

THERMAL POLLUTION

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SUBJECT: LAW

INTRODUCTION

There are various kinds of pollution, out of which some are very popular eg. Water pollution, air pollution etc. from the point of view of concern, while few like visual pollution, thermal pollution, are quite new concepts. "Thermal Pollution" is defined as sudden increase in temperature of a natural body of water which may be ocean, lake, river or pond by human influence. According to Webster's New World Dictionary, 5th edition, "thermal pollution is defined as the discharge of heated liquid into lakes, rivers etc as by an industry or nuclear power plant causing such a rise in water temperature as to affect the life cycles within water and disrupt the ecological balance¹". Similarly, The American Heritage Dictionary of English language defines "thermal pollution as the industrial discharge of heated water into a river or other body of water causing a rise in temperature that endangers aquatic life²". In an article, "thermal pollution of water systems", the author has explained the meaning of term thermal pollution as "the temperature alterations in the aquatic environment have become a latest industrial pollution syndrome. In common parlance, this syndrome is called thermal or heat pollution³." In this research paper, the law, the scope, effects, causes and remedies to prevent thermal pollution are studied in depth to provide an insight view on the topic.

HOW THERMAL POLLUTION IS CAUSED

Industries take water from natural water resources for their industrial process. They use it as coolant or to cool down the machinery of any factory or plant. Later on, this used water with much higher temperature than before is ejected back to natural resources including lakes, ponds etc. this causes sudden increase in temperature of natural water bodies, altering life forms under water and its various properties too.

CAUSES OF THERMAL POLLUTION

There are various causes of thermal pollution, out of which main causes are listed below:

- I. Use of water as cooling agent in manufacturing, industrial process and thermal power plants.
- II. Soil erosion: Consistent soil erosion causes water bodies to rise and making them more exposed to sunlight. Increased temperature may give rise to anaerobic conditions.

¹ Webster's New World College Dictionary, 5th edition, by Houghton Mifflin Harcourt Publishing Co.

²The American Heritage Dictionary of English Language, 5th edition.

³Burton Davidson & Robert W. Bradshaw, "Thermal Pollution of Water Systems".

- III. Deforestation.
- V. Natural Causes :volcanoes, geothermal activities under sea can trigger warm lava to rise temperature of water.
- VI. Growing industrial activities.
- VII. Chemical pollutants discharged into water.

EFFECTS OF THERMAL POLLUTION

- I. Decrease in dissolved oxygen levels.: Hot water holds relatively less oxygen as compared to cold water. Decrease in dissolved oxygen level causes suffocation for plants and animals leading to anaerobic conditions.
- II. Increase in toxins : Toxins increase with increased temperature of water bodies. Toxins have chemicals and emit radiations which have harsh impact on life under water .
- III. Loss of biodiversity: increased temperature causes death of various aquatic plants and animals.
- IV. Ecological Impact: Sudden thermal shock results in mass killing of fish, insects and amphibians as higher temperature decreases the activities of the organisms. Many aquatic species are sensitive to small temperature changes of even 1 degree celcius.
- V. Affects reproductive system: higher temperature of water bodies cause low rate of reproduction in fishes and also causes some defects in new borns.higher temperature causes the release of immature eggs or prevent normal development of certain eggs.
- VI. Increased metabolic rates: Thermal pollution increases the metabolic rate of organisms as enzymatic activity increases with the increase in temperature. As a result, more food is needed by the organism which disrupts the food chain and alters the balance of species composition.

LAW RELATED TO THERMAL POLLUTION

U.S. LAW ON THERMAL POLLUTION:

- Clean Water Act, 1977(CWA) is the main federal law in the United States which governs the water pollution. Objective of this act is to restore and maintain the chemical, physical and biological integrity of nation's water by preventing point and non point sources.

- Sec. 316 of CWA talks about the thermal pollution.
- “sec. 316. (a) With respect to any point source otherwise subject to the provisions of section 301 or section 306 of this Act, whenever the owner or operator of any such source, after opportunity for public hearing, can demonstrate to the satisfaction of the Administrator (or, if appropriate, the State) that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the projection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made, the Administrator (or, if appropriate, the State) may impose an effluent limitation under such sections for such plant, with respect to the thermal component of such discharge (taking into account the interaction of such thermal component with other pollutants), that will assure the projection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on that body of water.
- “Sec. 316(b) Any standard established pursuant to section 301 or section 306 of this Act and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact⁴”.
- Hence, from the wordings of the section, it is very clear that US has express law on thermal pollution and has the proper measures to deal with this kind of pollution.

INDIAN LAW ON THERMAL POLLUTION

- The Indian law for prevention of water pollution is under the Water (Prevention and Control of Pollution) Act, 1974.
- There is no express provision under Indian law on prevention of water pollution which talks about thermal pollution but impliedly the prevention of thermal pollution and its description also falls under the Water Pollution Act, 1974.
- The Preamble of the said act says “ an act to provide for prevention & control of water pollution & the maintaining or restoring of wholesomeness of water⁵ ...”so, by the term ‘wholesomeness’, it can be said that thermal pollution affects or changes the wholesomeness of water, hence, thermal pollution is also covered under the act.
- Secondly, according to sec. 2(e) "pollution" means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely

⁴ Federal Water Pollution Control Act, 1972, US, available at: www.epa.gov (last visited on 25th Nov. 2017)

⁵Water (Prevention & Control of Pollution) Act, 1974 (no. 6 of 1974).

to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms⁶ .” Hence, impliedly, thermal pollution is covered under this definition of pollution given in Water Act, as the (i) alteration in physical properties (ii) discharge of trade effluents (iii) injurious to the aquatic organisms- are the three components of the above definition of the term pollution and all these components are also the ingredients of thermal pollution.

WAYS TO PREVENT THERMAL POLLUTION

- I. Cooling Towers and Artificial Lakes can be built to check thermal pollution by natural processes.
- II. Use of alternative cooling agents- other than water eg; air cooled systems, oil based cooling systems.
- III. Reuse of heated water to heat up homes or buildings , rather than to release it back into water bodies.
- IV. Aforestation along the shorelines.
- V. Use of alternative source of energy: electricity generation through conventional thermal power plants is the main source of pollution. Solar energy or hydropower plants could be used to prevent thermal pollution during the process of production of electricity.

CONCLUSION

Thermal pollution is given less consideration in relation to other pollution , specially under Indian Law, but it also demands equal attention as it is dangerous to our aquatic ecosystems. Like other major pollution eg; water pollution or air pollution or noise pollution, thermal pollution also demands care and precautionary measures. UN World Water Development Report, 2014 addresses the issue “Water & Energy” in year 2014. The report said that thermal power plants using old technology are adding to India’s water stress. It also added that environmental impact of thermal power plants with wet cooling systems are major problems⁷. In 1968, “a detailed set of recommendations for thermal discharge limits were issued by National Technical advisory Committee. They include recommendations for maximum water discharge temperatures which will raise the temperature of a stream no more than 5oF; THE TEMP of cold, lower part of a lake no more than 3oF; and of temperature estuaries no MORE THAN 1.5oF- 4oF. Limit are also suggested for maximum temp. for various species of fish”⁸ .

⁶ Ibid.

⁷UNESCO, UN, Report on “Water and Energy” (March,2013).

⁸ Christopher T. Hill, “Thermal Pollution and its control”.

Similarly, “the Indian government proposes new rules to check pollution from thermal power plants. Environment Ministry has proposed stringent emission and water consumption standards. It also proposes to control emission of particulate matter, sulphur dioxide, nitrogen oxide and mercury and also cut water use by the coal based thermal power plants”⁹ .

Hence, it can be concluded that India though lacking on expressed law over thermal pollution but recognizes very well the concept of thermal pollution and is taking step in this direction to curb thermal pollution & its ill effects over aquatic life. Use of water as coolant in industries and other thermal power plants should be minimized or substituted by other ways to prevent thermal pollution. Govt. should make strict rules for industries or power plants which use water as coolant. This will minimize thermal pollution as well as other water related problems.



⁹Available on www.livemint.com (last visited on 25th nov. 2017).