

Science Fair Logbook

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Day 1:

Today, Saturday 13th February, I am trying to find a topic. Should I do an experiment? I really want to win this year & go to the city science fair! Like water powered something? Uhh, too complicated. How about crystals? NO ways! I did that last year. It did not go well... Well, I could do a volcano. No. That could make a mess. How about I just do a non-experimental project. How about global warming? Maybe deforestation? Should I do diseases? Should I do the environment? These are all great ideas but I think I know my topic! I'll write it down tomorrow!



Day 2:

Here is my topic! Since I was thinking of doing a non-experimental project, I thought of doing a worldwide problem. I chose water scarcity. I chose this topic because it is a big problem, & it isn't talked about often. I also wrote some information I found. Here it is! I'm kind of nervous since there is barely any time. Only 6 days!

What is water:

Water is an essential part of our lives. Without it, we wouldn't even be alive! Water's scientific name is Dihydrogen Monoxide. It is also called H_2O because it is made of 2 hydrogen atoms & one oxygen atom. Anyways, water is used for almost everything! For food, to drink it, showers, toilets, & MANY more! Water is important because it carries nutrients to all our cells in our body & oxygen to our brain. Water allows the body to absorb and soak in minerals, vitamins, amino acids, glucose and other things. Water purifies the body. It helps to control body temperature. In fact, you can only survive 3-4 days without water! If we didn't have water or if all the water evaporated, temperatures would become hot, humans & animals would die. Then plants would die. Then, Earth would become somewhat like Venus. Also, if all the water was gone, there may never be life on Earth again.

Water pollution: Water pollution is when harmful substances contaminate or dirty a body of water. Water pollution is caused by industrial waste, sewage and wastewater, mining activities, marine dumping, accidental oil leakage. the burning of fossil fuels, chemical fertilizers and pesticides, & leakage from sewer lines. When water is polluted, we cannot drink it. If we do drink it, then we would get very sick. Also, the water would have to go through a cleaning process with chemicals & all. Better be safe than sorry!

Water scarcity: And finally, we come to my main topic again! Water scarcity is the shortage of freshwater supply. There are 2 types of water scarcity.

I'll talk about the 2 types tomorrow!

Day 3:

Today I am going to talk about economic & physical water scarcity.

Physical water scarcity: Physical water scarcity is when water cannot meet all the needs of the area.

Economic water scarcity: Economic water scarcity is the poor management of the drinkable & available water.

What is the difference between Physical & Economic water scarcity?

Physical water scarcity is a result of poor natural water resources to supply an area's needs, but economic water scarcity is the result of poorly managing the available water resources.

There are many causes of water scarcity. Here are the three important ones:

Pollution, increased demand, & climate change. Tomorrow, I will be more brief about the causes & explain them.



Day 4:

Today I am going to explain about pollution, increased demand, & climate change.

Pollution: Pollution comes in many types. One of them is water pollution! Water pollution is caused by the dirtying of water, whether it is throwing garbage, throwing excrement in water, or oil & chemical spills. This makes that certain amount of water undrinkable, & since developing countries cannot handle that because of problems, there will be a water shortage in those countries. Water pollution is a problem on many continents. For example, South America's Amazon rainforest is about 7 million km² & is home to about 10 million people & more than 30,000 plant species. For decades, people have been dumping human waste & toxic chemicals into the Amazon River. These poisons are slowly destroying the jungle ecosystem. In other poor areas where freshwater often goes untreated, disease-carrying organisms grow & make people sick in many ways. Some examples of diseases are Cholera, food poisoning, Typhoid fever, Giardia, Dysentery & many more. When people lack running water, they dump their waste outside their houses. Then, the bacteria contaminates the water which makes it unusable & when people do use it, they will most likely get diseases or sickness. In Haiti, the poorest country in the Western Hemisphere, 7 out of 10 people do not have clean water to drink. Each year, waterborne illnesses cause more than half the deaths in Haiti. A massive earthquake hit in 2010, damaging wells & water pipes there, making clean water even more unavailable! Many children & adults have to walk miles to find clean water to drink. In Bangladesh, people have to drink dirty, polluted, untreated water. Also, the water is so polluted that all the fish have died!



Increased Demand: The reason for increased demand is for increased population! Water is a very important resource. Only less than 1% of the world's water can be used for human needs. When the population grows, more people need to use water, which basically leads to a water shortage. We need water for many things such as drinking it, food, toilet stuff, showers & baths and many more. When the population increases, the needs increase as well. If there are more people, either only developed countries would be able to get it, or people would have a very less amount of water to meet their needs.



Climate change: Many scientists think that climate change is already affecting people around the world by producing extreme weather conditions such as storms & floods. Yet the threat that climate change presents the global water supply may be the worst threat of all. Scientists predict that by 2050, one-fifth of the world's population may face a severe water shortage as a result of climate change. Climate change occurs as a result of too much carbon dioxide & other greenhouse gases in the atmosphere. These gases produced in large parts by the burning of fossil fuels, trap the sun's heat close to Earth's surface, like a greenhouse. The result is an overall increase in Earth's temperature. That warming, in turn, leads to climate change. The warmer temperatures disrupt the water cycle which is a delicate balance between evaporation & precipitation. Warmer temperatures increase the rate of evaporation of surface water into the atmosphere affecting different parts of the world in different ways. Increased evaporation might dry out some areas unlike producing excess precipitation in others. Droughts are long periods of abnormally low precipitation that result in shortage of water. Regions at the highest risk include the Mediterranean & in the Middle East. In the United

States, most scientists say that climate change is responsible for an extreme drought in the Southwest & California. The drought in the Southeast has been causing problems in the region since 1999. The water level of Lake Mead, on the border between Nevada & Arizona, has dropped 37 meters in that time. The lake which is fed by the Colorado River, is a source of freshwater for about 40 million people. Scientists say climate change is also responsible for the melting of glaciers high in the Himalayan mountains. The glaciers help provide freshwater for 1.5 billion people living in India, Pakistan, & six other Asian Countries. In the past, melting glaciers slowly released water into the tributaries of the Indus, Ganges, & Brahmaputra Rivers. Now the rapid melting of the glaciers is using up the water supply. At the same time, the increased glacier melt has caused severe flooding along each of the 3 rivers. As climate change worsens, less water is available for producing energy, raising livestock, & growing crops. Wildlife & natural ecosystems suffer. Arguments break out between cities, states, & even countries over who has the best claim to water. Tensions over water are growing between India & at least 2 of its neighbors- Pakistan & China. All 3 are racing to build dams on headwaters in the Himalayas that feed important rivers below. Meanwhile, some countries in Africa argue over who has the best claim on the Nile River. In the middle East-one of the driest areas on Earth-some experts predict that the next war will be over water. Warmer air can hold more humidity than cold air. This means that if the air gets warmer, the water evaporates, which makes the area dry, & more likely to suffer drought, & weird weather patterns. Also, studies say that the South is expected to get drier and the North is expected to get wetter. This means that the North will obviously have more drinkable water than the South, because water will be dried up there. So, there will be an unequal distribution of water. So if there is climate change, it will lead to problems for countries in the South & sometimes in the North.

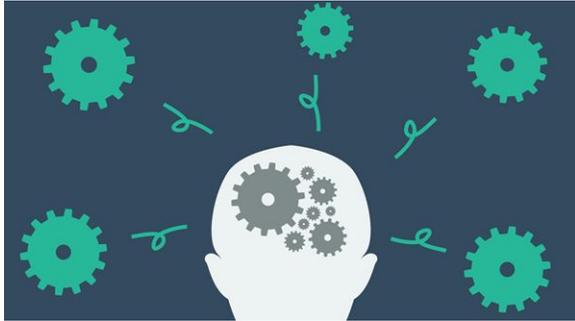
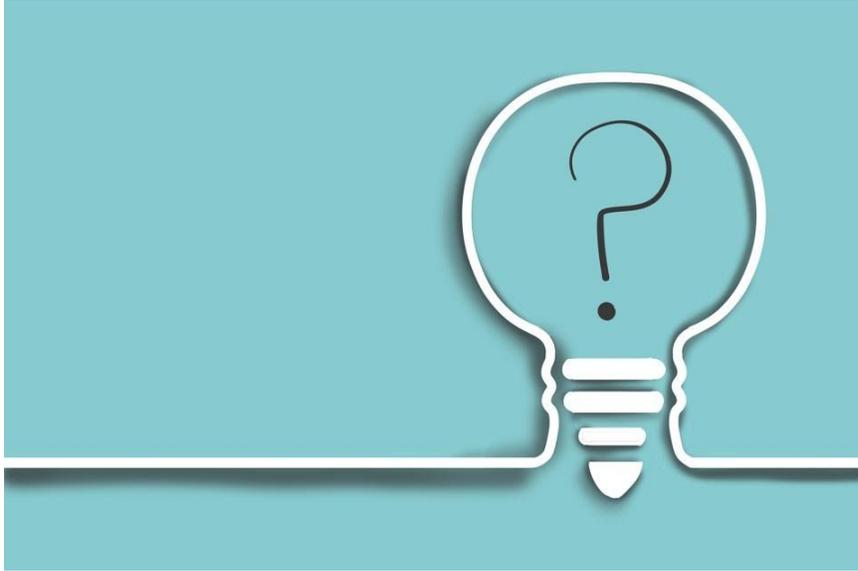


Day 5:

Today I wrote if we will ever run out of water. I will also write my question & problem:

Question: What is the main cause of water scarcity?

Problem: I think that population growth is the main reason for water scarcity. The reason is because population growth increases the use of water, & some people are careless about saving water. Also, when there are more people, there is more pollution & climate change because of more usage.



Day 6: OMG, there is only 2 days left! I hope I can finish! Today I'm gonna write my research.

Problems of population growth: The number of people around the world is always changing. Everyday, about 220,000 people are born & increased to Earth's population. Doesn't that seem like a lot? Well it is! Increased population causes many problems but we can't stop them all because if we tried to reduce the human population, people would basically have to die. Problems that population growth causes are, climate change, poverty, lack of health care, lack of food & drink, deforestation, stress, & many more.

Population growth & water scarcity: For thousands of years, human population grew slowly, but now, it is increasing rapidly. This rise has

led to a population explosion in the last two hundred years. This uncontrolled rise in population has quickly increased the demand for water and the pressure on the already scarce resources of Earth. The demand for water for domestic, industrial, agricultural and many more—these have increased in the past few decades. Certain areas have been more affected than others. The areas that mostly have water scarcity are the areas with fewer water resources, like rivers, lakes, streams & more. The little amount of water we can use around the world has brought problems between many nations. A country is classified water scarce if they have less than 1000³ meters of renewable freshwater per person for a year. Water scarcity affects the population because of the deaths of people from drinking contaminated water or no water at all. The increase in population leads to the increase in demand for freshwater. Also, when there is population growth, more crops & plants have to be grown so people can survive & this uses water.

Crops that use a lot of water: There are a lot of crops that require a lot of water. Here are some of them.

- Alfalfa: This crop is used to feed livestock. Because it contains protein & it is easy to transport. But unfortunately the water amount used to grow this is higher than some other crops. Alfalfa uses 18-36 inches per season.
- Rice: We all have probably eaten rice before. Well, do you know where it comes from? Well it comes from paddy fields. This means that rice has to be in a “flooded” area for it to grow which uses a lot of water.
- Almonds: Almonds are nuts. They use a LOT of water. To grow ONE almond, it requires about 1.1 gallons of water! That is a lot of water to grow one almond!
- Cotton: Cotton is what is used to make some clothes you wear. To produce just one kilogram, it takes 5,283 gallons of water!
- Sugarcane: Sugarcanes are sometimes used to make sugar. It needs about 210 liters of water to produce 1 kilogram.
- Wheat: Wheat uses a lot of water & also, it is used for many, many things. Wheat uses about 900 litres of water.



Animals that use a lot of water: And it's not just plants that use water, it also animals. Here are some animals that use water:

- Cows: Cows use a lot of water. They drink about 100 gallons a day!
- Elephants: Elephants are the largest land mammals. No wonder they drink about 50 gallons a day!
- Hippo: Hippos drink about 56 gallons a day.
- Blue whale: Blue whales are the biggest animal in the world, they drink about 10,000 gallons a day.

And lastly.....

HUMANS: We drink a lot of water. Everyday, from all the people in the world combined, we use about 10 billion gallons of water for our everyday needs!



Based on one of the Findings of the Worldwatch Institute's Family Planning and Environmental Sustainability Assessment (FPESA) and based on the recent scientific evidence, we can say that ongoing growth of the human population is a bigger cause of water scarcity than climate change.

After 2 years of assessing about 900 scientific papers published in 12 years, FPESA released a report of finding the relationship between family planning & environmental sustainability. Slow population growth means slower increase of pressure on the environment from human activity. And the same applies to the water crisis.

According to United Nations World Report & Population Institute, the connections between a growing population that needs a higher demand for drinking water and water for agriculture shows that the shortages of water that are expected to affect many regions of the world will have severe consequences on the lives of millions of people, and that world leaders will need to find solutions in order to conserve and protect water resources for their countries, or find alternative methods to find new sources of water, such as desalination.

According to WHO, population growth will also increase water pollution. Millions of people don't have access to safe drinking water, while billions of people don't have proper water sanitation. Urban areas have a high risk of water pollution as the area is densely populated.

Runoff from streets can carry oils, heavy metals, and other contaminants, while sewage water can leak into groundwater, bringing bacteria, nitrates, phosphorus and other chemicals. Waste dumping also can pollute existing sources of freshwater with hazardous materials and toxic chemicals. It is estimated that between forty to fifty percent of all available freshwater sources on Earth are polluted, and the pollution of groundwater is on the rise.



More urbanization with a dense population, leads to more water

pollution in urban settings.

In the last few decades, meanwhile, population growth in many or even most water basins has been more dramatic than any changes in climate.

Overpopulation will lead to local and international conflict over control of available quantities on water resources. According to many experts, if there is another world war, it could be over water resources.

Middle Eastern countries, such as Iraq, Iran, Afghanistan, Yemen, and Syria, countries in Africa like Darfur, Sudan, and Somalia, and the South American countries of Peru and Brazil have all experienced conflicts involving scarce water supplies. These conflicts are due to multiple countries relying on a single water source, such as the Shatt al-Arab river between Iran and Iraq. A dispute over water withdrawal from the river was an important factor that caused the Iran-Iraq war in 1980.

The city of Chennai in India faced a huge water crisis in 2019, because 4 of the main reservoirs that supply the city with water dried up due to lack of rainwater and groundwater. The lack of groundwater and rainwater is due to buildings taking up natural space (trees and the natural wetlands of Chennai have decreased due to urbanization), because of the high population and Chennai being the sixth largest city in India. Now in 2021, Chennai is looking to its wetlands for water supply.



Japan is one of the world's richest countries, and it has the third largest economy in the world. It also has many famous cities, and a large population. In Tokyo alone, the population is 37,340,000, while Canada's total population is only 38.44 million! No wonder Tokyo has a water supply shortage! In this city, the water supply shortage is caused by the population density, which is squeezed into just 17% percent of Tokyo.

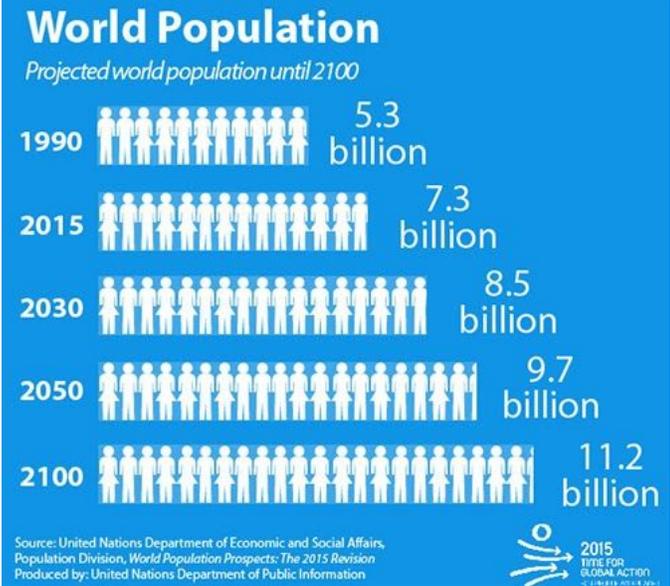


Commonly, in cities, you see mostly houses, malls and buildings because of the large population. There is little visible greenery ; trees. Because there's no trees, water cannot reach into the ground, which means less water for the urban areas.



The United States has listed water scarcity, and other consequences of overpopulation and climate change, as a threat to national security, realizing that water scarcity can cause social and political issues. To help stop countries from engaging in conflict over water resources, government leaders need to recognize how water is a finite resource, and the consequences that can happen when a finite resource is abused. There has to be agreements and contracts between nations who are in water stressed regions and who share the same water source that outline distribution amounts according to population size and or agricultural needs.

As the global population is expected to keep growing, the negative impact on earth's limited resources, especially water, will become increasingly clear as the world will start to face extreme shortages of water, leading to instability in food production, industry, social order, and political and military control. To limit conflict over limited water resources, there needs to be compromise and cooperation between all countries, not just the nations that are water stressed, to provide water management techniques, newer and more efficient technology to conserve as much water as possible, and strict security and enforcement of all regulations to prevent groups and individuals using water to gain power.



Day 7: OMG, today is the last day! I am almost done. Let me write my conclusion. By the way, I figured out that my hypothesis was correct! Here is my conclusion:

Conclusion: Based on my research studies, I found out that my hypothesis is correct because the population growth leads to higher demand for water. Also, the areas with most water scarcity are those with less water resources and a high/dense population. Moreover, climate change, pollution, deforestation and over usage are obviously the results of population growth. When population increases, more trees and forests have to be cut down to clear lands to make more houses, roads, malls, other constructions, for agriculture land, & raise livestock. Less trees means less groundwater. Also less trees means more carbon dioxide in the atmosphere, which leads to global warming and climate change which leads to melting of polar ice caps and glaciers. This will reduce freshwater, resulting in water scarcity. And also, speedy drying up of water bodies. Population growth causes more waste & packaged things to be made. Too much waste will end up thrown in rivers & there will be more landfills, which means there will be leachate, which can pollute the water. Finally, over usage of water is caused by population growth because the growing population needs more water, & not everyone uses the same amount of water. In the end, there will be water scarcity.



Lastly, here are my links:

<https://www.unwater.org/water-facts/scarcity/>

<https://www.britannica.com/science/water-resource>

<https://byjus.com/biology/causes-of-water-scarcity/>

<https://www.unwater.org/water-facts/climate-change/#:~:text=Higher%20temperatures%20and%20more%20extreme,and%20further%20deteriorate%20water%20quality>

[Oreatment%20pollutes%20the%20water.](#)

<https://climatekids.nasa.gov/how-to-help/>

https://www.sciencedaily.com/terms/water_scarcity.htm

<https://www.britannica.com/topic/water-scarcity#ref1265085>

<https://earther.gizmodo.com/when-will-we-run-out-of-water-1837941243>

<https://www.raz-kids.com/main/BookDetail/id/2525/from/quizroom>

<https://greenactioncentre.ca/reduce-your-waste/14-ways-to-reduce-water-waste/>

https://www.huffingtonpost.ca/entry/earth-water-old-sun_n_5887862?ri=18n=true

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<https://gpm.nasa.gov/education/water-cycle#:~:text=The%20water%20cycle%20describes%20how,to%20the%20surface%20as%20precipitation.&text=The%20cycling%20of%20water%20in,the%20weather%20patterns%20on%20Earth.>

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<https://www.worldfinance.com/news/the-threat-of-water-scarcity-looks>

<https://www.amnh.org/explore/ology/earth/ask-a-scientist-about-our-environment/will-earth-run-out-of-water>

<https://www.worldwildlife.org/threats/water-scarcity>

<https://www.britannica.com/topic/water-scarcity#ref1265085>

<https://water.org/our-impact/water-crisis/global-water-crisis/>

<https://earthsky.org/space/origin-earths-water-asu-solar-nebula>

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<https://earther.gizmodo.com/when-will-we-run-out-of-water-1837941243>

<https://www.britannica.com/list/7-lakes-that-are-drying-up#:~:text=Aral%20Sea&text=Shrinkage%20of%20the%20Aral%20Sea%2C%201960%E2%80%932009.&text=Once%20the%20world's%20fourth%20largest,east%20of%20the%20Caspian%20Sea.>

<https://eos.org/articles/dire-and-drier-future-for-lake-victoria>

<https://www.nationalgeographic.com/science/article/141001-aral-sea-shrinking-drought-water-environment>

<https://www.globalcitizen.org/en/content/himalayas-melting-climate-change/>

<https://www.volusia.org/services/growth-and-resource-management/environmental-management/natural-resources/water-conservation/25-ways-to-save-water.stml>

https://www.biologicaldiversity.org/programs/population_and_sustainability/population/#:~:text=Unsustainable%20population%20growth%20and%20lack,rise%20out%20of%20intergenerational%20poverty

<https://claroenergy.in/population-explosion-water-scarcity/#:~:text=The%20most%20water%20scarce%20areas,even%20higher%20population%20growth%20rates.&text=5%20Projections%20show%20that%20by,regions%20to%20become%20water%20scarce.>

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<https://www.ft.com/content/8a438352-fc76-11e7-a492-2c9be7f3120a>

<https://www.cnn.com/2020/10/05/weather/cape-town-celebration-water-drought/index.html>

<https://www.bbc.com/future/article/20210105-day-zero-how-chennais-wetlands-could-save-it-from-drought>

<https://www.wri.org/blog/2019/08/17-countries-home-one-quarter-world-population-face-extremely-high-water-stress>

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THANK YOU FOR READING!