Applications of Information Technology for Environmental Pollution Control

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Abstract

The last two decades of past millennium have seen great scientific and technological revolutions. IT revolution is the greatest revolution amongst all such revolutions , which has penetrated into all aspects of human life and has radically transformed the way we live. In fact IT has emerged as the fifth dimension in our day to day life. The environmental pollution has emerged as the greatest challenge to human civilization. IT has entered into the environmental pollution control aspect also. This has made it possible to have a better watch, control and monitoring on pollution generation and its environmental consequences. This paper highlights and describes the use of IT for pollution monitoring and its scope in environmental prevention decision making.

Keywords- **Information Technology, Pollution Control, Environmental Management.**

I. INTRODUCTION

The past century had been truly the century of scientific revolution. The growth rate of technology had been tremendous. The technology has not remained confined into the laboratories or academic institutes. It has percolated out. It has resulted into great industrial revolution. The industrial revolution not only charged our life style but also increased the population very rapidly [1].

The rising population demanded more energy and resource exploitation. The per capita energy and resource consumption also increased dramatically due to technological advancement. This made the life more comfortable and joyful. However the coin had a darker side also. The sum total effect of technological enhancement resulted into severe environmental degradation. The problems like global warming, climate changes, acid rains, energy crisis etc. emerged so gigantically that they became the real threat to the very existence of human being. The new concept of environmental preservation, pollution control, sustainable development etc emerged.

Side by side, information technology also developed very rapidly .It entered into each and every aspect of human life and became an integral dimension of modern civilization. IT has given solution to various problems of modern civilized life, including pollution control and environmental preservation aspect. This paper gives an insight into the various areas of pollution control where IT is helping human being.

II. WATER POLLUTION CONTROL USING IT

Discharge of waste water into river from various sources including domestic, industrial, Agricultural runoff etc results into water pollution. The waste water discharge into river results into Oxygen depletion. This is generally represented by Oxygen sag curve .The oxygen sag is a function of waste water Strength, climatic conditions and flow

rate of river .The flow rate of river is rapidly fluctuating. Here an IT base monitoring plan may be employed as follows:-

At suitable locations in the river flow rate recording devises may be installed. Simultaneously the temperature and other metrological parameters may also be recorded. All these data may be centrally monitored with the help monitoring plan. The locations of waste water discharge are also recorded. The strength of various sources is also a known parameters using streeter phelph's oxygen sag equation, the depletion of oxygen in river can be estimated along its length [2]. Consequently ,the most critical point of oxygen depletion can also be noted .Now any change in the flow conditions , the strength of waste water of environmental temperature etc. can have significant impact on the critical point of oxygen depletion and it's time of occurrence . IT facilitated to accommodate the effects of all these parameter variation in real time and thus to adopt possible control measures in appropriate time in fact by simulations studies , it is possible to try the effects of all possible parameter variation combinations and thus to decide the most critical combinations . The environmental management scheme can be designed to meet the requirements of most critical combinations and thus under other possible combination the pollution shall remain under control .

Thus IT base water pollution monitoring plan can help significantly in water pollution control decision making .

III. AIR POLLUTION CONTROL USING IT

In any residential, business or industrial area, generation of pollution is due to a variety of sources. They include highway segments also [3; 4]. The rising leveling air pollution has created havoc. Across the world the numbers of persons dying due to air pollution born disease are greater than that of vehicle accident [5] . Followed by these circumstances IT can provide excellent plan to monitor the air pollution and can assist in pollution control decision making. The IT based plan is proposed as follows:

The air pollution generated by any source gets dispersed in *x*, *y* and *z* directions. The dispersion is governed by a number of meteorological factors including wind velocity, atmospheric thermal gradient, solar radiation, humidity etc. [6] as shown in fig 1.

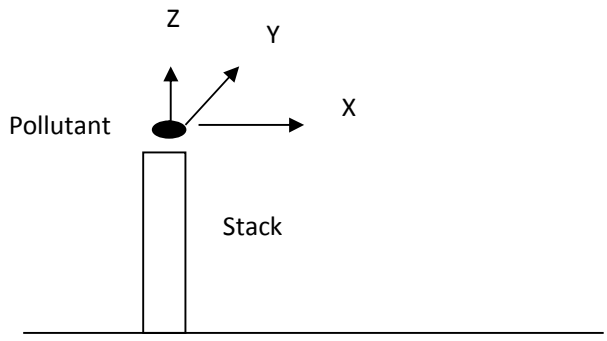

Fig 1. Dispersion of air pollutant due to natural forces.

. The air pollution due to variety of sources, at a given geo-spatial location can be estimated using Gussian dispersion models [7]. An order to keep the pollution

within permissible limits at any geo-spatial location, the permissible rate of emission from given sources can be worked out. However this approach gets complicated when there is a temporal variance in meteorological conditions. The meteorology in itself is so dynamic. Owing to the charge in meteorological parameters, the location of point of maximum pollution gets altered. If an IT plan is there, the instantaneous position of most critical air pollution point under dynamic meteorological conditions is possible to be forecasted. Under simulation studies, for varying meteorological conditions the locations of critical air pollution values can be determined. Amongst these critical points, the most critical point can be picked up. An order to keep pollution under control at this most critical point, the required control plan can be designed. It such control measures are properly designed, under dynamic meteorological conditions also the air pollution can be kept under control.

IV. SOLID WASTE MANAGEMENT USING IT

Solid waste has direct correlation with living standard with rising living standard; the quantity of solid waste generated will increase. Its characteristics will also become more complex. Today solid waste has become such a great threat to mankind; it can be explained by tow sample facts:

1. Cleanliness drives are lunched for Mount Everest also [8].
2. If the annual solid waste generated by Mumbai city is filled in trucks, they will take seven rounds of Earth [9].
3. India generates more than 60 MMT solid wastes per year from domestic sources and even more from industrial and other sources [10].

   IT can assist a lot in solid waste management.

   - IT can identify the sites getting detoriated due to solid waste using remote sensing technique.
   - It can assist in selecting suitable location for solid waste disposal using GIS Software.
   - It can assist in estimation of environmental input of solid waste disposal sites.
   - It can assist in expansion and upgrading of solid waste disposal sites.

V. CONCLUSIONS

Environmental pollution in various forms is the darker side of technological development .In fact it is an integral part of Development and mankind has to learn to live with it by controlling it .IT has a great role in all type of pollution control. Suitable IT plans can be developed to monitor the water, air or solid waste pollution .Such plans are extremely useful in decision making pertaining to pollution control. Thus we find that IT has great role in environmental protection and to make the human life healthier and happier.

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