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SYMPOSIUM ON 'DATA BASE NEEDS FOR ENVIRONMENTAL PLANNING'

CHAIRMAN — SHRI J. S. SARMA, *Former Chief Executive Officer, NSSO and Former Research Fellow EMERITUS, International Food Policy Research Institute, Washington, D.C.*

CONVENORS : — SHRI M. G. SARDANA, *Director General, C.S.O., New Delhi* and DR. O. P. KATHURIA, *Principal Scientist, IASRI, New Delhi*

A Symposium on 'Data Base Needs for Environmental Planning' was organised on 20th January, 1989. The Symposium was chaired by the Sessional President, Shri J. S. Sarma.

Welcoming the Chairman Prof. Prem Narain, Director, IASRI lauded the services rendered by Shri Sarma in his long illustrious career in the Government of India. As Economic and Statistical Adviser in the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, Shri Sarma was responsible for shaping the agricultural economic and statistical policies of the Ministry of Agriculture. Subsequently, on retiring as Chief Executive Officer, NSSO, Deptt. of Statistics, Ministry of Planning, Government of India, Shri Sarma joined International Food Policy Research Institute at Washington, D.C. and made very valuable contributions there.

In his opening remarks, the Chairman observed that environmental problems have arisen as a result of ever-increasing demand on country's natural resources due to rapid growth in population. The environmental problems of the country can not be viewed in isolation from the environmental problems of the other countries in its neighbourhood. He felt

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that the planning of the environment and its data base needs should be viewed in a global context. He observed that a lot of data was being generated by various Central and State departments, Research Institutions and various other agnecies, as part of their normal developmental and research activities having bearing on environmental problems which should be collated and regularly monitored for preparation of database.

Five papers were presented at the Symposium. Shri R.D. Agrawal, from C.S.O. besides presenting his paper on 'Statistical System from Environmental Planning' also gave brief summaries of the papers on 'Enviroment : Overall Perspective and Data Base' by Shri K.P. Geethakrishnan, Secretary, Ministry of Environment and Forest, Govt. of India and on 'Computer Aided Data Base Management System for Water and Air' by Barla, R. Naidu and Usha Ghosh of Central Pollution Control Board, Govt. of India. The other two papers were on 'Environmental Problems in Hill Areas : Data Base Needs for Planning' by Shri R. S. Bhatnagar, Director of Economics and Statistics, Himachal Pradesh, Shimla and 'Indicators for Monitoring Land and Soil Use Pattern for Environment Planning" by O.P. Kathuria and H.V.L. Bathla, IASRI' New Delhi. Observations and valuable comments were made among others by Prof. P. K. Bose, Prof. Prem Narain, Dr. T. P. Tripathi, Dr. S. G. Prabhu Ajgaonkar, and Dr. K. N. S. Sharma.

Concluding the discussion, Chairman observed that the immediate problem in determining the data base needs for environmental planning was to identify some immediate items of environmental concern, data on which should be maintained on priority basis. The methodology to be adopted for analysis of such data and the indicator variables should be identified with a view to monitoring the impact on environment. He suggested that the data already available in records of various Central and State Governments should first be utilized. Some studies on modelling the impact of environment may also be undertaken. The following recommendations were made in the course of deliberations at the Symposium.

1. Department of Environment in the Ministry of Environment and Forest, Government of India, should be the nodal agency for compilation of data on environment statistics which should function in close collaboration with all the concerned Central and State ministries/departments. C.S.O, may assist the Department of Environment in this important and newly emerging area.
2. The exercise being conducted by the Working Group constituted by

CSO in identifying the areas of immediate environmental concern and preparation of a minimum list of priority items should be completed and the list should be circulated among all concerned.

3. There should be an exchange of information on environmental problems and the related data with the neighbouring countries.
4. Research institutions should undertake modelling studies to describe the relationship between various developmental activities and their impact on environment.

Detailed summaries of the papars presented are as follows :

1. ENVIRONMENT : OVERALL PERSPECTIVES AND DATA BASE

K. P. GEETHAKRISHNAN*

Environment is the sum total of all social, biological, physical or chemical factors that comprise the natural and man-made surroundings. It includes air, water, and land and the inter-relationship which exists among and between water, air, land and human beings, other living creatures, plants, micro-organisms and properties. The different components of the environment are inter connected, inter-related and interdependent. Any disturbance to any one of the factors, therefore, has repercussions on others, leading to transformation of the environment.

2. While economic development has, undoubtedly, led to improvements in the quality of life of our people, we have begun to realise that this has been achieved in ways that interfere with natural systems and will be damaging in the longer term. Agricultural practices, diversion of water courses, extraction of minerals, emission of heat and toxic gases into the atmosphere, denudation of forests, genetic manipulation are some examples of human interference with nature. In a developing country like India, the links between environment and development are especially evident in the vicious cycle of poverty leading to environmental degradation which eventually results in even greater poverty for the poor who depend on the natural resources to meet their needs of food, fuel, fodder and shelter.

3. Today, it is increasingly being realised that a new approach to environment and development is needed. This realisation has been respon-

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sible for the evolution of the concept of sustainable development—a development process where the exploitation of resources, the direction of investments, the orientation of technological development and institutional changes are all in harmony and enhance both current and future potential to meet human needs and aspirations. The concept of sustainable development provides a frame work for the complete integration of environmental policies and developmental strategies.

4. Environmental management—a term encompassing environmental planning, protection, monitoring, assessment, research, education, conservation and sustainable use of resources is now accepted as a major guiding factor for national development in our country. Environmental planning is the nucleus of enviromental management and assists in giving adequate consideration to the incorporation of environmental concerns in the national developmental planning process. Tne objectives of environmental planning, should therefore be (a) reviving growth; (b) changing the quality of growth; (c) meeting essential needs for jobs, food, shelter, etc.; (d) ensuring a sustainable level of population; (e) conserving and enhancing the resource base; (f) reorienting technology and managing risks; and (g) merging environment and economics in decision-making.

5. Keeping in view India's developmental policies since Independence to provide the minimum needs of food, shelter, education and health to the vast masses, environmental planning in our country must address to two sets of problems, viz. (a) those arising out of poverty or inadequate development, and (b) those which have arisen and stillcontinue to arise out of ill-planned and thoughtlessly executed development processes.

6. Certain specific techniques for carrying out environmental planning effectively include Environmental Impact Assessment (EIA); and Environmental Accounts. The essential data inputs for EIA are (a) prediction of anticipated change in the environmental parameters; (b) determination of the magnitude or scale of the change; and (c) determination of major factors causing these changes. The Environmental Accounts help to introduce environmental dimensions into development planning more systematically and quantitatively. They help to influence the strategy of development in the direction of conservation, resource replenishment, reuse and recycling—in other words — they contribute to sustainable development. The data inputs required for the environmental accounting system are evaluation and review; research; monitoring; and information exchange.

7. Consistent and accurate data on diverse aspects of environment is

a prerequisite to environmental planning and management. This should be subjected to constant refinement and updating. The data base should also be made sensitive to changing socio-economic and environmental conditions, so that relevant and timely information services could be provided to planners, thus achieving the ultimate objective of integrating environmental considerations into our developmental planning.

2. STATISTICAL SYSTEM FOR ENVIRONMENTAL PLANNING

M.G. SARDANA,* M.S. AHLUWALIA ** AND R.D. AGRAWAL*

Environment is a newly emerging area of importance in view of the increasing concern for maintaining a balance between biological productvity and preservation of genetic diversity. The environmental instability threatens human well-being and survival and, therefore, has come to be recognised as one of the most crucial problems facing mankind today.

2. Following the United Nations Conference on Human Environment held at Stocklhom in 1972, in India too several measures have been taken to tackle the problem at national and state levels. The major problem in the field of environment and ecology is integration of environmental management in the development so that national development proceeds along rational sustainable lines. However, lack of quantitative information needed for environment-related analysis as well as of a system for collecting, storing and retrieving such information have been major drawbacks for environment planners. There is also a demand for environment data from business and industry, scientists, the mass communication media and the general public. The need for development of an appropriate environment statistical system has, therefore, been stressed at various forums. An inter-disciplinary working group under the chairmanship of Director-General, Central Statistical Organisation (CSO) is currently engaged in the task of identifying the major areas of environmental concern and determining the statistical parameters on which data need to be developed.

3. Following broadly the guidelines given in the Framework for Development of Environment Statistics (FDES) issued by the Statistical Office of the United Nations, the six major components of environment considered are atmosphere; flora; fauna; water (fresh water

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and marine water); land/soil (surface and subsurface); and human settlements. While the last component 'human settlements' refers to man-made environment, the remaining components constitute natural environment.

4. FDES relates components of the environment to the following information categories : social and economic activities, natural events; environmtal imports of activities/events; ponses to environmental impacts; and stock, inventories and background conditions. The same categories are being adopted by the working group of CSO. After identification of major areas of environmcntal concern as well as statistical topics, the CSO's working group has prepared a provisional but an exhaustive list of statistical parameters pertaining to different components. It has also tried to indentify under each component and information category, items which need to be collected on a priority basis. The depletion and degradation of natural resources—land, water and forests; their effect on food and energy supply; conditions of human settlements and springing up of slums; water and air pollution; and protection of endangered species of flora and fauna, are high priority items in case of a country like India. However, it has been recognised that data to be culled out from diverse sources would require considerable efforts to attain compatability, accuracy and interlinking.

5. Some of the suggestions for future work include (a) circulation of draft report of the CSO's working group; (b) preparation of a technical report containing guidelines in regard to unit of measurement, concepts, definitions etc; (c) compilation of a compendium of environment statistics to provide time-series data; (d) updation of Directory of Environment Statistics; and (e) closer coordination between Department of Environment, Central Statistical Organisation ond other related agencies.

3. COMPUTER AIDED DATA BASE MANAGEMENT SYSTEM FOR WATER AND AIR

BARLA R. NAIDU and USHA GHOSH*

Water and air being the essential elements for the existence of life are two major components of the environment. Even today concept of pollution is mainly used for these two components. Central Pollution Control Board (CPCB) is a statutory body established to promote cleanliness of wells and streams in different areas of the States by prevention and

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control or abate air pollution in the country. A large volume of data is being generated by the CPCB through pollution assessment and abatement activities. First part of this paper gives a brief description of regular activities of the CPCB and second part concerns the efforts made by CPCB to develop, maintain and utilise computer aided pollution data management system and to develop a nation-wide network for quick transfer of data between Central and State Pollution Control Boards.

2. The activities of CPCB cover a wide range and include (a) national water quality monitoring; (b) assessment of pollution potential in river basins; (c) coastal water monitoring; (d) national ambient air quality monitoring; (e) status of water supply and sanitation in class-1 cities and class-II towns in India; (f) inventory of water and air polluting industries; (g) pollution control at source; and (h) grant of consent, cess assessment and no objection certificates. Under national water quality monitoring, for administrative convenience, the whole network is divided under three programmes, namely (i) Global Environmental Monitoring System (GEMS, 51 stations), (ii) Monitoring of Indian National Acquintic Resources (MINARS, 122 stations) and (iii) Ganga Action Plan (GAP, 27 stations). The reporting of water quality is done through 20 physico-chemical parameters, namely Dissolved Oxygen, Biochemical Oxygen Demand, Chemical Oxygen Demand, pH, Temperature, Electrical Conductivity, Nitrogen Concentration, Califorms (MPN), major cations and anions etc. Similarly air quality is regularly monitored through a number of stations with 4-hourly or 8-hourly frequency for NO_2, SO_2 and SPM parameters, under National Ambient Air Quality Monitoring (NAAQM).

3. In view of the sizeable amount of data being generated and compiled by the Central Board, CPCB decided to develop the computer-aided data management system for timely processing of information. The in-house computer facility was introduced in May 1986 with the installation of one PC/*XT*. Later, another PC/AT system was added with the assistance from National Informatics Centre, which is now connected with NEC mainframe of NIC. Alongwith the hardware, CPCB also procured readymade software packages such as dBase III + (for data management), Wordstar (for word processing), SPSS-PC (Package for Statistical Analysis). The principal objective of the computerisation programmes were to develop, maintain and utilize computer-aided data management system for (a) water quality data, (b) air quality data, (c) industrial pollution related data, (d) Basin-sun basin data, (e) cess and consent management including legal cases, and (f) sanitation status of

urban cities. Other important objectives linked with above were (a) preparation of statistical reports on regular basis, (b) environmental modelling and simulation, (c) progress monitoring and (d) assessment of pollution levels in the country.

4. The application software packages for the management of data relating to water and air have already been developed. CPCB data base at present hold about 8600 records of water quelity, 9800 records of air quality, 300 water polluting industries, 205 records of sanitation status of urban cities and districtwise information on human, cattle population, land use, fertiliser and pesticide inputs for 3 major river basins. A national environmental pollution data network is being developed by extending the computerisation programme to the State Pollution Control Boards. It was expected that by the end of March 1989, at least 14 out of 18 State Boards will have the necessary infrastructure to start functioning. Central Board is planning to organise two training courses in 1989 for State Boards and distribute the application softwares developed at the CPCB. The CPCB is also coordinating with National Informatics Centre to have on-line connections between Central and State Boards through their nation-wide network NICNET.

4. INDICATORS FOR MONITORING LAND AND SOIL USE PATTERN FOR ENVIRONMENT PLANNING

O. P. KATHURIA* and H. V. BATHLA*

In this paper issues concerning environment of the surface land and the soil have been discussed. Indicator variables/statistics needed for identification of environmental problems in relation to land use and soil management have been suggested. Broadly, the indicator variables that would need to be monitored for measuring the impact on environment of land and soil may be studied in terms of the following factors :

Impact of Depletion of Forest Resources

The country has been losing good forests at the rate of 1.5 mh per annum. The area under good natural forests in the country in 1984-85 (i.e. at the end of 6th five year plan) was no more than 33 million hectares. The total area planted between 1951 and 1980 was 3.56 million hectares giving an average of 0.11 million hectares per year. During the period 1980-85 the area afforested was 4.65 million hectares and the targets

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achieved during 1985-86 and 1986-87 were 1.51 and 1.76 million hectares respectively. Yet, according to official statistics, the area under forests has remained constant at around 67 million hectares over the decades. Moreover, social forests and urban forests are strictly not forests. The areas planted under these categories should have been listed separately.

Demand and supply of major and minor forest products, their actual production and pattern of consumption in different sectors of the economy are other important factors which need to be continuously monitored. The feasibility of collecting comprehensive statistics of consumption of timber by various organised and unorganised sectors should be examined and these should be compared with the official estimates.

Impact of Over Grazing

According to land utilisation statistics the total area available for grazing including the area under permanent pastures and miscellaneous tree crops and groves, cultivable wastelands and fallow lands etc. amounts to 40.45 per cent of the total reporting area. While this area has more or less remained stagnant over years, there has been a phenomenal growth in the livestock population from 292 million in 1951 to 369 million in 1977 and 419.5 million in 1982. Between 1951 and 1982 while the area under agriculture increased by about 13 per cent, livestock population increased by 42 per cent thereby increasing pressure on grazing resources thus resulting in fast degradation of forest and grazing lands. During the period 1982-87, the livestock population must have increased by another 55 to 57 million heads without any corresponding increase in the grazing land. The consequence of grazing in the arid and semi-arid region in India is that the rich grasses get replaced by coarse ones, and finally by the annuals and the weeds.

Effect on Top Soil and Water Loss

With heavy livestock pressure and increasing human population resorting to indiscriminate removal of bushes and felling of trees in order to meet their ever increasing feed and fuel wood requirement, the soils of root zones get loosened resulting in heavy loss of top soil and increased intensity of run off. The increased run off in the catchment areas of rivers carrying the top soil results in rise in the bed level of rivers in the plains and consequently causing floods during periods of heavy rainfall. Of late, the incidence and intensity of such floods is increasing. The rate of siltation in the reservoirs which is the direct outcome of level of turbidity in water also goes higher than expected.

Impact of Cropping Systems and Management of Inputs to Crops

The increase in agricultural production in the country is attributable to a limited extent to increase in net area brought under cultivation and more to higher productivity achieved through application of higher doses of inputs like chemical fertilizers, irrigation, better crop varieties, pesticides etc. Continuous use of chemical fertilizers without adequate drainage of fields has made the soils saline/alkaline.

Monitoring of soil test values of available primary and secondary plant nutrients and its moisture level over time may help in identifying the environmental problems of cultivated and cultivable lands. Intensive cropping systems with continuous cultivation of cereal and cash crops in areas with adequate water availability is another factor, affecting the quality of soil. Cropping system followed in different regions/state should also provide a good indicator of the health of crop and area.

Pesticides, insecticides, weedicides and herbicides though essential for control of pests and diseases of crops and unwanted plants have become major environmental hazards. Most of these agro-chemicals are known to be used on the plants indiscriminately. It is necessary to monitor the toxic residues of agrochemicals left in plants and soils and their threshhold values should be determined by specialists in the respective areas.

Statistical Research in Monitoring the Suggested Indicators

Data on a number of indicator variables mentioned in the preceding sections may be available in records of different departments of Central and State governments which arise as by-product of normal functioning of these departments and in reports of projects of Research Institutions and Universities. Statistical techniques may help to explain the relationship of these indicator variables with each other. Some broad areas requiring development of suitable statistical models/techniques are study of relationships between intensity of grazing, loss of top soil and rate of run off with the level of turbidity in river water and the rate of siltation in reservoirs; study of the dynamics of tree stands in relation with availability of harvestable trees, estimation of rate of regeneration, tree density and proportion of gaps in areas where clearfelling has taken place etc.