Science Fair Project

Trifold Outline:

- Information about unclean water, and the harm it can do. Plus all of my research. Explaining how unclean water will affect each age group, and how unclean water affects plants and animals.
    - Show current stats of our water situations (polluting our water sources), and what it would look like in the future if we don't start now.
- Introduce my experiment on what I will be doing (focusing on plants)
- The problem in my experiment
- The procedure of my experiment
- The results after I conducted my experiment, with the water sample only and the water sample with plant pieces on the agar plate. I will be testing different types of water, itself and with the plant piece.
- The solution for my experiment, which is to make a simple filtration system.
- Test my filtered water with the agar plate.
- Explain my solution's outcome, with the successful agar plate
- Conclusion about the harms of unclean water, and what you can do to have clean water, with the benefits. Making people aware
- Resources and methodology

Research:

- WHO (World health organization) https://www.who.int/news-room/fact-sheets/detail/drinking-water:
    - Improved water supply, sanitation, and water resources, boosts the country's economy and contributes greatly to poverty.
    - Over 2 billion people in 2021, who lived in water stressed countries, which is expected to worsen, due to climate change and population growth.
    - Globally in 2022, at least 1.7 billion people had water sources contaminated with faeces. This is leading to microbial contamination, which leads to a great big problem on our drinking water source.

- Safe and sufficient water facilities that practice hygiene, is the key to prevent not only diarrhoeal diseases, but acute respiratory infections, and other pathogenic diseases.
- Contaminated microbiology drinking water can transmit diseases, such as cholera, diarrhoea, dysentery, typhoid and polio. Estimated to cause approximately 505 000 diarrhoeal deaths per year.
- In 2022 73% or the population (6 billion people) used a safe managed drinking service, free from contamination and located on the premises.
- The remaining 2.2 billion didn't have clean water, which meant
  - 1.5 billion people with basic water sources, have to walk to the nearest improved water location, which is around a 30 min walk.
  - 292 with limited service, or an improved water source, which would require more than a 30 min walk to the nearest clean water source.
  - 115 million people collecting untreated surface waters from ponds, lakes, rivers, and streams.

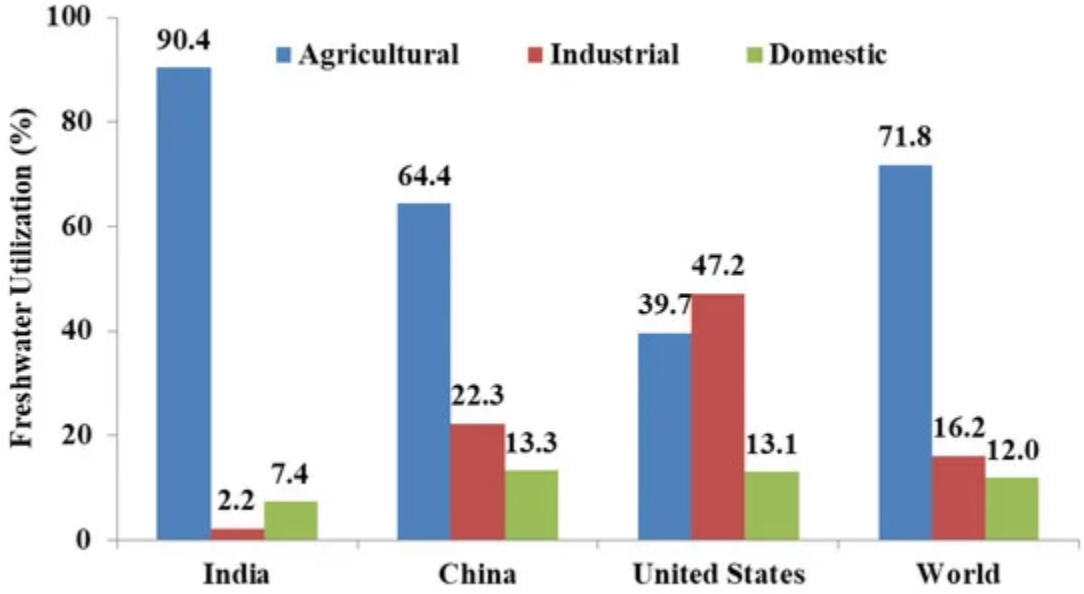
    - Contaminated water and poor sanitation, transmits diseases like cholera, diarrhoea, dysentery, hepatitis A, typhoid, and polio. Inappropriately treated water and sanitation services which expose individuals to preventable health risks, harms people with those pathogenic diseases. Especially in health care centres, where staff and patients will be further exposed to infections and diseases when water, sanitation and hygiene are lacking, it will have higher risks.

- Infinity Learn Effects of Water Pollution on Human, Plants, and Animals:
  - Polluted water negatively affects the breeding process for some aquatic species.
  - Makes fish and plants deficient in their ability to regenerate and reproduce.
  - Animals also fall to a variety of diseases due to drinking polluted water.
  - Around 360 people per one lakh die in India, and over 50% of the patients get admitted to the hospital due to waterborne diseases.

- The situation in underdeveloped countries is worse, because over 80% of the patients are suffering from waterborne diseases, by drinking polluted water.
- Children often get very sick from drinking polluted water, sometimes they even die due to the intensity of the disease. It is estimated that 13 kids die per hour in India due to diarrhea from the contaminated water.
- Large amounts of chloride in drinking water, causes deformation of the spine, which causes it to go snaky and makes the teeth yellow. Hands and feet lose flexibility of their bones and body starts to deform.
- Large amounts of sulphide in the water, causes various respiratory diseases, water contaminated with urea increases intestinal order.
- If we continue to drink contaminated water, it leads to stomach disorders, and other diseases, like lumps in throats, tooth decay, etc.

- Water Quality for Crop Production - UMass Extension:
  - How do plants get affected by poor water?
  - Slower growth
  - Poor quality of the living plant
  - Leads to gradual death of the plant
  - High soluble salts damage the roots of the plant, interfering with water and nutrient uptake.

Graphs: A Review of the Status, Effects, Prevention, and Remediation of Groundwater Contamination for



- United Nations, https://www.un.org/en/global-issues/water:
    - In July 2010, they recognized the importance of clean water and sanitation. They believe that every human should have the right to have access to about 50-100 litres of water per person, per day. The water should be safe, and the cost shouldn't exceed over 3% of their household income. The water source must be within 1000 meters of the home, and the collection of the water shouldn't exceed 30 minutes.
    - "Water of Life" International Decade for Action 2005-2015, helped around 1.3 billion people in developing countries, gain access to clean drinking water. They grew the progress of sanitation as part of the effort to meet the Millennium Development Goals.
    - Diarrhoea is estimated to cause 1.5 million child deaths per year, under the age of 5 in developing countries.

- European Union https://environment.ec.europa.eu/topics/water/water-wise-eu/polluted-water_en:
    - Almost 10% of groundwaters are affected by unsustainable withdrawals that are high in water.
    - Only 2.4% of the wastewater is reused, which is different per country.
    - Almost a quarter of treated water gets lost from distribution.

      What are the solutions?
        - For agriculture, improve irrigation techniques through smart meters, and reuse treated water.
        - Use practices like crop rotation, select water efficient crops, and enhance soil health.
        - Agro-ecological methods such as agroforestry and permanent pastures.
        - For Energy, move away from water intensive energy generation and focus on alternatives like wind, solar, and geothermal power.
        - Conserve energy to save power
        - Enhance energy efficiency

- Use advanced cooling technologies
- For infrastructure, on average 23% of treated water is lost in distribution in the EU.
- Fix leaking infrastructure
- Implement smart water meters
- Intergate water efficiency
- Find an affordable price for water, without incentivizing excessive water use.
- Target people who need support
- System applying the polluters to pay principle through extender producer responsibility.

Taking action: - Recycle water or fix a leak in the house, to stop waste of water, and save you money. You can make small changes in your lifestyle to reduce your water footprint.

- World Bank https://datatopics.worldbank.org/sdgatlas/goal-6-clean-water-and-sanitation/?lang=en:
  - The freshwater is distributed unevenly due to the location of the countries, how rich the country is, and the connection you have with that country.
  - China: Seen decrease of water about 50% per capita, availability between 1964-2020.

- John Hopkins Medicine Water, Sanitation, Hygiene, and Health | Johns Hopkins:
  - In sub- Saharan Africa, an estimated about 200 million people are infected with parasitic worms that cause schistosomiasis. Released by freshwater snails, the worms penetrate the skin of people who bathe in water contaminated by human sewage.
  - This disease can lead to kidney failure, bladder cancer, and infertility if untreated.

- Researchers from John Hopkins, went to the Peruvian Amazon, to collect samples of the water source. They will assess the sample, and see if the water the villagers are drinking is safe.

The Harvard Gazette [Unsafe levels of toxic chemicals found in drinking water of 33 ...]
[:]

- Widely use of industrial chemicals, are linked with different health problems like cancer, polyfluoroalkyl and perfluoroalkyl (PFAS)
- For many years, chemicals with unknown toxicities were allowed in our environment like PFAS, which is causing a disturbance to our environment.
- PFAS have been used in commercial products ranging from food wrappers, clothes, pots and pans . This is connected to cancer, hormone disruption, obesity, and high cholesterol.
- Drinking water has become one of the routes of exposing PFAS to people.
- The wastewater treatment plants discharge plants, which are unable to remove the PFAS from water by standard treatment methods. This could contaminate the groundwater. They could sludge the plants from regenerating, which is used as a fertilizer.
- PFAS have been detected by the EPA from 194 out of 4,864 water supplies in 33 starters across America. The drinking water from the 13 states was 75% of the detections: California, New Jersey, North Carolina, Alabama, Florida, Pennsylvania, Ohio, New York, Georgia, Minnesota, Arizona, Massachusetts, and Illinois.
- The Highest levels of PFAS were detected in watersheds near the military bases, industrial sites, and wastewater plants. These places may have had chemicals, and been found or have been used.

Asian Development Bank
https://www.adb.org/features/water-sanitation-and-hygiene-healthy-asia-and-pacific:

- An ADB supported project improved rural water supply and sanitation facilities, including chlorination and wastewater drainage systems.
- Another thing to children's health is dengue is a spread of a specific type of mosquito that breeds in still water.

- There was a project, where the Cambodia government introduced Guppy fish and Lao People's democratic republic with the support of WHO (World Health Organization) and ADB. This took place between 2009 and 2011, guppies eat larvae that grow into mosquitos. This resulted in a sharp decline in mosquito larvae in water storage tanks after the tiny fish were introduced.

- Drinking Water | US EPA U.S Environmental Protection Agency,
    - Can cause health problems, gastrointestinal illnesses, nervous system or reproductive systems, and chronic diseases like cancer.

- AquaRead: https://www.aquaread.com/blog/impact-of-water-pollution-on-aquatic-life/
    - Contaminants, which are heavy metals, oil spills, and pesticide can directly harm aquatic animals as well as land animals. For example, damage the gil, rot fin and tail. This can essentially lead to death.

    - Water pollution can cause a lack of oxygen in the ocean. Certain types of pollutants like nitrogen and phosphorus, which can often be found in agricultural runoff, cause excessive amounts of algae growth.
    - This creates dead zones, where fish and other animals suffocate due to the lack of oxygen. From decomposing algae.
    - Certain types of contaminants can cause the growth of more fungi, bacteria and algae. This disturbs their habitat. Huge mats of algae and moss, can cause a disturbance of sunlight to come through.

- GreenPeace: https://www.greenpeace.org/africa/en/blogs/49015/what-are-the-causes-and-effects-of-water-pollution-in-africa/
    - Industrial-scale farming uses a lot of agrochemicals, which causes a ginormous amount of water pollution in developing countries.
    - Farmers are under more pressure for crops, making them move away from organic, and more sustainable farmer practices.

- This is causing health risk for themselves and the communities due to pesticides and excess amounts of nitrogen from fertilizers into rivers, streams and bodies of water.

- Plant cell technology: Plant Diseases Due to Contaminated Water-
  - If water is contaminated, most likely the plants had contacts of diseases, viruses, or fungi.
  - Plants that have been in contaminated water, can lead to discoloration, stunted growth, which potentially leads the plant to die
  - If nitrogen filled water comes into contact with plants, the leaves may discolor, and you can become ill from consuming these plants. Most fertilizers have high amounts of nitrogen.
  - E-coli, Hepatitis A, Listeria, and Salmonella, can harm plants too.
  - Plants can get severely damage from being exposed to these two water molds (Pythium, and Phytophthora)
  - Plants can be in contact with waterborne pathogens from run-offs, irrigation sources, or even soil. If recycled irrigation is used, then your greenhouse plants could be exposed to inoculum.

Summarize version:

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