type of siliceous rock. When layered, its very fine texture helps to remove larger impurities like algae, as well as waterborne viruses, according to the National Drinking Water Clearinghouse. This makes diatomaceous earth-based water filters popular for recreational uses like swimming pools [11].

Of course, a water purifier gives the opportunity of producing clean water from mud-based liquids that include water, as the purifying is the stronger it gets with such cheap materials. In the construction method, we build two different layers of vessels that are not communicated but within we place the filter-bottle, in which we have already made a hole to the bottom and to the top. So, the water can be purified as it moves from the first layer towards the bottle-filter to the second layer.

The need to produce to phenomenally different systems is based on the fact that sea salt cannot be purified and so the salt to be removed from the water mass. To start, we think that funding would be ideal for our plan. It is important we have an amount of money in order to construct the desalination machines that we already mentioned. Afterward, when the project is self-sustainable, we will put our volunteering work into practice. Clean water is something that many of us think is a safe bet, yet plenty of our fellowmen don't have that amenity. And of course, as clean water is vital for our existence, offering to people that are in need of it is an act of philanthropy.

Our basic goal is to prevent the water crisis by helping and giving such a big hope to countries of the 3rd world where the problem is massive and the creation of products like that focus on, firstly, donation or cheap production in small quantities.

Other perspectives – Solutions

In the last decades, more and more businesses are interested in desalination projects, although not many of them have gained publicity. One of the most well-known companies that are accustomed to making fascinating desalination projects, as they have been in this field for many years is named Acciona corporate. We are looking forward to learning from them the general know- how to prepare and create the plans for our desirable machines. As a matter of fact, Acciona is now working on a desalination plant in Australia and on a magnificent project in the UK. We assume that their knowledge of huge desalination plants is something very important in order to accomplish our first goal. We aim that on an occasion of expanding this idea to massive production of cheap desalination-purifiers systems it would be a great honor if a well- known company in this area helped with their experience, knowledge, and workforce.

According to the Organization for Economic Co-operation and Development (OECD), a very good solution would be about the raising of the water prize in order to have less waste and control the pollution. However, we think that something like that would probably struggle the majority of the poorest countries to maintain supplies of water because the prize would be theoretically much bigger. Even though that would be a problem, undoubtedly it would help to limit the problem of water scarcity.

Climate change and water scarcity are producing the most dramatic consequences in developing regions, such as northwest India and Sub-Saharan Africa. One proposed solution is to transfer water conservation technologies to these dry areas. Doing so is tricky because economies are weak and there are gaps in skills that often compel government and business authorities to impose these changes on local citizens.

Another innovative solution seems to be the education of the masses. The creation of different behaviors can at long last make us, all, understand the urgency of the issue and of course, plenty of us will understand that the deadline is not only written in papers, is rather a fact. Some regions led by India, Australia, and the Southwest U.S., are already facing the freshwater crisis. So, an educational program is valuable, useful and a practical method for us to feel the existence of fear and start working hard for the better of our future.

And what about creating huge conservation systems, where water can be stored. Surely a genius idea as the rainwater is increasingly unpredictable and provides pure and clean water. A combination of new technologies and energy can, indeed, help a lot, but always the difficulties in the solution are not based on finding the idea but having the ability to make it. And if we want to be realists, we have to admit that for the common public, we are at least bored as we make excuses all the time.

An admirable example of sacrifice, for the public in order to make 3rd World countries through the water crisis is the action of Bill Gates. He wanted to find a way to make the sanitation system of countries in Africa and India better. The solution: Worms. Worms may not have spines, but they're doing some back-breaking sewer work in more than 4,000 toilets across India. The worm castings are 99 percent pathogen-free, which is better than a septic tank, and weigh only 15 percent as much as the original waste. The castings are usable as fertilizer. Or they will be when the tank is eventually cleaned out. The first Tiger Toilets are approaching five years old and have not required maintenance yet.

Conclusions- Sharing this global problem

As you see, above, the consequences of the scarcity of clean water are deadly, and we suppose that when you read them you were pretty shocked. For this reason, about this problem, everybody in every width and length of our planet should be informed. We are going to start the information campaign and we will try to spread it throughout the world. After that, we are quite sure that we will have more informed people who will join our group, to fight together for this not well-known problem. Our next goal is to create an online website, so everybody could have access to it, and motivate itself. In this website, we will upload all the content about the water crisis (description, relevant examples, causes, consequences, solutions) and every action we have done about it.

References

[1] Seametrics. (2015). *5 Countries Most Threatened by Water Shortages | Seametrics*. [online] Available at: https://www.seametrics.com/blog/5-countries-most-threatened-by-water-shortages

[2] World Health Organization and Unicef (2017). *Progress on drinking water, sanitation and hygiene: 2017 update and SDG baselines.* Geneva: World Health Organization and The United Nations Children's Fund. ISBN 978-92-4-151289-3

[3] Burek, P. et al. Water Futures and Solution: Fast Track Initiative (Final Report). IIASA Working Paper (International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria, 2016).

[4] Wada, Y., Wisser, D., Eisner, S., Flörke, M., Gerten, D., Haddeland, I., Hanasaki, N., Masaki, Y., Portmann, F.T., Stacke, T., Tessler, Z. and Schewe, J. (2013). Multimodel projections and uncertainties of irrigation water demand under climate change. Geophysical Research Letters, 40(17), pp.4626–4632.

[5] Igor Shiklomanov's chapter "World freshwater resources" in Peter H. Gleick (editor), 1993, Water in Crisis: A Guide to the World's Fresh Water Resources (Oxford University Press, New York)

[6] Gleick, P.H. (1993). Water and Conflict: Fresh Water Resources and International Security. International Security, 18(1), p.79. World Water Council, world WATER vision, ISBN: 1 85383 730 X, UK, 2000

[7] Faruqui, N. and Al-Jayyousi, O. (2000). Reflections on the World Water Vision by the 'Next Generation of Water Leaders.' Water International, 25(2), pp.303–311.

[8] Schultz, G.A. (2001). World Water Vision. Making Water Everybody's Business BY WILLIAM J.

[9] COSGROVE AND FRANK R. RIJSBERMAN xxvii + 108 pp., 29.5 × 21.0 × 1.0 cm, ISBN 1 85383 730 X paperback, GB £ 12.95/US$ 19.95, London, UK: Earthscan Publications Ltd, 2000. Environmental Conservation, 28(4), pp.378–387.

[10] Compain, P. (2012). Solar Energy for Water Desalination. Procedia Engineering, [online] 46, pp.220–227. Available at: https://www.sciencedirect.com/science/article/pii/S1877705812045316 [Accessed 28 Oct. 2019].

[11] Batra, S., Adhikari, P., Ghai, A., Sharma, A., Sarma, R. and V, S. (2017). STUDY AND DESIGN OF PORTABLE ANTIMICROBIAL WATER FILTER. Asian Journal of Pharmaceutical and Clinical Research, 10(9), p.268