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Environmental Change And It's Affect

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Abstract
Modern economic development sometimes disrupts nature's delicate balance. The extent of environmental pollution caused by humans is already so great that some scientist question whether the Earth can continue to support life unless immediate corrective action is taken. If left undisturbed, natural environmental systems tend to achieve balance or stability among the various species of plants and animals. Much of the world's air, water and land are now partially poisoned by chemical wastes. Some places have become inhabitable. These pollution exposes people all around the globe to new risks from disease. As a result of these developments, governments have passed laws to limit or reverse the threat of environmental pollution. The 19th century, industrial revolution placed greater pressures on the environment. Although industrial development through the control of nature and development of new products improved the standard of living of humans, this was at a great environmental cost.

Keywords: Environment, pollution, health, ground water, indicators.

1. Introduction

The solution of some environmental pollution problems requires cooperation at state, national and international levels. At the international level concern for the question of environmental health first came to the fore in 1972, when the UN sponsored a conference on the Human Environment in Stockholm. This gave birth to the setting up of United Nations Environment Programme with Headquarters in Kenya. From then on previous strategies of economic development, which ignored the environment, were no longer tenable. The United Nations Conference on Environment and Development (UNCED), better known as the "Earth Summit" held in June 1992 in Rio de Janeiro gave rise to Agenda 21 – which is a kind of a master plan designed by the nations of the world to address the problem of environmental pollution. The Agenda agrees to change unsustainable patterns of production and consumption that lead to environmental degradation.

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The recent wild degradations in the world's weather has convinced cynics and even the ordinary layman that something is wrong with the environment and they are therefore more responsive to environmental legislation no matter how unpalatable they may be.
Environmental problem is global i.e. what affects one group affects the others. Different environmental problem affects different group differently meaning that the level of vulnerability varies. There is clearly an ever-greater need to monitor the environment at a global scale, to gain knowledge of Earth's processes and how these affect and are affected by human activity. Currently, knowledge about such processes and their relationships to human activity is sketchy. Two developments, however, are improving the situation: the ever-increasing speed and power of the digital computing, and increasing data sources for environmental modeling. The ultimate aim is a global database and associated GISs that can provide information at a large enough scale (e.g., greater than 1:250,000) and with fine enough resolution (e.g. less than 250 meters) to enable environmental scientists to develop models that replicate, as near as possible, Earth's processes and assist in data integration and visualization at global scales (Zhou, 1998).

2. Environmental Change and the Health Implications

The environment plays a very important role in the upkeep of health. Since ancient times it has been recognized that promotion of environmental health keeps disease away. About 80% of diseases and one-third of mortalities in the world are related to the environment (UNCED).
The problems of environmental degradation are enormous. Disposal of sewage, industrial solid and harzadous wastes and their leaches into large numbers of open drains, river systems, soil erosion and degradation are some of the unsolved problems. These in turn affect the food security and safety or hygiene in communities. This situation promotes a variety of diseases, which cause morbidity and mortality in humans (Sridhar '99).
Air, water, and industrial pollution, impacts of climate change, stratospheric ozone and loss of bio-diversity are posing environmental health problems.

Air Pollution:
The cumulative effect of air pollution poses a grave threat to humans and the environment. Scientists believe that all cities with populations exceeding 50,000 have some degree of air pollution.
Smoke from factories, cars, industrial boilers, steel and plastic manufacturing factories generate large amounts of smoke containing metal dust or microscopic particles of complex and sometimes even deadly chemicals. This smoke combines with naturally occurring fog to form smog, which has long been recognized as a potential cause of death for those with respiratory ailments. Prolonged exposure will damage lung tissue. The American Lung Association sites sulfur-dioxide exposure as the third leading cause of lung disease after active and passive smoking (Compton's Interactive Encyclopedia, 1996).

Contaminants in the air have also been implicated in the rising incidence of Asthma, Bronchitis and emphysema – a serious and debilitating disease of the lung's air sacs. More threat is emanating from oil exploration communities due to oil spills, gas flaring and other industrial activities.

Acid Rain:

The awareness of a phenomenon called acid rain came into being in the mid-seventies. When sulfur dioxide emissions from electric power plants combine with particles of water in the atmosphere, they fall to the ground as acid rain or snow. In Canada, Scandinavia and the northwestern United States, acid rain is blamed for the deaths of thousands of lakes and streams. These lakes and streams have absorbed so much acid rain that they can no longer support algae, plankton and other aquatic life that provide food and nutrients for the fish. Scientists are concerned that the deaths of thousands of trees in the forests of Europe, Canada and USA may be the results of acid rain. (Source: Compton's Interactive Encyclopedia).

Ozone Layer:

The chlorofluocarbons (CFCs) chemicals used for many industrial purposes, ranging from solvents used to clear computer chips to the refrigerant gases found in air conditioners and ice boxes, combines other molecules in the Earth's upper atmosphere and then transform and destroy the protective ozone layer. The result has been a sharp decline in the amount of ozone in the stratosphere. At ground level, ozone layer is a threat to our lungs, but in the upper atmosphere ozone works as a shield to protect against ultraviolet radiation from the sun. If the ozone shield gets too thin or disappears, exposure to ultraviolet radiation can cause crop failures, spread of epidemic diseases, skin cancer and other disasters. In 1987 more than 20 nations signed an agreement to limit the production of CFCs and to work toward their eventual elimination.

Early in 1992, scientists detected alarming concentrations of ozone-depleting chlorofluorocarbons (CFCs) and halons over the North Pole. Also an ozone hole was discovered over the Antarctica, permitting dangerous levels of ultraviolet radiation to penetrate the Earth's atmosphere. If the same scenario were repeated on the North Pole, this would cause serious health problems for the people in the EU Countries, Canada and the USA. An agreement was later signed to phase out CFC production used mainly in refrigeration by the year 2000 AD.

Water Pollution:

Factories sometimes turn waterways into open sewers by dumping oils, toxic chemicals and other harmful industrial wastes into them. In mining and oil-drilling operations, corrosive acid wastes are poured into the water. In some towns raw sewerage are still being poured into streams. Septic tanks and cesspools used where sewers are not available may also pollute the groundwater and adjacent streams, sometimes with disease-causing organisms. Water and sanitation related diseases include malaria, diarrhea, cholera, gastro-enteritis, parasitic infections, guineaworm, typhoid, schistosomiatis and hepatitis etc.

Industrial Pollution:

Industrial pollution directly affects health through serious chemicals and organisms they discharge depending on the nature of the industry. These chemicals beyond a specified limit impart adverse effects on human health. The effects are seen in the heart, blood, kidneys, reproductive organs, lungs and liver.
Industrial wastes (liquid and solid) are disposed of untreated or improperly treated. They find their way into surface and ground waters, land and other ecosystems.

Land and Soil Pollution:
Land is a recipient of most of the wastes. Effluents and polluted waters are used for irrigation purposes in some countries. Some chemicals and the microorganisms are absorbed on the plant surface. In USA the use of compost manure obtained from sewage sludge is questioned for use on edible crops for the fear of heavy metals. Food acquires many of the toxic chemicals deliberately or ignorantly added to it. Anidine in food resulted in 2,000 deaths in Madrid.
In order to sustain the continually growing human population, current agricultural methods are designed to maximize yields from croplands. Agricultural pesticides are designed to deter or kill insects, weeds, fungi or rodents that pose a threat to crops. When airborne pesticides spread drift with the wind or become absorbed into the fruits and vegetables they are meant to protect, they can become a source of many illness, including cancer and birth defects. DDT provides a best-known example of a pesticide, which is a highly regarded because it reduced the incidence of malaria throughout the world. There is now evidence that it might be doing more harms than good. Health of workers on cotton growing soils has been at risk due to pesticide sprays and contaminated land.

Radioactive Pollutants and Nuclear wastes:
The large amounts of smoke and dust thrown into the atmosphere during a nuclear bomb explosion e.g. Hiroshima, Japan, August 6, 19945; accidental nuclear disaster e.g. April 26,1986, Chernobyl nuclear power plant, where large amounts of radioactive materials were release into the atmosphere and various nuclear weapons testing going on around the world, directly affects the environment. The long-term effects of exposures to these radioactive materials are cancer, birth defects and skin diseases.
Another immediate environmental problem is the disposal of nuclear wastes. Radioactive materials are highly dangerous for many thousands of years. There is a need to find a permanent safe method of disposal of these high level radioactive wastes. Even temporary storage of these wastes is dangerous and expensive.

Heat Pollution:
Heat pollution is a consequence of the rising energy needs of man. A very small rise in the average temperature of the Earth's surface could produce profound climatic changes. Some experts believe that it would cause the Greenland and Antarctic ice caps to melt, raising ocean levels and inundating large areas of land.
In 1990 the International Panel on Climatic Change (IPCC) which was established in 1988 by UNEP and World Meteorological Organisation (WMO) to coordinate the

various available knowledge in this field reported that a warming of the global climate 2^{o} to 5^{o}C could be expected by the 21st century, If no action is taken to curb greenhouse gas emissions (primarily carbon dioxide but also Methane, CFCs and Nitrous oxides etc). There was a prediction of a warming that is 10 to 100 times faster than ecosystems have ever faced before. There was also accompanying prediction of sea level rise, storm surges and coastal flooding drought and desertification and severe ecological disruption which global warming will bring to different parts of the world.

Oil spills

Oil exploration in the oil producing countries have resulted in massive oil spills and gas flaring with devastating health hazards. The developing countries (e.g. Nigeria) are the worst hit, where no adequate provisions were made to curtail its after effects. Land and water are contaminated and economic activities of the immediate community are paralyzed.

3. Environmental Health Research

In a 1978 conference, the World Health Organization (WHO) identified areas of major public health concern. These include environmental protection, water fluoridation and improved disease surveillance and control. In some countries, attempts have been made to reduce human exposure to harmful chemicals in the environment by establishing restrictions on smoking in public places and on automobile emissions, industrial use of chemicals and hazardous waste disposal. Many health problems are preventable and treatable through changes in behaviour.

The World Health Organisation (WHO) defines Environmental health as the control of all those factors in man's environment, which exercise a delirious effect on the physical, mental and social well-being. The science and art of preventing disease, prolonging life and promoting health and human efficiency through organized community efforts is known as public health. Modern public health practice involves the collection, analysis and use of vital health records to establish or influence public policy. Public health efforts are influenced by history, culture, society, scientific progress and need. Thus its professionals often comes from many different fields, including biomedicine, agriculture, engineering, environmental planning, architecture, behavioral sciences, government and law. Environmental public health is concerned with the community's physical surroundings. Its programmes focus on epidemic disease control, sanitation and hygiene and the elimination of exposure to toxins in the air, water and food.

3.1. GIS and Remotely Sensed Imagery as a Tool

The challenges of the information age are largely in terms of efficient information processing and interactive communications across traditional disciplines. The emergence of GIS has revolutionized the procedures for handling spatial information. The spatial referencing of observations is the salient feature of a GIS. Location in spatial data has a major implication in the way they can be analyzed and in fact leads to two different types of spatial effects – spatial dependence and spatial heterogeneity. Conventional topologies in GIS recognize some or all the following classes of spatial data: points, lines, areas, spatially continuous or 'field' data and spatial interaction or 'flow' data (Gatrell, 1998).

Spatial information processing in the context of GIS involves the collection of data; the modeling and rendering of spatial features; the processing and analysis of the patterns and inferences and finally the communication of the resulting information to the users of the system. The principal objective is to enable the users to see the patterns of spread and other features using appropriate interactive visualization tools and procedures.
A disease is a condition that impairs the proper function of the body or of one of its parts. Every disease has a cause, although the causes of some remain to be discovered. Every diseases displays a cycle of onset or beginning, course or time span of affliction and end, when it disappears or it partially disables or kills its victim.
The integration of spatial diffusion forecasting models into a GIS would improve our understanding of the epidemiology, transmission dynamics and control of infectious diseases of humans (Cliff *et al,* 1988). It will help to forestall the spread of these diseases, which poses a continuing threat to public health, particularly in the developing nations. The display, generation of maps and reports using an appropriate developed program will greatly reduce the time for the processing and presentation of results of surveillance data that is required for prompt intervention of the spread of a disease. Monitoring of patterns and forecasting of diseases incidence is best studied in a GIS package.
Gatrell and Senior, 1998 report that there is a growing number of researchers exploring the usefulness of satellite imagery in understanding the ecology of tropical diseases such as malaria e.g. use of coarse- resolution satellite imagery and derived NDVI measurements in modeling malaria transmission.
Since the late eighties, there has been considerable progress in the use of GIS and spatial analysis for health research. In epidemiology considerable advances has been made in the development of methods for the detection of clusters of health events; together with productive links between statisticians, epidemilogists and geographers in demonstrating the usefulness of GIS-based approaches.

3.2. Environmental Indicators

As defined by Kalensky *et al*, 1998 Environmental Indicators are measures representing specific environmental conditions. They should facilitate an objective and uniform environmental assessment of a country or an ecological region, monitoring environmental changes, forecasting trends and providing early warning information. The concept of environmental indicators has been adopted by all major United Nations bodies involved in environmental issues (e.g. WHO, UNESCO, UNEP etc.).
Types of Environmental Indicators:
There are four types of environmental indicators:
(a) *Environmental state indicators* – representing the current environmental status.
(b) *Environmental change indicators* – representing the change in environmental conditions for a given time interval (for example for the past ten years).
(c) *Environmental trend indicators* – forecasting the trends of environmental change.
(d) *Environmental response indicators* – representing corrective action towards the restoration of environmental quality or best practices to adopt under the changed conditions.
The knowledge of the environmental trend indicators is essential to the realistic setting of environmental protection priorities.

The example below further facilitates an understanding of the environmental indicators:
Environmental Condition:

3.3. Pollution of ground water.

- *State Indicators:* location and extent of area effected by contaminated ground water (e.g. amount of mercury in mg/I).
- *Change Indicator:* increasing amount of specific pollutants in ground water at the given location.
- *Response Indicators:*

- arranging alternative water supply;
- stricter regulations for mining operations regarding the discharge of pollutants and their systematic monitoring, yielding measurable improvement in the quality of ground water. (Kalensky *et al.*, 1998).

Conclusion

The advent of massive oils spills, washing up of medical and industrial waste on shores and an increased build-up of toxic wastes with devastating health hazard calls for urgent action on ways of preventing environmental abuses and heightening public awareness on environmental issues.

There is a need to strengthen disease surveillance and monitoring keeping in mind the special or peculiar environments. The data should be properly and adequately documented, updated and disseminated.

The combination of remote sensing from earth observation satellites with GIS, GPS and internet, provides the technological means for continous monitoring and assessment of environmental conditions at the national, regional (continental) and global levels.

Global Environmental Information Systems is indispensable for the sustainable management of natural resources, operation of early warning systems against natural disasters, diseases as well as for the development of mathematical models for effective mitigation of their consequences.

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