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Urban planning and carbon budgeting

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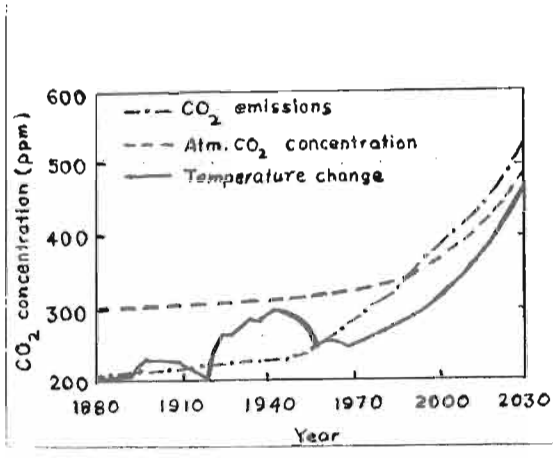
The civilization in the 20th century has seen many developments, revolutions and technological innovations. The cities have developed as a result of the changes from nomedic to agriculture to industrial and finally to information societies. Each society is a mile stone of civilization but has also fallouts creating problems for civilization and nature.

The urban development initially have created many civic and administrative problems but in the recent years it has thrown light on many other problems, which are of local origin but have global importance. The urban planner have to consider, these challenges faced, in the planning.

A city from environmental or ecological point of view is a fabricated ecosystem, it is creating more problems or stresses than solving them. "Pollution" is a word very common now but has a recent origin. It is an outcome of urban-industrial complex and due to lac of holistic planning in part of city planners. The "greenhouse effect" is one of them created locally but has global importance, it is thretening the very existance of many cities and countries of the world. It has been found that increased carbon dioxide in atmosphere produces a warning of earth's surface and the lower atmosphere. The warning of lower atmosphere is due to the increased absorption of long wave radiation from the surface, from clouds and increased downward emission from the CO_2 in the atmosphere. The doubling of atmospheric CO_2 concentration would lead to net heating of ocean, and land, by a global average of 4W/m2 or it will raise the global temperature from 1.7 to 4.5 degree centigrade. This in turn will melt the polar ice cap and mountain ice cover, the sea level will rise 1 to 2 meter, innundating several cities, changing contour of countries and some countries like Malta and Maldives will be under water. This will further change the agroclimate leading to socioeconomic and political problems globally. The figure indicates the CO_2 concentration in last 100 years and projection for the future.



Carbon dioxide emissions, atmospheric concentration and temperature change [computed]. Source E.S.P. 1981

It clearly indicates that there is a positive increases of atmospheric CO_2 in last 30 years. The increase is due to fossil fuel burning by and for urban-industrial complexes all over the world, the rate of deforestation and burning of forests in different developing countries.

On the global scale, the reservoir of carbon are atmosphere, ocean, biosphere and lithosphere. The transfer between Carbon (CO_2) source and sink (reservoir) constitutes the "Carbon Cycle". The impact of urban-industrial complex is more carbon-di-oxide than needed by "Carbon Cycle" and the extra is getting deposited in atmosphere causing green house effect. It is for this reason urban and industrial planners are supposed to concentrate on planning of "Carbon Cycle" in their local complexes.

Cities are developing due to demographic, political and economic pressures. The increase of carbon dioxide, on one hand, is due to developmental activities and pressure, on the other hand, due to deforestation carbon sinks are getting reduced. It has been projected that annual net release of carbon due to tropical deforestation and soil deterioration in 1977

amounted to 1.7 - 3.9 x 10^{15} g carbon in atmosphere. It has been estimated that potential sink for atmosphere carbon dioxide in the land biota is about 0.5 - 2.8 x 10^{15} g carbon. Thus, from ecological point, it is clear that carbon cycle is not complete or balanced and addition of CO_2 to atmosphere by men's activities exceeds then removed.

The increase in carbon dioxide need not have deterious effects. For plants the increased carbon means :-

- increased net photosynthesis.
- changed leaf area and leaf structure.
- changed canopy shape.
- changed pattern of photosynthesis allocation.
- increased water used efficiency.
- increased tolerance to toxic atmospheric gases.
- changed root shoot ratio.
- changed dates in flowering, seeding, etc. etc.

The urban and industrial development is essential for the growth, the co-ordination can be maintained by the anthropogenic CO_2 sources and development of the sink of carbon thus maintaining carbon cycling locally and reducing greenhouse effect globally.

The arthropogenic source of CO_2 are house, small and large industries, automobiles and the city slums. A variety of measures can be adapted to present, control or ameliorate CO_2 induced climatic changes. The planners are to help in local level reduction in use of fuel, collection, disposal and storage of CO_2. The carbon budgeting is needed for each local situation, which requires various strategies in part of urban planners and industrialists. However in this paper we are concentrating an urban house and town planning.

There are various ways by which emission of CO_2, CO, SO_2 etc. can be controlled in house but the adaptibility of communities is an important factor. Domestic carbon budgeting involves lesser release of CO_2 during cooking/heating process, to meet with that there are smokless ovens, stoves, but they are not in use, as the urban kitchens have not been planned to install them. In developing and underdeveloped countries the main cooking fuel is not gas or electricity but coal, charcoal, wood or dry leaves, all of these produce carbon-di-oxide and add 50-60% of atmospheric carbon dioxide in most of the Indian cities. The smokeless devices are not accepted even if given free, because their kitchen is not built to accommodate them. Some is true with solar cookers.

Therefore to reduce the carbon load of domestic origin a new approach is needed in the layout of house and kitchen. For the emission from automobiles strict traffic regulation are required and incentives are needed for fuel efficient engines.

The other strategies the urban planners have to think is with regard to the development of carbon sinks, that can use the carbon of atmosphere. The two simplest way are, to develope green cover in cities by planting trees in every open space, even for a shorter period, the tree plantation should not be aimed for timber but as the sink of carbon also the development of parks and green fields. The other is the development of lakes and ponds for the recreational purpose which lowers the local temperature of the cities and also act as carbon sink. Both of lthem can act as sink of carbon. Therefore with the development of carbon source if carbon sinks are planned then the carbon cycling will be completed in the local urban environment. This is essential for sustained growth and development.

REFERENCES :

1. JAGGER, J., Climetic and energy systems. John Wileys & sons. 1983 (a book).

2. Annual Report - Non conventional sources of energy, 1988-89 Department of Energy, Government of India.

3. Technology for the people, bullatins by Development Alternatives, New Delhi.