

**DOW UNIVERSITY OF HEALTH SCIENCES
GREEN YOUTH MOVEMENT CLUB**



EUTROPHICATION

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Perfusion Sciences (041)

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INTRODUCTION



Walking down a lake or a river, you witness intense amounts of algal growth on the water surface and foul smell coming out from it which only bothers your senses, but also hinders the beauty of the place. These are just the superficial things that are yet visible to you, what lies beneath this thick green layer of algae might give you nightmares. To our surprise this foul smell is accompanied by the pungent smells of hydrogen sulfide, methane and nitrogen. These gases aren't just your regular water gases, but they arise from dead bodies; dead bodies of thousands of aquatic animals that have died inside the water body. Or imagine being unable to drink water from a natural source of water which leads to further water scarcity in a country like Pakistan where there is already a water shortage.

THE PROBLEM

The growth and accumulation of algae and other unnecessary plants on a water body, which gives rise to the biomass in the water body and its surroundings due to excessive enrichment of waterbed with the nutrients, which in turns results in the death of



aquatic life is known as Eutrophication. Why does Eutrophication occur? The process starts when the nitrogenous fertilizers are drained out into the water bodies near the farms without any proper treatment of the waste. These fertilizers may be a result of farming activities or factory dumps. Whatever the main cause, it is becoming a threat to the environment. The topic of eutrophication is of least importance to the environmentalist and society workers, but it is of great importance and must not be overlooked.

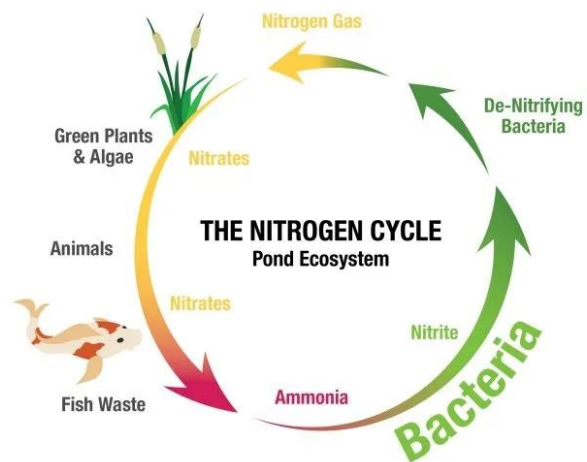
Another question is that how does aquatic life die due to the growth of algae? The answer to this question is that when there is an algal bloom on a river or lake, it makes a thick layer on the surface, which blocks the sunlight from entering the water and the aquatic plants are unable to photosynthesize and produce oxygen hence the fish dies due to lack of oxygen. Not only this, but the algae also consume carbon dioxide present in the water, which is one of the main constituents of photosynthesis which further stops the aquatic plants from producing oxygen and further reducing oxygen content in the water.

The question here arises, what happens when eutrophication is not stopped, and aquatic life dies? Well, everything in nature and environment is linked. Nature has two major cycles; one is the Carbon dioxide cycle which regulates and maintains the level of oxygen and carbon dioxide in the atmosphere so that a healthy environment

is maintained. Carbon dioxide and oxygen are responsible for the growth and nourishment of the plants and animals outside the water too. The slightest of changes in the levels of these two gases can have a drastic effect on our environment.

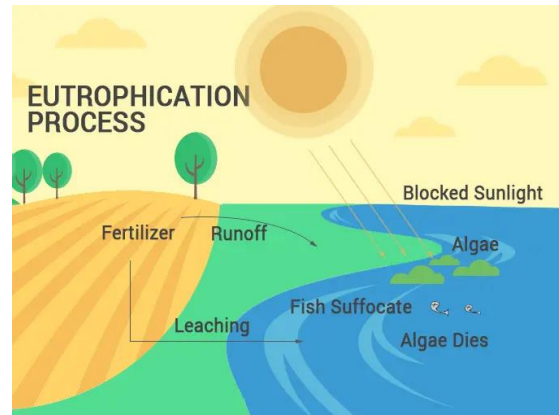
Another cycle that is disrupted by this phenomenon is the nitrogen cycle. The nitrogen cycle again is of grave importance and is majorly responsible for regulating

nitrogen levels between plants, animals, bacteria and atmosphere. Nitrogen is the major constituent of life and changes in the levels of nitrogen can be detrimental for the environment. Another effect is that it discourages the tourism in Pakistan and disrupts the revenue channel of Pakistan. Since the revenue is deficient, governments pay least interest in allocating the budget for the environmental development of Pakistan.



SOLUTION

Eutrophication is a challenge to solve. In a country like Pakistan, where the economy is struggling and in a third world country with less technological advancement, solving this problem can be a big hurdle. But if steps are taken accordingly, we can minimize the effects of the eutrophication if not eradicating it completely.



First, we need to list down the causes of the eutrophication. The major cause of eutrophication is the excessive drainage of fertilizers into the lakes, rivers and mainstream water bodies. To resolve this problem first we need to educate the farmers about the harms of draining the fertilizers into the water bodies, the harms of damaging aquatic life. We need to educate them on how to use the fertilizers effectively and efficiently to minimize the wastage of fertilizers and usage of unnecessary excess fertilizers. Apart from this we need to build proper drainage systems in the farms and agricultural land. Proper water channels so that the fertilizer infused water is drained into proper disposal areas, not in the rivers and lakes.

The second major cause of eutrophication is chemical dump by factories into the lakes and rivers. These waste materials include the compounds of phosphorus, nitrogen and sulfur. These compounds give a boost to algal growth in the water bodies. In order to stop this the initiatives our government can take are first to educate the organizations not to dispose of the waste materials and dump the nitrogenous compounds in the water bodies. Another thing that can be done, is to provide these companies with a separate massive land so that they can have a separate place to dump their waste. These lands can be excavated with the help of construction tools, and these harmful compounds can be dumped deep inside the earth's crust. In addition to this we can install separate industries, where these waste compounds from one industry can be used as a raw material to produce other products that could be sold later to generate increased revenue. Moreover, industries should be installed away from the water bodies, in order to maximize their fuel consumption, hence discouraging the companies from dumping the waste material into lakes and rivers. Apart from this, the government can impose heavy fines and strict laws against the doers of this action.

The third thing we can do is to create awareness amongst the people of the nation, explain to them the harms and detrimental effects of these activities. What role they can play in helping the government in solving and fighting this issue.

COSTING

Agriculture	Industries	Public
Expenses	Expenses	Expenses
PVC Pipes	Land price	Maintenance
Cement	Machinery	Utilities
Tools	Plant and equipment	Labor
Machinery	Labor	Government Legalities
Labor	Maintenance	Miscellaneous
Maintenance	Tools	
Government legalities	Government Legalities	
Utilities	Utilities	
Miscellaneous	Miscallaneuos	

The above-mentioned accounts are the expenses that are associated with each of the problems and solutions. (Note: Each expense is accounted in dollars, so that economic factors can be kept in mind before initiating any progress).

Firstly, we will be talking about the agricultural expenses. These expenses include Cement and PVC pipes because in order to make a proper drainage system we need these two materials as our raw inputs so that we can generate a masterpiece. This would cost us around \$1000 per acre, just for the raw materials. In addition to this we have the labor, tools, machinery in order to work with the raw materials and process them into finished products. This would cost around \$6000 in total for a month per acre and per 20 labor individuals. In addition to this we have maintenance, miscellaneous and utilities for the repair and maintenance of the machinery and utilities include the expense for electricity, fuel, water, labor food etc. This would cost around \$10000-15000 per month. These utilities and miscellaneous expenses also include the expenses incurred while educating and spreading knowledge amongst farmers.

Then, let's understand the budgeting and costing of the industrial expense. Now this is where the government must allocate a big budget to deal with these giants. Land prices are the expenses which will be incurred when the government purchases the land for the waste dumps. These prices may vary due to seller to seller and locality to locality variation but estimated it would cost around \$15000 per acre. Apart from this, the expenses that are to be dealt with are machinery, labor, plants and equipment and tools. These are the expenses that would be occurring if the government decides to build separate industries to process the waste materials into new products. Again, this cost is variable but is likely to cost millions of dollars to the government and the industry owners. Then comes the miscellaneous, maintenance and utilities expenses that are same as that of the agriculture. These expenses would be incurred in contrast to the well-being to laborers, machinery and repair of the equipment.

The Public expenses are mostly the expenses that would incur on the individuals who are guiding and educating the public regarding the issue and the expenses of these would vary according to the volunteers and engagement of the staff and general public.

Government Legalities in all these accounts are the expenses that would be incurred due to the expenses of government forms and legal documentation for the following work and changes taking place. These expenses may also vary according to the requirements of the situation.

EXECUTIVE SUMMARY

To summarize the report, Eutrophication is the process by which the water bodies such as rivers and lakes start to grow excessive algae which makes the oxygen level to severely decrease under water and as a result aquatic plants and animals die. This excessive growth is caused by the dumping of nitrogenous waste chemical compounds by the industries into the water body and drainage of water-soluble fertilizers by the farmers in these rivers and lakes. This phenomenon can have a serious effect on our ecosystem. Disrupting the carbon and nitrogen cycle of the environment which in turn can be harmful for the life living under the ecosystem. There are many solutions to the problem. Whether it is the education of farmers and industrialists or the creation of new drainage systems in the agricultural region. Whether it is awareness campaigns amongst

the locals or creating land dumps and new industries for the big giants, all these come with the expenses, hence I have discussed the expenses that are most likely to incur during this journey. Most common ones are Utilities and Miscellaneous, while Land expenses, government charges, and labor cost can not be ignored, since they have their own significant effect on the budgeting of the government to stop eutrophication.