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अनुक्रमणिका (INDEX)

| अ. क्र. | प्रकरण | संशोधक | पृष्ठ क्रं. |
|---------|---|---|-------------|
| १ | PLANS, POLICIES AND PROGRAMMES FOR EMPOWERMENT OF WOMEN | Dr.Mohamad Mustafa A. Muja war Nadwi | १ |
| २ | EMPLOYEE SAFETY MEASURES FOR BETTER WORKING CONDITION | Wilson Kandre | १२ |
| ३ | A study of Changing face of Indian Banking Sector through Information and Communication Technology: A critical Review | Dr. Dilip Mohanrao Misal | १५ |
| ४ | Electronic Resources Management | Miss. Yadav Shyamla Chandrakant Dr. Ghumre Shivshankar K | २१ |
| ५ | A STUDY OF WORKING AND GENERATION OF SELF-EMPLOYMENT BY SELF HELP GROUPS IN AURANGABAD DISTRICT | Dr. Anjali Jairam Bhusare | २५ |
| ६ | Potarajacha Por: A Reading | Dr. Ramesh A. Landage | २८ |
| ७ | Women Empowerment through Self-help Groups in Nashik City | Dr. Nitin Bhatu Songirkar | ३२ |
| ८ | The Greenhouse Effect and Its Impacts on Environment | Dr. Mirza Wajid Rustum Baig | ३७ |
| ९ | STATUS OF WOMEN IN INDIA | Dr. Vanita Sable-Chavan | ४२ |
| १० | Redescription of the soil nematode genus Axonchium Cobb, १९२० (Nematoda: Dorylamida) | Kumbhar K.A. Kale M.K | ४४ |
| ११ | Women Empowerment: Issues and Challenges | Mano har S.S. Dr. Sunita Watore. | ४८ |
| १२ | Social Trends and Directions in Physical Education Sport and the Society | Dr. Tanpure V.S. | ५३ |
| १३ | Citation Analysis of Doctoral theses awarded by Shivaji University, Kolhapur during १९७२-२०१२ in the subject of Environment Science | Mrs. Shobha G. Dolas Dr. Shalini M. Sakharkar | ५६ |
| १४ | TO STUDY THE PREVALANCE OF FREE LIVING PROTOZOAN FROM NAGINA GHAT, NANDED (MAHARASHTRA) | Jadhav P.B Kale M.K | ६० |
| १५ | A Great Social Reformer - Maharshi Dhondo Keshav Karve | Dr. Vanita Sable-Chavan | ६३ |

The Greenhouse Effect and Its Impacts on Environment

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Abstract - The buildup of so-called "greenhouse gases" in the atmosphere - CO₂ in particular - appears to be having an adverse impact on the global climate. This paper briefly reviews current expectations with regard to physical and biological effects, their potential costs to society, and likely costs of abatement. For a "worst case" scenario it is impossible to assess, in economic terms, the full range of possible non-linear synergistic effects. In the "most favorable" (although not necessarily "likely") case (of slow-paced climate change), however, it seems likely that the impacts are within the "affordable" range, at least in the industrialized countries of the world. In the "third world" the notion of affordability is of doubtful relevance, making the problem of quantitative evaluation almost impossible.

Keywords - Greenhouse gases, History of Greenhouse gases, sources of Greenhouse Gases, Impacts, and How to reduce Greenhouse effect, conclusion

Introduction : The sun's energy is emitted as heat radiations. Some of the radiations from the sun reach the earth's surface. Some of these are absorbed and retained by the earth's surface. Then again some of the absorbed heat is re-radiated by the earth into the atmosphere. There is an energy balance between the heat energy reaching the earth and the heat energy that is re-radiated into space. This energy balance determines the earth's surface temperature. It is important to maintain the earth's surface temperature within a range in which life can exist.

Excess accumulation of some gases like carbon dioxide, methane, chlorofluorocarbons (CFCs), ozone and water vapour are responsible for disturbing the energy balance and thus increasing heat on the earth. Fossil fuel based industries and the man's life-style have resulted in an unprecedented rise of these gases, known as greenhouse gases. This is because they act in lower levels of the atmosphere like the glass of a greenhouse. We have seen a greenhouse, which is covered with a glass. It allows the sun's rays to penetrate into the greenhouse but blocks the radiation of heat from the greenhouse but blocks the radiation of heat from the greenhouse, back into the atmosphere.

Greenhouse gases in the atmosphere allow the near infrared rays from the sun to penetrate into the earth. But these gases do not allow the heat radiated by the heated earth to penetrate back into space. Thus, by preventing heat rays to escape into the outer space the greenhouse gases add to the heat already available on the earth's surface. This increase in temperature due to the concentration of the greenhouse gases is known as the greenhouse effect.

The greenhouse effect is not confined to particular region but has a global impact. If unchecked, accumulation of these gases from industry and agriculture could change temperature and rainfall pattern and sea level of the earth. By realizing the potential danger of these gases to the earth, the United Nations Environment Programme (UNEP) used to talk about this danger. The slogan was given on World Environment Day, June 5, 1989.

HISTORY OF GREENHOUSE GASES :

The existence of the greenhouse effect was argued for by Joseph Fourier in 1824. The argument and the evidence was further strengthened by Claude Pouillet in 1827 and 1838, and reasoned from experimental observations by John Tyndall in 1859. The effect was more fully quantified by Svante Arrhenius in 1896. However, the term "greenhouse" wasn't used to describe the effect by any of these scientists; the term was first used in this way by Nils Gustaf Ekholm

in 1901. In 1917 Alexander Graham Bell wrote. The unchecked burning of fossil fuels] would have a sort of greenhouse effect", and "The net result is the greenhouse becomes a sort of hot-house." Bell went on to also advocate the use of alternate energy sources, such as solar energy.

Sources of Greenhouse Gases :

Global warming is the consequence of the Greenhouse effect.

The following five gases are mainly responsible for the Greenhouse Effect and Global Warming:

- (i) Carbon dioxide (CO₂)
- (ii) Methane (CH₄)
- (iii) Nitrogen oxide (Nitrous oxide)
- (iv) Chlorofluorocarbons (CFCs)
- (v) Water vapour

Other gases which also contribute to the greenhouse effect and global warming are - Sulphur dioxide (SO₂) and Ozone (O₃). Contributions of the different gases to greenhouse and global warming are given below.

Carbon Dioxide:

In the natural 'carbon cycle', atmospheric Carbon dioxide is normally absorbed by two major 'sinks' - (i) plants which absorb CO₂ during the process of 'photosynthesis' and (ii) the oceans. But we produce more CO₂ at a rate faster than the sinks can absorb it. Therefore, the level of CO₂ in the atmosphere is increasing day by day.

The primary source of Carbon dioxide is the consumption of fossil fuels like coal, oil, petroleum, etc. The secondary source is the oxidation of carbon compounds in marshes and forests by natural degradation. Manufacture of cement is another factor contributing to increase of Carbon dioxide in the atmosphere.

METHANE (CH₄)

Methane is known to trap heat five times more effectively than CO₂ in the atmosphere. Moreover, Annual Methane release rates from different sources at global level.

| Sr. No. | Source Methane release | rate Per Cent |
|---------|------------------------|---------------|
| 1. | Natural wetlands | 21.3 |
| 2. | Rice paddies | 20.4 |
| 3. | Biomass burning | 10.2 |
| 4. | Enteric fermentation | 14.8 |
| 5. | Termites | 7.4 |
| 6. | Landfills | 7.4 |
| 7. | Gas drilling | 8.3 |
| 8. | Coal mining | 6.5 |
| 9. | Oceans | 1.9 |
| 10. | Other sources | 1.8 |
| | Total | 100 |

Source: Minami (1900).

Methane due to oxidation, gives rise to Carbon dioxide and water vapour-both of which are greenhouse gases.

CHLOROFLUOROCARBONS (CFCs)

Concentration of CFCs is rising at the rate of 5 per cent per year. It has been estimated that these gases are responsible for 15 to 20 per cent of the global warming. These gases are also responsible for Ozone layer depletion.

Chlorofluorocarbons are used in foam aerosols, solvents, air conditioners, refrigerants, etc. we shall study about the Chlorofluorocarbons in Chapter 21 of this book while dealing with Ozone layer depletion.

NITROUS OXIDE (N₂O)

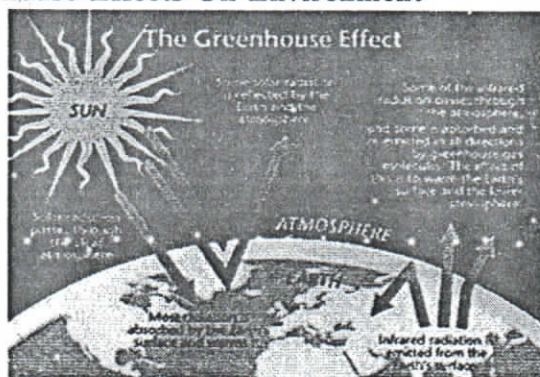
N₂O is a greenhouse gas. It is 230 times more efficient in global warming than CO₂. It is also responsible for the destruction of Ozone layer. The concentration of nitrous oxide is rising at a rate of 0.3% per year and is responsible for at least 6% of the total global warming.

N₂O is produced by burning of forests, grassland and other biomass. Other sources of N₂O are inland water, oceans, natural soil and nitrogenous fertilizers used in agriculture.

WATER VAPOUR

Water vapour is also responsible for producing the greenhouse effect. Because of the rise in global temperature, transpiration and evaporation increases water vapour concentration in atmosphere. This phenomenon produces more global warming.

Impacts Of Greenhouse Effects On Environment



The greenhouse effect will not only result in global warming but will also affect various natural processes.

- 1) **Effect on human society and agriculture:** It is estimated that the earth's mean temperature will rise between 1.5 to 4.5 by middle of twenty first century by greenhouse effect. This will greatly affect the human society and agriculture in various parts of the earth.
- 2) **Decline in Precipitation:** Some scientists believe that increase in temperature due to increased greenhouse effect would cause decrease in precipitation and soil moisture content in the most developed agricultural regions of the world. As a result of this the whole ecosystem may be adversely damaged.
- 3) **Increase in the level of acidity in ocean:** with increase of carbon dioxide in the atmosphere, the oceans would be required to absorb more and more carbon dioxide. More absorption and decomposition of carbon dioxide in the oceans would raise their normal level of acidity. Increase in oceanic acidity would decrease biological productivity of the marine ecosystem and declined plant cover in the oceanic areas would change the albedo of the ocean surface.
- 4) **Rise in sea level:** The increased surface temperature would cause melting of continental and mountain glaciers and polar ice caps. The melt water raises sea level and thus would cause flooding of coastal areas of lowland countries. Bangladesh would be submerged under sea water and consequently about billions of people would lose their agricultural lands and homes.
- 5) **Effect on Atmospheric Processes:** The concentration of carbon dioxide may increase to such an extent that the total atmospheric pressure would be increased. The outgoing

long wave terrestrial radiation which would in turn increase the surface temperature to such an extent that all the atmospheric processes which are now responsible for the existence and sustenance of all life in the biosphere would come to grinding halt and everything then would be over. This is an extreme situation which is unlikely to occur and this should not occur.

- 6) Depletion of ozone layer: the impact of greenhouse gases is almost expected to intensify the depletion of ozone layer in the atmosphere, which would cause further rise in temperature of the earth's surface.

WHAT NEEDS TO BE DONE:

Emission of the greenhouse gases can be controlled by taking the following steps:

- (a) Reducing the emission of the greenhouse gases in the atmosphere.
- (b) Preparing for adapting to the changing situation in the future.

REDUCING GREENHOUSE GASES:

1. Combustion of fossil fuels is the main cause of increase in the level of Carbon dioxide in air. We have to plan for alternative fuels such as solar energy, hydrogen or atomic energy, hydro-electricity etc., to reduce the emission of Carbon dioxide in the atmosphere.
2. Deforestation must be checked and efforts should be made to develop new forests by encouraging tree planting programmes. This is because forests act as Carbon dioxide sinks and helps to reduce the CO₂ concentrations and thereby reduce the greenhouse effect.
3. The emission of nitrous oxide should be reduced by regulating the application of nitrogenous fertilizers. Biofertilisers and other soil nutrients are to be used.
4. The developed countries should bear the financial responsibility for implementation of programmes aimed at controlling emission of the greenhouse gases. The developing countries should be helped by developed countries in the conservation of forests and development of new forests.

ADAPTING TO NEW SITUATION :

1. We should think of ways for adapting to the changed situation of global warming. As for example, if there is a rise in the sea-level arrangements have to be made for rehabilitation of people living in the low coastal areas.
2. For the development of highly salt resistant crop production on the saline lands, varieties may have to be developed biotechnologically to replace the existing ones.
3. Thus adjustment with the changed situation by changing the place of cultivation, time of sowing, by making arrangement for proper irrigation, using fertilizers in conformity with the soil reactions and adoption of sound management practices may help the situation.

CONCLUSION :

This study has shown that activities related to power generation and energy consumption has associated emissions with potential to influence greenhouse gas which is the main source of impending global warming. In reality, anthropogenic greenhouse gas emission from other human activities. Essentially, the study also advocated the need to strategically tackle GHG reduction to prevent the sanctity of the global environmental distinction for sustainable development and biodiversity interaction. Finally, it supported the need to increase renewable energy security, energy control and health related problems. A greenhouse is built of any material that passes sunlight, usually glass, or plastic. It mainly warms up because the sun warms the ground and contents inside, which then warms the air in the greenhouse. The air continues to heat because it is confined within the greenhouse, unlike the environment outside the greenhouse where warms

air near the surface rises and mixes with cooler air aloft. This can be demonstrated by opening a small window near the roof of a greenhouse: the temperature will drop considerably. It was demonstrated experimentally (R. W. Wood, 1909) that a "greenhouse" with a cover of rock salt (which is transparent to infra-red) heats up an enclosure similarly to one with a glass cover. Thus greenhouses work primarily by preventing convective cooling. More recent quantitative studies suggest that the effect of infra-red) radioactive cooling is not negligibly small, and may have economic implications is a heated greenhouse. Analysis of issues of near infrared radiation in a greenhouse with screens of a high coefficient of reflection concluded that installation of such screen reduced heat demand by about 8%, and application of dyes to transparent surfaces was suggested. Composite less reflective glass, or less effective but cheaper antireflective coated simple glass, also produced savings.

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