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Global Warming and Soil Pollution Generating from Sugar Industries : An Overview

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ABSTRACT

All human beings around the globe depend upon the healthy natural environment in which they can live for the full enjoyment of their life, health, food, water and sanitation. Today, the growing needs of human being demand for huge energy due to fast industrialization, increasing number of vehicles and luxury items like AC, refrigerators etc. The requirement and needs of more and more energy usually generates the acute problem of global warming and eventually it turns into greenhouse effect and the natural calamities. As known, there is a direct relationship between global warming and natural disaster. Global warming refers to the impact on the storm formation by decreasing the temperature difference between the poles and equators. Warmer temperature refers a hotter and more humid environment due to the increase in the water vapour that enters the atmosphere. Now-a-days, temperatures are getting a rise worldwide due to greenhouse gases trapping more heat in the temperature. This indicates more possibilities of droughts, tropical storms, less snowpack in mountain ranges. On the other hand, sugar industries are known for generating the environmental pollution especially water pollution and soil pollution. When untreated waste water of sugar industry is discharged, then it will affect the surface water and soil quality too at a large extent.

This paper reveals about the causes of global warming and soil pollution in the light of sugar industries.

Keywords : Global Warming, Natural Environment, soil pollution, water pollution

I. INTRODUCTION

In olden days, human needs were very limited, he could satisfy all his wants using very little amount of natural resources. But today, everywhere there is a big demand of natural resources especially energy like in transportation, agriculture, business, telecommunication, domestic requirement etc. As we all know that most of energy comes from fossil fuels like oil, coal and natural gas etc. they increase the CO_2 concentrations and other greenhouse gases in the existing atmosphere up to a large extent. Eventually, there will be a big hand of these gases in environmental pollution and global warming ie environmental crisis. As reported by several researchers that the natural crisis is not only the result of natural calamities but also is the result of lack of good govt planning, increase in the number of industries, human waste and above all lack of public awareness towards environmental conservation.

India is an agriculture based country and a major user of water resources for various crops' irrigation. Industries are the symbol of nation's development. But today, it has become a matter of major concern in

the deterioration of the environment upto a large extent. Sugar industry is considered to be one of the industries polluting the water bodies and land by discharging a large amount of waste water as effluent. They often discharge the effluent having high amount of suspended solids, dissolved solids, BOD, COD, Chloride, sulphate, nitrates, calcium and magnesium. When the farmers use these effluents to irrigate the crops, the crops are often affected harmfully. Along with it, diverse sugar industries or factories effluents disposed of in soil and water cause major environmental pollution problems and poses a serious health hazard to rural and semi-rural population that use streamand river/canal water for domestic or agriculture purposes. Samuel and Mathukkaruppan (2011) found that germination percentage and germination values decrease with increasing concentration of effluent in seeds tested. They reported that untreated sugar industry effluent could possibly lead to soil deterioration and low productivity. The effects vary from crop to crop because each plant species has its own tolerance of the different effluent concentrations.

Objectives of the Study

1. To study the concept of environmental pollution
2. To highlight the major polluting industries in India
3. To pinpoint the concept of water-pollution and its standard in India
4. To highlight the effects and health hazards regarding the water pollution
5. To understand the concept of soil pollution
6. To know the elementary composition of the earth's crust
7. To understand the close relationship among impacts of sugar industries and soil pollution upon human health via food chains process.

The Concept of Environmental Pollution

The word environment is derived from the French word environner which means to encircle or surround. All the biological and non-biological entitles surrounding us are included in it. The environment consists of both biotic and abiotic substances i.e. consists of air, water, food, sunlight, temperature, electricity etc. with increasing scientific knowledge, man is more capable to modify the environment to suit his needs or requirements much more than any other organism. So, man is more responsible for environmental pollution.

Table 1. Major Polluting Industries

Aluminium Smelter	Dyes and Dye Intermediates	Petrochemicals	Thermal Power Plant
Caustic Soda	Fertilizer	Drugs and Pharmaceuticals	Zinc Smelter
Cement	Integrated Iron and Steel	Pulp and Paper	
Copper Smelter	Tanneries	Oil Refineries	
Distilleries	Pesticides	**Sugar**	

Sugar industry is considered as one of the most polluting industries in India and is recognised as one of major industrial problems of 21st century and also a big challenge causing the environmental degradation with high adverse effects especially on water, air and soil quality around us.

Today, environmental pollution due to sugar Industries is recognised as one of major industrial problem of 21st century and still continues to be a big challenge causing the environmental degradation

around us with high adverse effects especially on water, air and soil quality. Sugar industry is one of the most important agro-based industries in India and is highly responsible for industrial pollution. It comes under the 17 categories of major polluting industries. As we know that sugar industry is a seasonal in nature and often runs only for 120 to 200 days in the entire one year. During this specific period, the level of environmental pollution whether water, air or soil, increases.

Water quality criteria and standards are thus used to ensure that the appropriate quality of resource is available to a particular requirement.

Table 2. Water Quality Standard in India

Designated Best-Use	Class of Water	Criteria
Drinking Water source without Conventional Treatment but after disinfection	A	1. Total coliforms organism-MPN/100mL shall be 50 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen- 6mg/L or more 4. Biochemical oxygen demand- 5 days 20^{o} C, 2mg/L or less
Outdoor bathing (Organised)	B	1. Total coliforms organism-MPN/100mL shall be 500 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen- 5mg/L or more 4. Biochemical oxygen demand- 5 days 20^{o} C, 3mg/L or less .
Drinking water source after conventional treatment and disinfection	C	1. Total coliforms organism-MPN/100mL shall be 5000 or less 2. pH between 6 and 9 3. Dissolved Oxygen- 4mg/L or more 4. Biochemical oxygen demand- 5 days 20^{o} C, 2mg/L or less
Propagation of wild life and fisheries	D	1. pH between 6.5 to 8.5 2. Dissolved Oxygen – 4mg/L or more 3. Free Ammonia (as N)- 1.2mg /L or less
Irrigation, industrial cooling, controlled waste disposal	E	1. pH between 6 to 8.5 2. Electrical conductivity at 25^{o} C, 2250 micro mhos/cm max 3. Sodium absorption ratio- max. 26 4. Boron- max. 2mg/L

Source- http://ww.cpcb.delhi.nic.in

Researches have shown that sugar production over the world has a devastating effect on the soil, air and water through intensive use of water, heavy use of agro-chemicals, discharge and runoff of polluted effluent and air pollution. Mishra and Sahoo (1989) reported sugarcane industry is an agro based industry, effluents generating from this industry contain considerable amount of organic and inorganic chemical components such as fibers, cellulosic wastes, woods dust, chlorine compounds, carbonates and bicarbonates

Table 3. Effects of Water Pollutants

Pollutants	Effects
1. Organic wastes	Promote decomposition, causing deoxygenation and death of animals, anaerobic (oxygen hating) bacteria produce foul smelling gases, scum and sludge form and render water unfit
2. Pathogens	Disease of human and domestic animals
3. Phosphates and nitrates in fertilizers and detergents	Promote algal growth, causing deoxygenation and death of animals, decay of dead algae produces foul gases, silt and decaying matter may fill up the water body.
4. Toxic chemical (Hg, As, Pb, Cyanide)	Reach human and animals bodies through poisoning, disease and death as they accumulate in bodies
5. Oil	Kills animals by catching fire and by reducing oxygen and plant life
6. Radioactive wastes	Reach human and animals bodies via food chain and cause death
7. Solid particles	Cause turbidity that reduces light for photosynthesis and this causes loss of water life
8. Heat	Warm water holds less O_2 insufficient to support life
9. Non-degradable pesticides	Reach human body via food chain, affect nervous system
10. Broad spectrum pesticides	Causes large scale destruction of aquatic life
11. Fluorides	Fluorosis
12. Dyes: Fe and Cr compounds	Change colour of water
13. Fe, Cl, Mn, HC, Phenol	Make water distasteful
14. Cl, H_2S, NH_3	Impart unpleasant ordour to water
15. Detergent, Soaps	Cause from formation
16. Corrosive materials	Spoil waste water treatment plants
17. Organic sulphur	Hampers nitrification

Source-Foundation of Environmental Studies, Galgotia Publication PVT Ltd, New Delhi

Water is the basic need for the existence of life on the earth. Water pollution indicates the adverse change in the condition and consumption of water to such an extent that it becomes harmful for the purpose, for which it is intended to be used. The polluted water in any form is highly objectionable and damaging for many reasons. Effects of water pollution can easily be seen in human health and safety, aquatic and other life.

Table 4. Pathological Effects of Heavy Metal Water Pollution on Human-Beings

Metal	Pathological Effects
1. Mercury	Foetal disorder
2. Lead	Neurological disorders, kidney damage, gastrointestinal, pulmonary disorders, genetic damage, brain, liver and kidney

	damage, anemia, vomiting and loss of appetite
3. Arsenic	Disturbed peripheral circulation, mental disorders, liver, cirrhosis, lung cancer, ulcers in gastrointestinal track, kidney damage
4. Cadmium	Bone deformation, Kidney damage, injury to central nervous system, liver, growth retardation
5. Copper	Sporadic fever, Hypertension
6. Barium	Excessive salivation, vomiting, diarrhea, paralysis, colin pain
7. Zinc	Renel damage, cramps
8. Chromium	Nephritis, gastrointestinal ulceration, cancer, disease of central nervous system
9. Cobalt	Diarrhea, low B.P., lung irritation, bone deformities, paralysis

Source- Environmental Studies**,** *S.K. Kataria and Sons, Publishers and Distributors, Delhi*

The Concept of Soil Pollution

As shown by the conducted researches that effluent of sugar industries over the world has adverse effects especially on water, air and soil. Swaminathan and Ravi, 1987; Monanmani et al 1990; Kannan et al. 1993; Pervej and Pandey 1994; Narasimha et al 1999; and Kansal et al 2005 reported that direct discharge of effluents from sugar industry may have profound influence of soil physico- chemical and biological properties. Though a wealthof information on occurrence of changes in properties of soils due to discharge of effluents from other industries is available.

Table 5. Elementary Composition of the Earth's Crust (Comprising of Rocks and Loose material)

Elements Present	Percentage by Weight
Oxygen	49.85
Silicon	26.03
Aluminium	7.28
Iron	4.12
Calcium	3.18
Sodium	2.33
Potassium	2.33
Magnesium	2.11
Hydrogen	0.97
Titanium	0.41
Chlorine	0.20
Others	1.00

Source-*Fundamental Concepts in Environmental Studies*

Table 6. Common Minerals found in Earth Crust and their Composition

Name of the Mineral	Chemical Composition
Feldspars	$K_2 Al_2 Si_6 O_{18}$ Na Al $Si_3 O_6$ Ca $Al_2 Si_3 O_8$
Pyroxenes	(Mg, Fe) Si O_3
Quartz	Si O_2
Micas	K Al_2(Al Si_3 O)($OH)_2$
K Mg Fe-Al Silicates	
Olivine and Serpentine	(Mg, Fe) Si O_4
Amphiboles	(Mg, Fe) $Si_4 O_{10}$ $(OH)_2$
Calcite	Ca CO_3
Magnetite	Mg CO_3
Dolomite	Ca CO_3 Mg CO_3

Oxides of Iron(Halmetite, Magnetite Limnite)	$Fe_2 O_3$ $Fe_3 O_4$ FeO(OH), XH_2O
Montmorillonite	(Ca MgO) Al_2O $5SiO_2$ $5H_2O$
Kaoline	Al_2O_3 $2SiO_2$ $2H_2O$

Source-*Fundamental Concepts in Environmental Studies*

Sugar Industries and Soil Pollution upon Human Health

Today, health problems caused by unhealthy food crops can easily be identified. Introduction of new toxins or allergens in safe foods, increasing levels of toxins beyond safe limits and decrease in nutrition value of food is an alarming situation. Moreover, irrigation by effluents of sugar industries creates many health issues through food chain process among public. Water and soil are highly affected by effluents of sugar industries. So, proper monitoring is must to control the hazardous pollutants in waste water discharged from sugar industries.

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