Bio Shield Barrier

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Abstract

Today, Egypt suffers from many problems as pollution managing water climate change, and urban congestion. Our project aims to deal with these problems and to make our lives better. Now we have a big issue with floods because they kill people and wastewater, and we need to save water because we use it in farming and water is a very important thing in our life. Also, we study that climate change has a high temperature that affects the water rises sea level, and makes rains that destroy places where people live. For these reasons, we have decided that we should solve this problem by making a dam that is good for the environment helps the life of people, and manages water in a good way, The chosen design requirement for this project is (cost) because by saving money you can increase the production or the output with the same cost of another solution but with greater output. Also, we made the dam from some materials to make the dam without discharging water, so we made the tank from reinforced plastic and made the dam from concrete to make the strength of the dam hold more than 10 kilo gram, finally we used draining gates from pipes closed by safety valve in the back and iron gate in the front of it. The result is perfect in only three trials which makes our dam effective and they drained 50% 0.195 Liter/second and 25% 0.142 Liter/second. Also, store the water for two hours and have a deflection equal to zero. Finally, by these design requirements, we followed the perfect way in the dam to protect people from floods and used in farming.

Introduction

Egypt has some problems that it faces. One of them is climate change. Climate change is Between *1901* and *2013* temperatures in Egypt increased by an average of *0.1*°C per decade. The rate accelerated between 2000 and *2020* with a temperature increase averaging *0.38*°C per decade, which was higher than the world average (*0.31*°C per decade) as a result the percentage of floods is increasing over time. Floods are natural disasters characterized by the overflow of water onto usually dry land, often caused by heavy rainfall, storm surges, or the breaching of water containment systems, resulting in widespread damage to communities and the environment. Over time, advancements in engineering resulted in the development of tanks, dams, and floodgates aimed at arranging water flow and minimizing flood impact. Structural measures like dams and floodgates offer immediate protection against moderate floods, preventing inundation of nearby areas and reducing immediate damage. Also, these solutions have facilitated agricultural development and urban expansion by controlling water flow, allowing communities to settle in flood-prone regions and use water resources efficiently. Although it has strong points it has weaknesses points. Large-scale infrastructure can disrupt natural ecosystems, alter river courses, cause erosion of the soil, and kill marine animals affecting biodiversity and ecological balance. Structural solutions might be insufficient against extreme or unforeseen flooding events, leading to failure, and causing widespread damage. for example: during the floods that occurred in Darna in Egypt we thought of building a dam to protect the people and prevent damage from floods. As a result, that happened, We selected gravity dams, and the best location of the dam is in Wadi Alam as a solution to floods because they are heavyweight can withstand the force of water and have a high stability rate, we think it is the best solution for floods. Our project includes design requirements it can store 50 at least liters of water, and the height of the stored and the height of the dam is 30cm in addition The Thickness of the dam at the bottom is 15cm and the top is 7cm. when we calculate the flow rates, we use this law: the amount of water % time, and when we calculate the amount of water that the tank can store, we use the law of volume: height *width *length.

Materials and Methods

After the materials were bought and prepared. We started to build up our prototype through some methods which are:

First, we brought 4 kilograms of cement, 3 kilograms of sand, and 2 kilograms of gravel and mixed them. Second, we poured the mixture into the template of a dam and let it dry. Then, started to pour the 50 liters of water into the dam until it was full. Then, we added water so that it would automatically drain over the dam. after that, we drained the water by 25 percent of the 50 liters (12.5 liters). Then we drained the water by 50 percent of the remaining 50 liters of the water (25 liters). After that, we brought 10 kilograms of iron and put them on the bridge above the dam. And it is important follow safety rules such: wearing coat, gloves, and googles

Figure (1): The wood template

Figure (2): Mixing cement

Figure (3): the dam after complete

Table (1): materials

Item	Quantity	Cost	Source	picture
sand	**2 Kg**	**free**	**natural**	
cement	**10 Kg**	**25 LE**	**Shop**	
wood	**3 Kg**	**free**	**Building Violations**	
iron bars	**250 G**	**free**	**Building Violations**	
Plastic	**2 Kg**	**free**	**factors**	
safe valve	**2**	**95 LE**	**shop**	

Results

Table (2): Weight & Deflection

We Try testing the dam by put a difference weight in middle point on the crossroad

Trials /test	Weight	Deflection
Trial 1	10 Kg	0
Trial 2	15 Kg	0
Trial 3	20 Kg	0

Table (3): Water leakage

We test ability of dam and tank to save water without any leak. In the first trial, the tank was broken. So, all water was leak. But in second and third trial there is not any leak.

Trials /test	Quantity of Water	Water Leakage	Time
Trial 1	50 liters	50 liters	1.5 hours
Trial 2	50 liters	0 liters	2 hours
Trial 3	50 liters	0 liters	4 hours

Table (4): Flaw Rate

We test the flow rate from the gates. In first trial, we can't drain water because the tank was broken. But in second trial and third trial are successful.

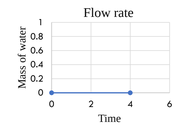
Trials /test	Quantity of Water	Time	Flow Rate
Trial 1	0	∞	0 liter/second
Trial 2	37.5 liters	312 second	0.120 liter/second
Trial 3	37.5 liters	216 second	0.174 liter/second

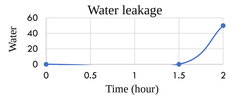
Analysis

Our project was built to solve floods caused by climate change, which was considered a grand challenge Egypt faces. The dam was one of the prior solutions. There are many prior solutions for this problem such as the Assiut Barrage, and the High Dam, but these have disadvantages such as the high cost, that we solve because we use recycled materials. The dam will control floods which decrease damage to the environment by protecting trees, animals, and humans from floods. and increase sources of clean water.

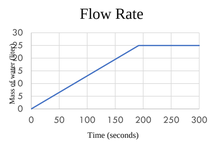
The dam has a road with a width of 7 cm. By changing that with a scale of 5.5 we learned on MATH LO4 (similarity) will be 38.5 in real life.

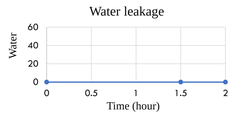
In the first trial, we used cement, sand, gravel wood box, plastic tank. We made a wood box to get the shape of our dam, Then we mixed cement, sand , gravel, and water. Then we put that in the wood box and waiting for dry. Then we connected the tank with the dam. We put 10 Kg in middle point and the deflection was 0. Then We put about 50-liter water in the tank. We let water in the tank about 90 minutes, But it was broken because it maybe happen wrong thing or because the pressure of water. So, we can't drain water.



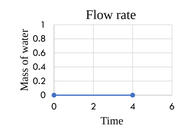


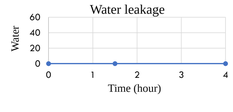
In the second trial, we used the same materials, but we put the cement around the tank, and we use pipes to drain the water. When we put water in a tank, it carries water for 2 hours. After this we drain about 25% of the water about 12.5 liter at 120 seconds, the flow rate 0.104 then we drain 50% of the water about 25 liter at 192 seconds, the flow rate 0.138. Then we make a graph by what we learned in MATH LO2.





In the third trial, we used the same materials, but we put the cement around the tank, and we use pipes to drain the water. When we put water in a tank, it carries water for 4 hours. After this we drain about 25% of the water about 12.5 liter at 79 seconds then we drain 50% of water about 25-liter at 126 seconds.





Finally, In the end, a comparison was made on the three trials to know how the dam developed. And big changes in the results Were noticed. As there was a great success in the third trial.

Conclusions

after collecting data and results the final result of the design requirements was made and qualified in the third trial and the water was drained by 25% with 0.142 Liter/second and by 50% with 0.195 Liter/second and water storage by 50 Liter without any discharging in water and the road it holds the weight of 30 kilograms we did the test, the most important thing in conclusion that the design requirements that we made had a good efficiency. And we choose the design requirements that make the dam perfect. Also, we chose Wadi Alm as a place that makes our dam on a large scale effective. Finally, the quality of cement, plastic, and gates that we use is very good in draining and testing.

Recommendations

After finishing work, we want advice for anyone working in this area again. When you build a container don't use an iron because it is more expensive, but you can use plastic, glass, or wood or build it from cement and recycling material. It is important not to start without two or three plans.

When you build the project in a real-life application, you should build wood to put cement in it. You should use gravel, cement, iron bars, and sand. Don't forget to use seawater cement and waterproof material to protect the cement from water.

If you continue with our project, you should mix cement, gravel, and sand with a good ratio. You should follow safety rules, and we recommend raising the quality of the project more than that.

In reality, working on our project makes us better STEM school students. For example, in the first, we don't like each other and fight many times. The difference between our opinions was a big problem. but now, we think that is a good thing because we have a lot of things we can search about and choose a good idea. That improves our teamwork skills in the same way as learning subjects. We need to use what we learn in the project. That improves our thinking, and we use what we learn on other sides of our lives. We learn how we can measure the lengths and how we can determine the ratio of lengths.

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