

RESTRICTED

REPORT OF THE
REGIONAL ADVISORY TEAM
MISSION TO INDIA

28 August - 13 September 1977



UNITED NATIONS ENVIRONMENT PROGRAMME
Regional Office for Asia and the Pacific
Bangkok, Thailand

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Foreword

The Regional Advisory Team (RAT) of the UNEP Regional Office in Bangkok was organized to help provide advisory services to the countries in the ESCAP region. As such it responds to specific requests and also undertakes country missions of an overview nature as required by countries.

Early in 1977 the RAT visited the five ASEAN countries and had extensive discussions with environment officials of those countries. As a result of those consultations, an ASEAN Sub-Regional Environment Programme (ASEP) was formulated.

The present mission to India is a start in a similar direction for the South Asia subregion.

Because of tight schedule of commitments, it was not possible to have all three members of the RAT in the mission and only Dr. R.M. Lesaca, Team Leader and Dr. Dhira Phantumvanit, Regional Adviser comprised the Mission. The third member, Mr. M.K. Banjitsinh, however, is a senior Indian official on deputation to UNEP and therefore familiar with Indian conditions, particularly with respect to wildlife and nature conservation. He was away on another mission at the time of the visit.

This report is based mostly on the briefing visits and information contained in information material, reports and other documents made available to the RAT. The RAT in their individual capacity is solely responsible for this report which does not necessarily reflect the opinions of UNEP or the government.

For convenience the report is divided into two parts. Part One deals with the summary and recommendations, introductory background, general information and overview of environment in India. The second or Part Two is based on detailed notes, briefings, observations during visits to sites and discussions with officials.

/Acknowledgement

Acknowledgement

The Regional Advisory Team (RAT) is grateful to the government of India for allowing this visit which enabled the UNEP Regional Advisory Team to establish direct official contacts with key agencies responsible for environmental matters.

To Dr. M. Ramachandran, Director General of the Department of Science and Technology (DST), and concurrently Chairman, Council of Scientific and Industrial Research (CSIR) we owe thanks for giving us the opportunity to become familiar with the institutional mechanisms involved in environmental work. He gave us substantive and valuable information and his staff arranged the detailed visits to the various offices and laboratories of interest to us. We are likewise grateful to the head and senior staff of the institutions and agencies we visited (too numerous to name here but listed in Annex - A), who gave us part of their precious time during our briefings.

In particular, we owe special thanks to Dr. M. Parabrahman, who, inspite of his busy schedule, accompanied us throughout our visits outside Delhi.

Lastly, we want to acknowledge the logistic support and arrangements provided by UNDP, through its able Resident Representative Mr. R. Polgar and his staff, to ensure that our mission was a successful one.

/Abbreviations

Abbreviations Used in This Report

CAZRI	-	Central Arid Zone Research Institute
CBPCWP	-	Central Board for the Prevention and Control of Water Pollution
CIFRI	-	Central Inland Fisheries Research Institute
CMFRI	-	Central Marine Fisheries Research Institute
CPHEEO	-	Central Public Health and Environmental Engineering Organization
CSIR	-	Council for Scientific and Industrial Research
CSSRI	-	Central Soil and Salinity Research Institute
CWC	-	Central Water Commission
CWPRS	-	Central Water and Power Research Station
DST	-	Department of Science and Technology
IARI	-	Indian Agricultural Research Institute
ICAR	-	Indian Council for Agricultural Research
ICMR	-	Indian Council of Medical Research
ICSSR	-	Indian Council of Social Science Research
IGPRI	-	Indian Grasslands and Fodder Research Institute
ISI	-	Indian Standards Institution
JNU	-	Jawaharlal Nehru University
NBO	-	National Buildings Organization
NCEPC	-	National Committee on Environmental Planning and Coordination (of DST)
NCST	-	National Committee on Science and Technology (of DST)
NEERI	-	National Environmental Engineering Research Institute
NIO	-	National Institute of Oceanography
PCWP	-	Prevention and Control of Water Pollution
SSA	-	Soil Science and Agriculture (Division of IARI)
UNDP	-	United Nations Development Programme

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REPORT OF THE REGIONAL ADVISORY TEAM MISSION TO INDIA

28 August - 13 September 1977

PART ONE

1. Summary and Recommendations

The Mission stayed in India for a little over two weeks during which time, discussions were held with about 60 officials from more than a dozen agencies and several UN bodies operating in the country.

Success of the Mission was insured by the full support of the office of the UNDP Resident Representative and the wholehearted co-operation of the Department of Science and Technology, the principal environmental focal point. Consultations with the officials of the various agencies concerned with environmental matters were very fruitful and an overview of the existing condition of environment in India was obtained.

1.1 General

Although the picture generally painted of India in terms of traditional economic indicators is bleak, the actual situation, as the Mission found, is quite different. True, the population is increasing at the rate of about 2.4 per cent or an addition of some 15 millions a year (equivalent to that of the entire population of Australia or Czechoslovakia), but it is equally true that its gross national product is among the 15 highest in the world. Its total industrial output is among the top ten. There is poverty on a wide scale but there is also a determined bid to overcome this through industrialization and economic development on a self-reliant basis.

1.2 Human and Material Resources

India is blessed with potentially great resources both human and material. Its trained manpower has been manning the various higher institutes of learning, research laboratories, industrial establishments and the bureaucracy. Although it suffers from the "brain drain" like other developing nations, its annual output of graduates in the various science-related disciplines for 1972 - 1973 alone was more than 127,000

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coming from a total of some 121 institutions of higher learning. The fact that it was able to succeed in exploding a nuclear device of its own, using indigenous talent and material, is indeed a tribute to Indian scientific capability.

There is a high sophistication in the design, fabrication and manufacture of modern instruments including automated ones in some of the laboratories we visited. What is lacking is the huge capital investments needed to mass produce such instruments together with appropriate mechanisms for marketing these instruments not only inside India, at various places such as laboratories and industrial plants where they are needed, but also to foreign countries as well, especially those in the ESCAP region.

Research in India is subsidized by the Government and approximately 1.1 per cent of GNP is allocated to research. Scientific research including that pertaining to environment, is highly institutionalized with at least four apex organizations or councils, the Department of Science and Technology (DST), Council of Scientific and Industrial Research (CSIR), Indian Council of Agricultural Research (ICAR) and the Indian Council of Medical Research (ICMR).

For energy supplies, India is lucky to have substantial deposits of coal, oil and natural gas. Even then India still imports oil. Bombay is stepping up its crude oil production from 2 million tons to 4.5 million tons in 1978 and offshore production from 9.4 million to 10 million tons. This will help reduce Indian oil imports amounting to an estimated 14 million tons in 1977 down to about 13 million tons in 1978 keeping in view the expected consumption growth of 7.5 per cent. Cooking gas for urban centres, however, presents some problems. Indian Oil Corporation (IOC) says there is likely to be persistent shortage of cooking gas or liquefied petroleum gas (LPG) for the next 2 or 3 years, since oil refineries are declining their LPG output. There is also less and less quantity of associated gas available from existing oil fields. Currently, IOC supplies only 400,000 tons of LPG annually.

According to some sources, moreover, there was no possibility of India becoming self sufficient in its total power requirements in the next 5 years. Hydroelectric power is being stepped up but the

demand still outstrip current supplies. In fact severe power crisis is soon likely in the northeast region, according to observers in Shillong, Meghalaya. The shortfalls by the end of the fifth and sixth plans have been assessed at 307 and 1011 megawatts respectively.

Fortunately coal is in plentiful supply and it is perhaps this factor, together with adequate deposits of iron ores, that makes possible Indian burgeoning steel industry. India is expected to be the fifth largest coal producer by 1985 and will be producing 327 million tons by 2000 with a consumption level of 313 million tons. Thus it is envisioned that India can export some 13 million tons.

As pronounced by the Minister of Industries, Indian industrial development should be healthy and balanced. Different types of industry - small, medium and large - had to grow in harmony. Growth of small-scale industry has to be at a much higher pace to widen entrepreneurial base and provide support to massive industrial development.

The implications of these industrialization thrusts on the environment are fully recognized by the Government. The fact that Parliament has passed the Water (Prevention and Control of Pollution) Act of 1974 and that a similar legislation pertaining to air is waiting enactment is testimony to such recognition.

Perhaps the single most vexing problem that faces India today is how to provide adequate housing and basic needs and services for its population. A twin approach has been launched - reduction of population growth and a steady programme of providing as many housing units as compatible with available resources. The World Bank has already indicated that it may give financial assistance to the Housing and Urban Development Corporation (HUDCO) for "sites and services" projects aimed at proper settlement of urban squatters. The City and Industrial Development Corporation (CIDCO) with the financial assistance of HUDCO meanwhile has recently announced a new housing scheme incentive - book or reserve a house any time and the earnest money and registration fee deposited will earn 6 per cent interest.

1.3 Environmental Pollution

To insure adequate public water supplies, the central government announced that about Rs 400 million will be spent in 1978 on a drinking

water scheme for "problem villages" in the entire country. Those villages are those without any source within the radius of one-mile, or which have a saline water supply only.

It is estimated that 70 per cent of the diseases that occur in urban areas are of the communicable type and 50 per cent are water-borne and thus can be easily prevented by providing safe and adequate supplies. But water-borne diseases are not the only problem. Insect-borne diseases, principally malaria, is also a threat. In fact the malaria threat is alarming since it has affected more than 400,000 people in Delhi alone, according to the Executive Councillor (Health) of the Delhi Metropolitan Council, and the number of cases has been increasing as follows:

1968	-	37 cases reported
1970	-	1,056
1973	-	3,451
1974	-	12,163
1975	-	37,879
1976	-	49,330
1977	-	101,357

Out of almost 3,000 towns in India, only about 188 have sewer facilities. Of the 142 towns with a population of 100,000 or more only about 59 towns had full or partial sewers and at least 83 had none whatsoever. Domestic water pollution in such areas is thus implied by this situation. In urban areas industrial effluent discharged into river with partial or no treatment makes the condition worse. On a national scale, water-borne disease affect an estimated 50 million or 12 per cent of the population and the annual deaths to such ailment amount to about 2 million. Rivers that are considered polluted are Yamuna River (Delhi), Ganga (Kanpur), Hooghly (Calcutta) and Sone (Bihar).

Air pollution is already a significant occurrence in at least the four largest Indian cities - Calcutta, Bombay, Delhi and Madras and in industrial areas such as Puna and Jamshedpur. This is caused by the motor vehicles, industrial stacks, power generation and open fires using wood, coal or cow dung, for domestic cooking and heating.

Noise pollution is likewise becoming a recognized hazard. In Delhi such noise has been attributed to motorbikes without silencers, mill sirens, loudspeaker aided worship at night, juke boxes and music bands.

During the mission, there was also being held in Nairobi, UNEP Headquarters, the UN Conference on Desertification aimed at focusing worldwide attention to the threat of advancing deserts and how global, regional and national actions should be taken to halt its spread and subsequently to develop such areas. Proceedings in Nairobi were carried prominently by the Indian news media. India has some large arid zones and desert areas in the western part estimated at more than 200,000 sq. kms.

1.4 Environmental Problems and Issues

The mission, in the course of its interviews and field visits, has been most impressed by the:

- a. gigantic size and population of the country
- b. poverty in certain urban centres, such as in Calcutta
- c. industrial complexes present in Bombay - Puna
- d. scientific and technological advances being made
- e. strict adherence to the policy of self-reliance
- f. elegant grandeur of its culture as manifested in ancient temples, palaces and ruins
- g. genuine concern towards improvement and protection of the environment including safeguarding the country's forests and wildlife.

The RAT's perception of India's basic environmental problems may be summarized as follows:

- a. provision of sufficient housing for the great masses of people and up-grading existing marginal human settlements;
- b. provision of the basic sanitation facilities particularly in rural and suburban areas, where populations tend to congregate;
- c. need for environmental assessment of certain development projects, particularly those that have environmental impacts, and the inclusion of environmental impact statement as a part of an approval mechanism and as a tool in development planning;

- d. insufficient information dissemination of basic environmental concepts to the general public, schools, universities and institutions;
- e. absence of air pollution legislation, which has been expected to follow the water pollution legislation passed by the Indian Parliament about three years ago and need for a more comprehensive environment legislation
- f. inadequacy of energy resources and/or supplies in suburban areas and rural settlements.

Among the environmental problem areas that had been identified, which may need some action programme, and to which the officials agreed during the debriefings, are the following (not necessarily in order of importance):

- a. urban sewerage and sewage treatment and disposal;
- b. industrial pollution control in certain selected urban areas;
- c. relocation, provision of basic services, and rehabilitation of displaced or affected populations in project areas such as impoundments, highways, etc;
- d. environmental protection of severely eroded and/or polluted coastal areas;
- e. scientific instrumentation monitoring for environmental parameters including pollution, and participation in UNEP GEMS Programme;
- f. environmental aspects of transient settlements and their proper handling and operation;
- g. environmental aspects of natural disasters, including protection of frequently affected areas;
- h. development of appropriate technology including utilization of agricultural residues and recycling and inclusion of an appropriate cell in industrial development strategies;
- i. wildlife management both on central and state level;
- j. afforestation and rangeland (grassland) management;
- k. mountain ecology studies and activities with possible establishment of an Institute of Mountain Ecology;
- l. soil erosion and watershed management;
- m. development and establishment of marine parks;
- n. adequate supply of fuel and energy supplies to rural areas to wean away the population from the traditional dependence upon scarce fuelwood and cattle manure which would be far more useful as nitrogenous fertilizer;

- o. training in environmental management for administrators and planners, middle management personnel, fresh university graduates and their acceptance by industry and environment offices;
- p. provision of more environmental education fellowships;
- q. environmental education and information dissemination to public.

1.5 Recommendations

In the light of the foregoing the following recommendations are submitted.

- a. The second phase of the UNEP project FP/1310-75-01(512) entitled "Marine Pollution Monitor and Marine Living Resources Assessment for the Indian Ocean Region" be implemented.
- b. UNEP, within its own capability, and in co-operation with governmental departments and local universities, support national seminars and workshops on impact studies of development projects that have large potential effects on environment.
- c. An exchange of scientists in marine sciences be explored, with India playing a lead role because of its advanced work in this field.
- d. Steps be taken towards the establishment of marine parks, which may serve as models in the ESCAP region, and an institute of mountain ecology with emphasis on Himalayan ecosystems.
- e. Under the leadership of DST and its NCEPC, a move be taken to start codification of environmental legislation, and providing of more funds to existing pollution control and other environmental agencies.
- f. DST and other agencies undertake a more vigorous campaign on dissemination of environmental information, particularly the results of various researches done in the country.
- g. Results of solar energy research be developed for practical application to arid areas devoid of firewood and coal resources with government subsidy if necessary.
- h. Whenever and wherever possible, recycling of certain industrial wastes be undertaken, making use of results of research work already done.

1. The DST assume a more positive posture in pointing out potential adverse environmental effects of development projects in the planning stage, without however, having to recommend outright cancellation of those projects already approved prior to establishment of DST. Certain industrial and other projects already in operation which pose serious environmental hazards may be selected by the DST for study with a view to suggest appropriate remedial action.

2. Introductory Background

2.1 Mission Objectives

As part of its functions, the Regional Advisory Team of the Regional Office undertook this mission to India, with the following objectives:

- a. To identify the key government offices and agencies involved directly with environment matters and to become familiar with some of their main activities and programmes;
- b. To meet and become acquainted with key government officials and heads of environmental agencies which would help facilitate communication with UNEP and the government of India on matters pertaining to environment;
- c. To obtain an overview of current environmental conditions in India;
- d. To identify key problem areas in the field of environment with the end view of developing a technical co-operation programme should this become necessary;
- e. To determine what pending programmes and projects the Government of India might have especially those that bear on environment and have regional implications, and which could be assisted by modest UNEP inputs.

2.2 Offices Visited

The trip was undertaken from 20 August to 13 September 1977. Research institutions located in Nagpur, Bombay, Pune, Goa and Calcutta involved in environmental work were visited as well as national environment offices in New Delhi. Notes taken during the discussions with government officials are given in para 5, and these notes formed the basis from which the following report was prepared. The list of agencies visited and government officials met is given in Annex - A, and the detailed itinerary is

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given in Annex - B. Some basic information about the country is briefly summarized in Annex - C. While in the country, some newspaper clippings on environmental matters were collected and these are shown in Annex - D. Miscellaneous publications, some of which were technical papers and reprints while others were information pamphlets or brochures detailing the work or activities of an agency or office are listed in Annex - E.

During the mission, discussions were held with officials of:

- a. four UN agencies, namely UNEP, World Bank, WHO and UNIDO in Delhi;
- b. five national government agencies, namely Department of Science and Technology (DST), and its National Committee on Environmental Planning and Coordination (NCEPC), National Buildings Organization (NBO), Central Public Health and Environmental Engineering Organization (CPHEEO), Central Water Commission (CWC) and Central Board for the Prevention and Control of Water Pollution (CBPCWP), in Delhi;
- c. a municipal corporation (Greater Bombay);
- d. four national laboratories, namely the Indian Agriculture Research Institute (IARI), Soil Science and Agriculture Division (SSA) at Pusa, New Delhi, the National Environmental Engineering Research Institute (NEERI) headquarters at Nagpur and its Zonal Laboratory in Calcutta, the National Institute of Oceanography (NIO) at Dona Paula, Goa and the Central Water and Power Research Station (CWPRS) at Pune, Maharashtra;
- e. a fertilizer manufacturing plant the Zuari Agro Chemicals, Ltd., in Dabolim, Goa; and a higher learning institute, the School of Environmental Science, Jawaharlal Nehru University in Delhi.

3. General Information on India

3.1 Demography and Government

India is the second most populous (548 million in 1971 and estimated at 625 in 1977) and the seventh largest (3.28 million sq. kms) country in the world. Its population is largely Hindu (83%) with Muslims, Christians, Sikhs and Buddhists the predominant minorities. Calcutta is the most populated city in the country with a 1971 population of 9 million living within an area of 1,370 sq. kms.

India has a federal type of government with 22 states and 9 union territories. Often referred to as the largest democracy in the world, it recently (March 1977) had national elections which saw a change of government from the former ruling Congress Party of Mrs. Indira Gandhi to the coalition Janata Party of Mr. Morarji Desai.

Although as a federated country India is similar to the USA and USSR, its governmental set-up is similar to that of UK where the electorate chooses members of Parliament and the majority or a coalition of parties select the Prime Minister. The executive branch is headed by a President, but real power is vested in the Prime Minister. There are some 26 separate ministries in the central government and are listed in Annex - C. Most responsible government jobs are named by the All-India Government Service (AIGS) which has 9 different categories - civil/administrative, engineering, railway, forest, foreign, auditing/account, revenue/finance, medical and agriculture. The Union Public Service Commission is the central secretariat of the AIGS, and administers the requisite examination prior to recruitment.

3.2 National Planning

Economic and development planning in India is centralized through a Planning Commission under the office of the Prime Minister. Recently the Government has adopted a "Rolling Plan" concept which will be employed henceforth. In this scheme, the Five-Year Plan will be formulated as before by the Planning Commission, but will be reviewed and extended year by year, to enable adjustments to be made according to changing conditions. Reallocation of funds will start in 1978 under this Rolling Plan, and every year there will be an annual operational plan with a fresh 5-year perspective. There will be no more rigid 5-year framework as before.

The Planning Commission utilizes the concept of planning for the masses under a labour-intensive policy. An economic survey, prepared in 1976-1977 just published by the outgoing government is under serious scrutiny by the new government. It seems there is a question as to the planning strategy employed and the statistical data given in the survey.

United Nations assistance, like in any other country, is funneled through the country programme of the UNDP which deals directly with the Department of Economic Affairs of the Ministry of Finance. However the

Planning Commission co-ordinates with the Department of Economic Affairs and thus has an indirect linkage with the UNDP. United Nations agencies with on-going projects or activities in India are UNDP, UNIC, UNF, UNICEF, ILO, FAO, UNESCO, WHO, IBRD (World Bank), UNIDO, ITU and WMO/ESCAP. A unique UN agency is the UN Military Observers' Group in India and Pakistan (UNMOGIP) whose office in New Delhi is a legacy of past Indo-Pakistan conflicts.

3.3 Economy

The economy of the country is largely agricultural with slightly less than half (40.9%) of the gross domestic product (GDP) coming from this sector. However, in absolute terms, this GDP is among the 15 highest in the world. Its manufacturing or industrial sector accounts for less than 14% of the GDP, but the country's industrial output is within the top ten in the world. It is only because of the large population that the Indian Gross National Product (GNP) per capita is among the lowest in the world (about \$115 only in 1976).

The railway system in India has a total length of more than 60,000 kms. and is reputed to be one of the largest employers in the world.

3.4 Climate and Topography

India has a very diverse topography and climate. Certain areas are still heavily forested while others are barren, drought-prone or desert-like.

The Great Indian (Thar) desert in the west bordering Pakistan is about 200,000 sq.km. in area. Rainfall is unevenly distributed throughout the country over the year. Areas affected by the monsoon season have periodic floods, whereas other areas see the gradual encroachment of desert conditions. Some 14 major rivers drain 85% of the entire subcontinent and some of them like the Ganga are considered holy by the Hindus.

At the southern part, climate is typically tropical, whereas the far north is temperate. Even the federal capital at New Delhi, has near-freezing temperatures during winter.

3.5 Research

Research is a highly developed area of concern in India. In 1973-74, expenditure on research and development (R & D) amounted to Rs 1.7 billion and at the end of the Fifth Five-Year Plan, India is expected to allocate 1.1 per cent of GNP to R & D. Other than the Department of Science and Technology, the three more important councils that serve as apex organizations and sponsor, co-ordinate and direct research, are the Council of Scientific and Industrial Research (CSIR), the Indian Council of Agricultural Research (ICAR) and the Indian Council of Medical Research (ICMR).

CSIR has a network of 30 national laboratories, four directorates and ten co-operative industrial research associations. Two of the national laboratories were visited by the mission, the NEERI, which has a central headquarters at Nagpur and 8 Zonal laboratories located strategically over the Indian continent, and the National Institute of Oceanography (NIO) with headquarters at Goa and regional centres at Cochin on the Malabar coast, Bombay on the Arabian Sea, and Waltair on the Bay of Bengal.

On 1 September 1977 while the RAT was in India, it was announced in the newspapers that the posts of CSIR director general and DST secretary have been merged and official orders to this effect have been issued. Some sectors have criticised the move as an attempt to dismantle the CSIR since there is also a reported move to transfer about 28 constituent laboratories, institutes and research organizations of CSIR to other government ministries, department and agencies. Some scientists, e.g. from Hyderabad and Bangalore, have registered strong opposition to the move because of the fear that the autonomy of the laboratories will be disturbed and might lead eventually to dismantling the whole original concept of CSIR.

ICAR controls 25 research institutes including three national ones, Indian Agricultural Research Institute (IARI), Indian Veterinary Research Institute (IVRI) and National Dairy Research Institute (NDRI) and three specialized institutes the Central Arid Zone Research Institute (CAZRI), Indian Grasslands and Fodder Research Institute (IGFRI) and Central Soil Salinity Research Institute (CSSRI). One of them, IARI (its Soil and Agriculture Division) was visited by the mission.

ICMR guides and finances medical research through its 8 permanent institutions.

Other research organisations that indirectly relate to environment are located in ministries. The Department of Irrigation of the Ministry of Agriculture and Irrigation has the Central Water Commission (CWC) and its two research stations, the Central Water and Power Research Station (CWPRS) at Puna and the Soils and Rocks Research Station at Delhi.

The Ministry of Works and Housing, likewise has its research arm - the National Buildings Organization (NBO) and the Central Public Health and Environmental Engineering Organization (CPHEEO).

It may also be of interest to note that NIO has adopted an incentive policy for its scientists whereby 40 per cent of the profit generated from contracted researches are distributed to the scientist workers and 60 per cent to NIO/CSIR.

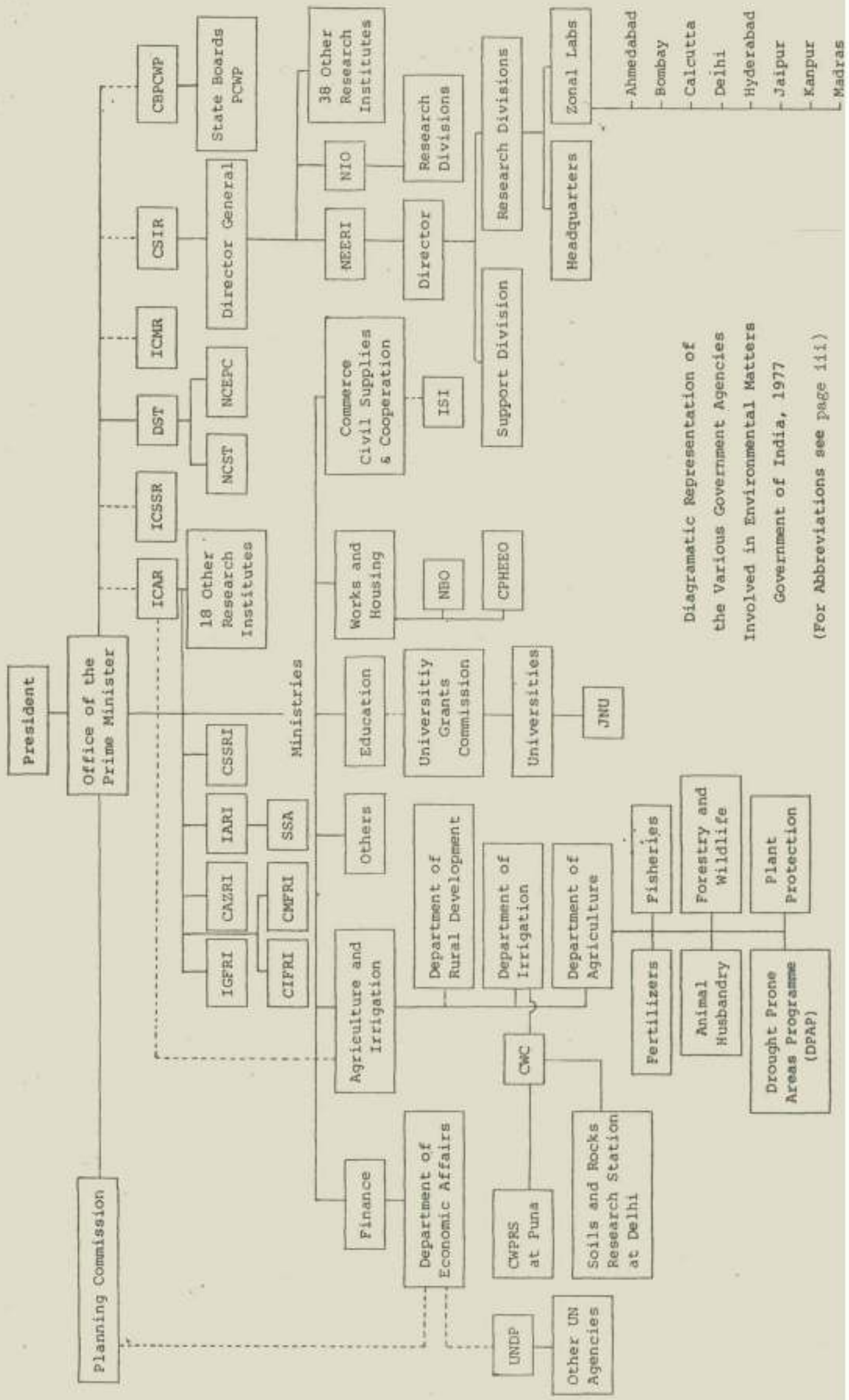
4. Overview of Environment in India

4.1 Environment Agencies

India, at present, has no Ministry of Environment or centralised agency that is solely responsible for environmental affairs. Instead, there are a number of key agencies that deal with separate sectors. Nevertheless, there are now attempts at co-ordinating all activities that bear on the environment.

A diagram of the present government structure showing the principal offices involved in environment, in particular, the agencies visited by the team is shown in the next page.

The single agency and current focal point of contact for environment is the Department of Science and Technology. It has set up, within its own internal organisational framework, two major national committees, the National Committee on Science and Technology (NCST) and the National Committee on Environmental Planning and Co-ordination (NCEPC). Both of these are working Committees that formulate high level policies and give advise to the Office of the Prime Minister.



Diagrammatic Representation of
the Various Government Agencies
Involved in Environmental Matters
Government of India, 1977
(For Abbreviations see page 141)

The Ministry of Works and Housing has a unit called the Central Public Health and Environmental Engineering Organization (CPHEEO), headed by an Adviser and a Deputy Adviser. The basic philosophy guiding this organization is environmental protection in national projects undertaken by the Ministry. Other CPHEEO functions include (a) preparation of guidelines for air and water pollution prevention, (b) provisions of guidelines on industry location to minimize environment impact and (c) enforcement of national government standards, through the Central and State Boards for Water Pollution Control and Prevention. Another function of CPHEEO is to gather information on industry needs for effluents treatment and control which are then passed on to KEERI for appropriate studies and recommended treatment or handling methods.

Another principal office is the Central Board for the Prevention and Control of Water Pollution (CBPCWP), a federal or central government agency created in the Water Act of 1974 by Parliament.

The Central Board consists of the following members all nominated by the Central Government:

- a. a full-time Chairman
- b. 5 officials representing the Central Government
- c. 3 non-officials to represent the interests of agriculture, fishing or industry or trade or any other interests.
- d. 2 persons to represent companies or corporations controlled or managed by the Central Government.
- e. a full-time member secretary qualified in public health engineering and having administrative experience.
- f. such number of persons, not exceeding 5, from the members of State Boards of whom not exceeding 2 shall be from among the members of local authorities functioning within the State.

All in all the Central Board has a maximum possible membership of 17. Its main function is to promote cleanliness of streams and wells in different areas of the State. It gives technical assistance and performs also advisory, co-ordinating, planning and organizational functions on programmes, activities and research relating to problems of water pollution and their prevention, control or abatement.

At the state level, the Water Act also created State Boards each of which consists of a full-time Chairman, 5 officials represent the State Government, 5 persons from local authorities functioning within the State, 3 non-officials to represent the interests of agriculture, fisheries, industry or trade or any other interests, 2 persons to represent companies or corporations owned, controlled, or managed by the State and a full-time member-secretary, all to be nominated by the State Government. Such State Boards are authorized to plan a comprehensive programme for the prevention, control or abatement of pollution of streams and wells; advise the State Government on matters concerning water pollution, collect and distribute information, encourage and participate in research and collaborate with the Central Board.

Already 15 State Boards have been constituted including the 12 originally covered at the time of passage of the law. Of the remaining 7 states, three are using regulations passed earlier by state legislatures. The remainder are mostly states where water pollution is not a serious problem since there are no major industries and the areas are sparsely populated. State Boards have also set up or created a State Environmental Committee that provide policy and direction, the Chairman of which is usually the Chief Minister of State.

In its laying down of general standards for interstate rivers, the Central Board consults with the State Boards and with the Indian Standards Institution (ISI). ISO formulates standards based on research studies and on demonstrated or known health effects, with participation of industry. However, the industrial sector sometimes complains that standards are too strict and would result in extra costs.

An interesting case in point is the case of the Zuari Agro-Chemicals, Ltd. (ZAC) in Goa. They claim that the total ammonia and urea nitrogen content in their plant's final effluents as discharged into Marmagao Beach can be maintained at 80 and 20 ppm respectively, by having a surface condenser or by installing a separate cooling tower. But current ISI standards stipulate 50 ppm of ammonia nitrogen as the maximum for effluents to be discharged into inland waters. The CBPCWF extended this restriction to effluents discharged into the sea with the added stipulation that the pH should be between 5.5 to 7 and that no

free ammonia enter the receiving sea waters. Thus ZAC had no option but to install a hydrolizer/stripper for ammonia which costs the plant some Rs 12.8 million.

Management of the environment is thus presently undertaken mainly by the two central government agencies, the DST and its NCEPC, and the CBPCWP which co-ordinates the work of the state Boards for the control and prevention of water pollution of all inland rivers and streams in the country.

The Department of Agriculture of the Ministry of Agriculture and Irrigation, meanwhile, takes charge of other aspects of the environment through the following divisions or offices: fertilizers, fisheries, animal husbandry, forest and wildlife and plant protection. On the other hand, the Department of Irrigation in the same Ministry, has the Central Water Commission (CWC) which is the premier co-ordinating body in all technical matters pertaining to water resources. CWC has 4 line divisions and two research stations, one in Puna and the other in Delhi. With the accumulated experience of the CWPRS staff with more than 200 studies completed, it is beyond doubt that CWPRS is one of the leading institutes in inland and coastal water resources research.

Soil and water conservation measures are being developed by ICAR to help profitable farming on nearly 50 million hectares of land which get an annual rainfall of 50 mm or less. A co-ordinated Dryland Agricultural Research Project (DARP) is operative in 24 centres in the country. A Trust Fund project, administered by UNDP/FAO, is TF/IND/136 entitled "Drought Prone Area Programme" (DPAP) and is also under the DARP project of the Department of Agriculture.

India has a number of higher learning institutions that have environmental offerings. Both curricular and teaching materials on environmental education are being prepared for use in the elementary and secondary levels. Environment education on a graduate level is a specialization in the School of Environmental Sciences of the Jawaharlal Nehru University. In addition many of the research institutes also offer training programmes on certain aspects of the environment such as mangroves, aquaculture, marine pollution, etc.

India, through the NIO, participates in the Global Marine pollution monitoring which is linked to the GEMS programme (Global Environmental Monitoring System) of UNEP and the Integrated Global Ocean Station System (IGOSS) of IOC/UNESCO. NIO also has completed the first phase (survey of institutional capabilities) of the UNEP project FP/1301-75-01(512) entitled "Marine Pollution Monitoring and Marine Living Resources Assessment for the Indian Ocean Region".

The DST, through one of its senior specialists or a Focal Point is an important partner of UNEP's International Referral System (IRS) of sources as of 31 August 1977 and perhaps is the most advanced in IRS activities amongst the developing countries. When the International Register of Potentially Toxic Chemicals (IRPTC) becomes operational India will be one of its active members with DST as the national correspondent.

In the field of human settlements, building and construction activities are encouraged by the National Buildings Organization (NBO), which also serves as a UN Regional Centre for Housing for tropical dry areas. The Housing and Urban Development Corporation (HUDCO) is a government owned corporation whose main function is to plan and implement housing programmes particularly for the urban and suburban poor. With financing from internal government and international or bilateral agencies it provides sites and services. They are urban/sub-urban developers and operate on a regular business basis.

Health services, of course, are provided by the Ministry of Health and Family Welfare. But provision of water supplies and drainage/sewerage is generally a municipal function and there is usually a water corporation within a given urban area. In Delhi, for example, there is the Delhi Water Supply and Sewerage Disposal Undertaking (DWSSDU) of the Delhi Municipal Corporation.

To finance its services and maintain the existing systems, the DWSSDU levies a uniform rate of Rs 12 per sq. meter of land area in the city, suburbs and nearby colonies served.

Because of the diversity of geographical and topographical conditions in the Indian subcontinent, there is a corresponding diversity of ecosystems which includes arid and semi-desert areas, tropical woodlands and forests grasslands, mountain ecosystems, coastal estuaries and mangroves.

There is a felt need for the establishment of an office or institute of mountain ecology to look into the environmental problems that beset the high mountains and watersheds. Already there exists a Central Arid Zone Research Institute (CAZRI) which undertakes studies and prepares programmes for controlling the spread of deserts and to develop such areas into productive agricultural lands. Likewise, the Indian Grassland and Fodder Research Institute (IGFRI) handles a similar responsibility with respect to grasslands and savannahs. Areas with saline soils are also given special attention by the Central Soil Salinity Research Institute (CSSRI). Wildlife conservation and protection of nature resources are the responsibility of the Forestry and Wildlife Service of the Department of Agriculture of the state governments.

So far there is minimal integrated approach to environment and development, and central policy appears to concentrate on industrial expansion. There is a Ministry of Steel and Mines which undertakes geological surveys and explorations, mineral development of precious and ferrous metals, and increased steel production to meet the nation's growing demands. Obviously such operations must exert strong and heavy pressures on the environment.

However the concept of appropriate technology appears to be in full implementation. There were also claims that the idea was originally implemented in the national desire to utilize unemployed people especially in the rural areas.

In the light of recent developments in integrated rural development (IRD), India has made significant advances in instituting new IRD programmes since 1975. In the past, programmes intended to increase agricultural production, such as the Intensive Agriculture District Programme (IADP), Intensive Agriculture Area Programme (IAAP) and High Yielding Varieties Programme (HYVP), actually increased regional disparities rather than reduce them. Accordingly, India switched to special programmes such as Small and Marginal Farmers Programme (SMFP), Drought Prone Area Programme (DPAP), Desert Development Programme (DPP), Communal Area Development Programme (CADP) and Rural Employment Programme (REP).

/DPAP

DPAP is in operation in 74 districts covering 13 states and effort is concentrated on optimal utilization of land, water, human and livestock resources without disturbing ecological balance. The DDP identified 16 most arid areas (10 in Rajasthan, 3 in Haryana and 3 in Gujarat) where IRD aims to raise productivity.

Other IRD programmes involve (a) provision of rural drinking water supply to 113,000 problem villages which have no source within 1.6 kms. and where water-borne diseases are endemic; (b) construction of all weather rural roads using labour-intensive construction methods; (c) rural electrification in which some 206,000 villages were electrified (as of August 31, 1977) enabling the use of 3.125 million small pumps from 90,000 kms of high tension and 100,000 kms of low tension lines; and (d) rural health schemes that are still in the planning stages.

4.2 Environmental Legislation

In India there exists a large number of relatively older legislations covering certain aspects of environment and its protection. There may be cited, for example, the Northern India Canal and Drainage Act of 1873, Bengal Smoke Nuisance Act of 1905, Indian Ports Act of 1908 and Indian Forest Act of 1927. More recent central laws are the Atomic Energy Act of 1962, Insecticide Act of 1968, the Indian Wildlife (Protection) Act of 1972 and the Maritime Zone Act of 1976. All these legislations, however, suffered from the fact that they were not necessarily envisaged with the primary objective of environmental preservation and any reference to environment was just in passing or incidental in nature.

4.2.1 Environmental Reference in the Indian Constitution

Having a parliamentary form of government, the Indian Constitution provides a federal set up with unitary features reflected in the distribution of powers between the Central (Union or Federal) Government and the State Governments. Article 48A, the Directive Principles, casts a specific responsibility on the State to endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country. The seventh schedule classifies the various legislative topics into the Union list, the State list and the Concurrent list

/referring

referring to topics that are the responsibility of the Central Government, the State Government or both, respectively. Though the topics "environment" or "pollution control" as such do not appear in the lists, various sectors are provided for specifically. For example, while water supplies, irrigation and canals, drainage, etc. is a state subject, the regulation and development of interstate rivers and river valleys encompassing more than one state is a Central subject. Again public health and sanitation, agriculture, protection against pest and diseases and prevention of plant diseases constitute state subjects, while prevention of the extension from one State to another of infection or contagious diseases or pests affecting man, animals or plants, is in the concurrent list. Forests and protection of wild animals and birds are significant examples of subjects in the concurrent list.

Current legislation in force pertaining to certain sectors of environment is briefly enumerated in what follows:

4.2.2 Water Quality

A Central legislation entitled "Water (Prevention and Control of Pollution) Act" is in force since 1974. As water is a State subject, the Central legislation was enacted under the enabling provision of Article 252 of the Constitution, on receipt of requests from some individual State Governments, conveyed to the Centre in the prescribed manner. After the central legislation was thus passed, a few more States have passed resolutions in their Legislatures adopting the Central Act. As of today, 15 States in the country have adopted the Water Act. One State (viz. Maharashtra) has a Water Pollution Control law of its own.

The Central Act provides for the constitution of a Central Board for the Prevention and Control of Pollution and corresponding State Boards. Their functions would be primarily to advise the Government on policies related to prevention of water pollution, to lay down standards and implement them. Provision has been made therein for the establishment of well-equipped laboratories, but due to lack of funds this has not yet been fully implemented. Nevertheless the Central Board and some of the State Boards, in their respective areas, have initiated extensive

river monitoring programmes with the ultimate aim of protecting or upgrading the water quality of their rivers, with the help of existing laboratories.

In addition to the Central Act mentioned above, the various State Governments have their own Water Supply and Sewerage Acts, providing, inter alia, for waste water treatment, Central and Drainage Acts and Irrigation Acts providing for proper use of water.

4.2.3 Air Quality

The Central Government is seriously considering enactment of a comprehensive legislation to control air pollution. A draft of such legislation has already been formulated by the DST and recommended to Parliament for action.

A Motor Vehicles Act is already in force, which empowers the Government to make rules for controlling emission of smoke, visible vapours, ashes and for reduction of noise caused by traffic. Besides this, a few States have their own Smoke Nuisance Act which, among others, may regulate the construction of new industrial units of a specified category coming up in any particular area.

4.2.4 Regulation of Land Use

Under the Federal structure of the Constitution, regulation of land-use and its development is a State subject, and the State Legislatures are the appropriate authorities to enact any legislation in this regard. The individual States have generally adopted the "Town and Country Planning Acts" which stipulate land-use planning and govern land-use decisions.

In addition, the various Land Revenue Regulations (which are also operated at State level) determine the use of land for agricultural and non-agricultural purposes.

(a) Slum Clearance:

Different States have enacted "Slum Areas (Improvement and Clearance) Acts" under which areas can be declared as "slum areas" if the buildings and other living conditions are detrimental to safety, health or morals by any reason of delapidation, overcrowding, narrowness

of streets and lack of ventilation. Provision is made for undertaking improvement of such areas.

(b) Urban Land Ceiling:

A Central Act called "Urban Land (Ceiling and Regulation) Act, 1976" is in force, fixing a ceiling on vacant land in urban agglomerations, regulating buildings on such land and acquiring such lands in excess of ceilings and ensuring equitable distribution of land in urban agglomerations. These provisions would, inter alia, necessitate provision of greater service facilities, which in their own turn call for detailed planning to ensure a safe and healthful human environment.

(c) Agricultural Pollution:

Legislations such as the "Insecticide Act of 1968" empower the Government to prohibit or regulate the import, manufacture and sale of pesticides. Adequate provision is made for analysis, inspection and establishment of laboratories for the purpose.

4.2.5 Preservation of Flora and Fauna

(a) Parks Preservation:

Legislations in some States provide for prohibition of alienation of any part of specified areas for any use other than for promotion of parks. Provision similarly exists where "tree authorities" are set up for both urban and rural areas and no felling of any tree can be done except with the approval of that authority. The Tree Authority is expected to carry out a census of existing trees, including those on private premises. Declarations are to be obtained from owners of such lands about the trees. The Tree Authority can specify the number of kind of trees which each locality (or type of land) shall have.

(b) Conservation of Forests:

Forest is a Concurrent subject and both the Indian Forest Act of 1927 and the relevant State Acts implemented through the respective state forest departments provide the necessary legislative support for forest management. Provision exists for declaring forests as "Reserved forests" etc., with regulation regarding the felling of timber, entry and transit, etc.

(c) Protection of Wild Life:

The Wild Life (Protection) Act of 1972 forbids the hunting of certain specified rare species of animals. Hunting of other categories of animals could be allowed only under licence. Advisory boards are set up to recommend measures for the protection of wildlife. Provision is also made for establishment of sanctuaries, national parks and for control over trade and taxidermy in wildlife and products derived therefrom.

4.2.6 Noise

General provisions exist to ensure keeping nuisance due to noise under control. Besides the Police Acts containing provisions to this effect, a few States have enacted "Control of Noise Acts" for this purpose.

The Motor Vehicles Act (under its section 70) empowers the central Government to take steps for reduction of noise caused by vehicles.

4.2.7 Protection of Cultural Property

Such legislations as "Protection of Ancient Monuments Act" and "Preservation of Antiquities Act" are intended to ensure that state cultural property are adequately taken care of and no such treasures are allowed to deteriorate or be taken out of the country.

4.2.8 Radiation

The Atomic Energy Act of 1962 confers on the Union Government full control over radio-active substances, in respect of their manufacture, possession, use, transfer, export or import and disposal. It can impose all reasonable regulations on the premises where such radio-active substances are being manufactured (a) to prevent injury being caused to the health of persons employed at such premises or other persons, either by radiations or by the ingestion of any radio-active substances, (b) to secure that any radio-active waste products resulting from such manufacture, production mining, treatment, storage or any other use are disposed of safely.

4.2.9 Marine Pollution

Certain provisions exist for control of marine pollution under the Merchant Shipping Act (Section 35(A)). India has also adopted the "Maritime Zone Act, 1976" which stipulates the extent of India's territorial waters, exclusive economic zone, etc.

4.2.10 Toxic Substances

Legislations like "Prevention of Food Adulteration Act, 1954" and "Factories Act, 1948" provide for a certain amount of control over toxic substances. Under the Factories Act, for instance, the Chief Inspector of Factories may impose restrictions on the manufacture of toxic substances if found injurious to health of workers.

There is, however, a felt need for a general Toxic Substances Act. India, incidentally, intends to become an active member or partner in the UNEP International Register of Potentially Toxic Chemicals (IRPTC) project.

4.2.11 Need for funds and implementing machinery

Legislative provisions to prevent environmental degradation can only be effective, if adequate funds and an appropriate implementation machinery is also set up, with complete facilities for monitoring and evaluation. This can be done if sufficient funds are provided to the Central and State Boards. Scientific status report giving the nature and magnitude of the problem is an essential pre-requisite for the purpose. Surveys so far conducted in this regard, especially in the field of water and air pollution control are only sporadic in nature conducted ad hoc in different parts. Undertaking a systematic survey in this field is one of the areas offering scope for international co-operation.

A centralized national authority, commission or agency on environment may soon become necessary to insure and effect co-ordination of efforts, and to provide agency leadership at the highest level. Within the foreseeable future, certainly within a decade, a permanent office of environment may become mandatory for such a large country as India which is accelerating its industrial and total development.

Neither of this is envisaged as a self-contained or isolated authority into itself. Rather, it is intended to serve as a focal or lead point in a system constituted from the full range of other offices, departments and ministries carrying out development and welfare responsibilities. The main function of this office will be to give strength and cohesion and provide leadership and direction in environmental management.

4.3 Current Conditions

Within the short time that the Mission was in India it was certainly not possible to get an extensive picture of the environmental situation for such a large country. Nevertheless, from the discussions held, reports and publications made available and actual visits and on-site observations, it is possible to outline the salient and significant conditions of the environment in India today.

4.3.1 Land and Soil

The Indian subcontinent contains 14 major river basins covering 85 per cent of the land mass. These are the Brahmaputra, Ganges, Indus, Narmada, Tapti, Damodar, Maharadi, Godavari, Krishna and Tungabhadra, Pennar, Kaveri, Perigar, Mahi and Luni rivers. Yamuna, a branch of the Ganga (Ganges) River passes through Delhi and is heavily polluted in certain sections. The city's sewage dumped after incomplete treatment into the river eventually reaches the city of Agra, site of the world-famous Taj Mahal, about 250 kms. to the southeast of Delhi and complaints have come up that Delhi's sewage could potentially enter Agra's Public water supplies.

The basins that the rivers drain are fertile but occurrence of droughts often result in loss of crops. On the other hand, rampaging flood waters bring death and destruction to many rural areas. In the western boundary of the country lies the Great Indian Desert which, as stated, is estimated to be more than 200,000 sq.kms. in area.

Coastal erosion has been reported to be a major problem on the western coast of Kerala where, during the monsoon season, long stretches of shores are exposed to the hammering action of waves. At the same time, mud banks and shoals are formed along the northern portions of the eroded area. The entire affected area is almost 360 kms. in length and represents about 60 per cent of the southwestern tip of the country.

4.3.2 Water, Sewage and Effluents

The main water pollution problem, especially outside industrial areas, is that caused by domestic sewage. Of the several hundred thousand villages in the country, only about 200 have sewage collection systems and hardly any treatment is provided prior to disposal into the nearest water course.

It was a severe outbreak of infectious (viral) hepatitis in 1955 at Delhi, where some 28,000 cases were reported, that eventually led to the establishment of the NEERI. Upon epidemiological and engineering studies, it was definitely established that virtually the entire intake of the Delhi water supply from the Yamuna River channel was drawn from a canal which was like an open sewer receiving sewage from a large population of temporarily housed refugees already suffering from the disease. After several years of experimentation, NEERI was finally able to develop 14 products for water purification; in particular the use of magnetic iron oxides to remove viruses from water.

In areas where there are significant industries operating, such as Bombay-Puna complex, industrial pollution tends to be a serious problem, particularly during the dry season or non-monsoon periods. Certain parts of rivers passing through such as industrial area may be employed by industry for disposal, but only under the advice and guidance of the State Board or Central Board in co-ordination with the CPHEEO. However, before approval to dispose effluents into a river, an industry has to notify the Ministry of Industry which in turn refers the matter to CPHEEO, State Boards or the Central Board for appropriate recommendations.

Effluent and stream standards are prepared by ISI in collaboration with DST, CSIR and the Ministry of Industry.

Among the industries that cause water pollution are chemicals, textile mills, steel mills and foundries, coal mines, and sugar mills. Agricultural wastes may also be of significant amounts.

Inadequacy of refuse collection, handling and disposal contribute to water pollution since such solid wastes eventually find their way into rivers and other water bodies.

River pollution surveys are currently being conducted in the State of Maharashtra. Meanwhile, the Indian Oil Corporation and the Indian Institute of Petroleum are collaborating on a monitoring project on pollution by oil coming from refineries and petro-chemical plants. The Steel Authority of India is also undertaking a study of air and water pollution from steel manufacturing.

In at least four states, there is a high fluoride concentration ranging from 3 - 14 ppm.

HEERI is helping in monitoring and controlling the pollution of the Hooghly River. Recycling of sewage through irrigation in rural or suburban areas is being recommended together with subsidiary aquaculture. The feasibility of this has already been shown.

Greater Bombay is planning to dispose part of its sewage into the Arabian sea and to construct a sewage treatment plant where marine disposal is not possible.

4.3.3 Motor Vehicles and Stationary Sources of Air Pollution

Air pollution is not considered serious in India except on rare occasions in some heavily urbanized areas such as Calcutta and Bombay - Puna area. But even here the air pollution levels are well below the limits considered hazardous to human health. Sources of air pollution are mostly motor vehicles, industrial plants, power generation and domestic fires using firewood, coal and cow dung dried cakes for cooking and heating.

A notable case that is causing concern is the proposed petro-chemical complex at Mathura, 90 miles south of Delhi. It is feared that this may cause emissions that may affect the Taj Mahal and other monuments of nearby Agra.

The Industrial Natural Oil and Gas Company undertakes research on industrial air pollution, in collaboration with research institutes or ministries. Maximum pollution levels are monitored including that coming from daily transportation (motor vehicles) services and facilities.

A major problem is the power generating plant in Delhi itself which uses coal in the thermal plant serving the federal capital. It

is ironic that this plant is located within two blocks of the Regional WHO Office.

4.3.4 Human Settlements and Habitat

The government policy on human settlements, which is a relatively new field, is to concentrate actions on the rural poor and those of marginal settlements in suburban areas of large conglomerates. The necessary institutional infrastructure and local expertise are already available in India and the single greatest problem is lack of capital for investments in low cost mass housing. The government is keen on establishing pilot/demonstration projects on low cost 2- and 3-storey houses using local materials and techniques. Twenty such centres in selected villages are planned. Here they envisage improvement of existing sanitary conditions, providing pavement, drainage, latrine, water supply and biogas generation facilities making use of cow dung and other agricultural wastes that are plentiful in rural areas. Five of these demonstration projects are already operational one of which is in Gujarat and the other in New Delhi, adjacent to the Engineering/Architectural College of the Jawaharlal Nehru University.

Ultimately it is planned to have a demonstration site in each of the 22 states. The concept is to select a village where population is less than 5,000 with 5 to 7 persons per household. Each state is encouraged to undertake such a study proposal and produce a report with action plan under the technical guidance of the NBO.

Another major NBO activity is to design urban and suburban housing shells cost of US\$200 per unit of about 17 sq.m. in area. Such plans are being prepared for the larger cities of Bombay, Delhi and Calcutta. Once the basic shell of the home is constructed by the government, the people are encouraged to finish the house themselves with technical advice from NBO. Using all available media, information on building construction materials and techniques is disseminated.

NBO also undertakes research on building materials. It has succeeded, for example, in recycling of flyash, using lime and a binding material, into building blocks which is light enough to float in water; and in the manufacture of asphaltic roofing sheets utilizing waste papers impregnated with hard tar and jute fibers.

If the national housing programme succeeds, NBO predicts that in 10 years time there will be a start of urban migration to the rural areas, reaching a maximum in the year 2000.

New Delhi is reported to have 400,000 cases of malaria which makes this a major public health problem. Mosquito breeding areas include the small tributaries of Yamuna River which passes by Delhi.

Solid wastes are being composted in about 45 plants over India. Two important findings are that helminthic disease parasites are relatively unaffected, and that mechanical operation is needed to make the operation and maintenance of a compost plant economically feasible.

In the Mahim Creek area, north of Bombay, reclamation work on the Bandra-Kurla scheme has reduced 800 hectares of marsh-lands to 360 hectares.

A unique occurrence in India is the annual pilgrimage to Hardwar and Benares on the Ganga. For a few days, millions of devout Hindus congregate at a certain place and immerse themselves into the Ganga waters for spiritual cleansing. But the massing of so many people at one place for only a few days can bring a lot of temporary problems of accommodation, safe food and water supplies, transport and related services and above all sanitation, which cannot always be fully met.

Transient settlements have become a major environmental concern to the Indian authorities and any work programme in this will be of direct interest to UNEP. Inputs from the United Nations in solving this problem would be most welcomed. UNEP in particular would be ready to co-operate in the development of the relevant studies and programmes of handling transient settlements.

4.3.5 Energy

In rural areas, use of biogas as a source of energy is being encouraged. Brochures on biogas generation written in the vernacular are printed and distributed to the people for actual construction and operation. Gas produced is then used for cooking and night-lighting, especially in areas without electricity.

Cow dung is also a common source of fuel. Fresh manure is dried under the sun. Because of its high cellulose and organic content

/dried

dried cow dung burns well and provides useful heat. In some rural areas, firewood is reported to be less available in drought prone areas thereby requiring residents, dependent on them, to travel longer distances. It is, however, still a major source of energy in most Indian rural areas. The concept of village forests may need implementation or enforcement. Wind and solar energy utilisation is being studied with greater emphasis. Solar energy research, in particular, is being accelerated.

In India, early efforts to harness solar energy began in the 1950s and low-grade solar thermal processes were investigated such as water heating, distillation, space heating, drying and cooking. Data were accumulated and led to efficient flat-plate collection design and technology. But social non-acceptance of technically successful cooking developed by the National Physical Laboratory led to cessation of financial support to solar work until early 1970s. Since then, under the leadership of the DST, support for solar energy development has been emphasized. Today solar water heating and solar stills are manufactured and sold commercially.

To further develop solar energy utilization, the government has defined three priority sectors which are to be developed at least to the demonstration stage. These are:

- a. Rural sector (villages with less than 1,000 people)
 1. Water pumping
 2. Drying of agricultural products
 3. Conversion of brackish into potable water
 4. Use of solar slurry heaters in integrated biogas plants.
- b. Urban sector (towns from 1,000 to 10,000 population)
 1. Small power plants, 10 - 50 kw size
 2. Solar water heaters, domestic size
 3. Space heating and cooking for health centres, tourist bungalows, etc.
 4. Solar ice-making for fisheries, health centres, etc.
- c. Metropolitan sector (cities with more than 500,000)
 1. Solar cells for TV, radio, etc.
 2. Bioconversion of waste into transportable fuels

3. Process steam
4. Factory heating and cooking
5. Large size solar water heaters (cafeterias, hotels)

The following activities in solar energy research by various institutions have previously been reported:

1. Radiation measurement: Meteorological Department, Delhi
2. Flat Plate Medium Temperature Collectors: National Physical Laboratory, Delhi
3. Silicon, Cadmium sulphide and other Cells: Solid State Physics Laboratory, Delhi; Jadavpur University, Calcutta; Space Technology Centre, Trivandrum; Indian Institute of Technology, Delhi
4. Desalination: Central Salt and Marine Chemicals Research Institute, Bhavnagar
5. Space Heating: Defence Science Laboratory, Jodhpur; Indian Institute of Technology, Madras
6. Heating for water, slurries, etc.: Central Building Research Institute, Roorkee; Khadi and Village Industries, Allahabad; Bhabha Atomic Research Centre, Trombay
7. Air Conditioning University of Roorkee, Roorkee
8. Small Power Plants: Sri Aurobindo Ashram, Pondicherry; Indian Institute of Technology, Kanpur; Punjab Agricultural University, Ludhiana; Birla Institute of Technology and Science, Pilani; Indian Institute of Science, Bangalore, Karnataka
9. Agriculture uses such as rice drying: Annamalai University, Chidambaram; CAZRI, Jodhpur; Bangalore Agricultural University, Karnataka
10. Wood Drying: Forest Research Institute, Dehra Dun.

Wind power utilization started in 1952 with the formation of a Wind Power Sub-Committee of the CSIR. In 1955, a conference on large scales utilization of wind power was held in New Delhi. By 1959 designs of local water pump windmills were standardized. A special type was designed to start at low wind speeds about 8 kph and had facilities for automatic furling of sail at heavy winds.

In 1963 a report was published in which an attempt was made to derive optimum rated speed for maximum energy output at minimum cost using available data of wind speeds recorded by the National Aeronautical Laboratory.

A design and development project was started in 1975 for a "Darrieus rotor type windmill" to develop about 1 kw power at a wind speed of 25 kph. Other types of designs include a low-cost "Savonius rotor type" for rural areas and permanent magnet generator.

The following activities in wind energy in utilization have been reported:

1. Generators and pumps: National Aeronautical Laboratory, Bangalore, Karnataka
2. Vertical Axis rotors, integrated system: Indian Institute of Science, Cell for application of Science and Technology for rural areas, Bangalore, Karnataka; Auroville Centre for Environmental Studies, Pondicherry
3. Miscellaneous types of rotors: Indian Agricultural Research Institute, Dairy Road, Delhi; Social Work and Research Centre, Admer District, Rajasthan.

Ideal for rural areas would be a combination of biogas, wind and solar energy and India is bound to play a leading role in this field.

Oil exploration activities are now being undertaken offshore from Bombay. Coal is plentiful and the government is determined to increase production not only for self sufficiency but for export as well. Nuclear power plants are now in the planning stages and some are in an advanced stage. Meanwhile the DST is aware of the environmental implications of these developments and are closely monitoring pollution levels and undertaking environmental impact assessments.

4.3.6 Nature Conservation and Wildlife

The national forest policy lays down the objective of having one third of the land area under forests. At present almost 23 per cent of the land is under the control of the various forest departments of the state governments, but the entire area cannot be deemed to be covered with forests. There has been some qualitative loss in forests, mainly due to pressures of grazing and firewood extraction by an increasing

population. However, there has not been very great quantitative loss of forest area, and by and large the forests of the country have been quite well protected in comparison with other countries in the region. The system of forestry management inherited from the British still continues almost unchanged and has served the country well. However, the concept of the significance of forests does need certain new dimensions, namely, that forests are not only important from the view point of supply of timber but as very important watershed areas to prevent floods and soil erosion, and to provide for the socio-economic needs of the people who have traditionally lived in the forests as well as those that live outside them. In the foreseeable future the local population would continue to depend upon firewood as domestic fuel. It is essential that instead of concentrating almost only upon converting existing natural forests into man-made forests of species with commercial value, the authorities in charge of forests also propagate fast-growing trees to supply rural firewood needs at various places where it would be convenient to distribute this commodity to the rural population, and thereby reduce the burden on existing forests. For this purpose new areas need to be brought under forest cover in the "settled" areas of the country. Certain states like Punjab and Haryana have done excellent work in propagating plantations on road sides and by irrigation canals. This practice could well be emulated by other states.

As regards wildlife conservation which is now a concurrent subject under the Constitution whereby responsibility is shared by the Union Government as well as State Governments, the Wildlife (Protection) Act of 1972 is the first uniform legislation of its kind in the country. It provides for complete protection of certain specified species and regulates hunting of certain others. The procedure of the establishment of national parks, sanctuaries, etc. is laid down, and trade and taxidermy are also brought under control. Stringent punishments are provided involving mandatory imprisonment and minimum fines for certain types of offences under this Act. Due to the lead given by the Union Government together with the increased interest in nature conservation now evinced by most of the state governments, wildlife conservation has made rapid progress in the past five years. The Project Tiger involving a very substantial outlay from the Government of India supported

by additional inputs from state governments and the World Wildlife Fund, has effectively conserved nine prime tiger habitats. A UNDP/FAO project to propagate three species of crocodile in the country, particularly the endangered gharial, has been making good progress since its inception in 1974. Central government is also providing assistance to the state governments in the establishment and better management of certain selected national parks and sanctuaries. The main obstacle has been the lack of resources and the infrastructure needed in a large country like India to implement the Wildlife (Protection) Act 1972 and to adequately protect natural areas and habitats. Nonetheless, the conservation movement in India is making very good progress. Certain suggestions, however, in this regard may be made at this juncture.

Firstly, while habitats in the deciduous and semi-evergreen forests of the country are well represented in the existing national parks/wildlife sanctuaries system of the country, there is an urgent need to establish at least one or more "desert" national parks; at least two marine national parks, and five or more mountain national parks - with at least two in the Trans-Himalayan zone of Ladakh and Lahul-Spiti, and at least three in the temperate Himalayan zone in the states of Kashmir, Himachal Pradesh, Uttar Pradesh, and Arunachal Pradesh.

Certain islands in the Andaman and Nicobar groups which have endemic and unique species of wildlife, also need to be identified and sanctuaries or parks established on them. The fauna and flora of the Laccadives, Minicoy and Amandivi Islands also needs to be investigated and protected where necessary.

Lastly, one of the greatest needs is to develop management techniques and skills in the field of wildlife conservation within the country. An important step has been taken in this regard with the proposed establishment of a comprehensive national wildlife research and training institute, with the assistance of UNDP. It is hoped that this institution would be established shortly and that it will be able to train not only personnel from India but from other countries of the region as well.

4.3.7 Rural Environment

Because 80 per cent of the total population lives in rural areas, it is deemed worthwhile to look into the environmental conditions in such areas.

Socially, a typical village consists of a few big landowners, medium, small and marginal farmers, tenants the bulk of whom are insecure sharecroppers, village artisans and a large number of agricultural workers - those who depend on agricultural ways for more than half their income.

Out of the estimated 93 million dwelling units in the country only 20 per cent are in urban areas and the average number of persons per dwelling is 5.9. In 1971 it was estimated that the number of rural settlements with not more than 5,000, called villages, was about 580,000. The four physical patterns of small settlements are dispersed clusters, linear clusters, tightly nucleated rectangular or shapeless clusters and isolated households or hamlets. Houses are built of non-durable materials, which require frequent repairs and maintenance. It is estimated that about half of rural people live in "Kutchha" houses (mud walls and thatch roof), 37 per cent live in semi-pucca houses and only 17 per cent in pucca houses (stone walls and tile roofs).

By and large environmental conditions are poor. It is estimated that only about 3 per cent have latrines. Also, 93 per cent have no bathrooms, and protected drinking water facility is available to only 2.6 per cent of households. The more common sources of rural water, which are considered generally to be polluted and hence unsafe, are open dug wells (68%), tanks and ponds (6.5%), with some driven or tube wells (9.5%).

Other civic amenities such as drains, community latrines, and baths, approach roads and electricity for domestic and street lighting are either lacking or grossly inadequate and much more needs to be done.

Basic services such as school facilities and health clinics in rural areas are likewise inadequate but are being provided at an accelerated rate.

4.3.8 Environmental Management

Environmental management on a national level is still in its infancy in India. Until an appropriate central mechanism for comprehensive environmental efforts is set up, sectoral efforts will continue to be in use in the foreseeable future.

The DST, through its NCEPC, is now embarking on a determined bid to effect co-ordination of national efforts at environmental management. It has recently succeeded in convincing the Planning Commission of the need for close co-operation and collaboration in development planning. Consequently, every development project, particularly in the field of agriculture or irrigation is proposed to have a prior environmental impact assessment and clearance from the Planning Commission of the Central Government before it could be approved and funded for project implementation. A special environment unit is soon to be established in the Planning Commission to analyze project proposals in co-ordination with and possible assistance from DST.

4.3.9 Environmental Education, Training and Research

Among its prominent higher leading institutes, certain universities have started environmental education and training programmes. The College of Engineering at Guindy, Madras, has been active in the field of environmental engineering. It is under support through the UNEP/UNESCO Project on International Programme on Environmental Education and Training of Engineers. There is also the Indian Institute of Technology with campuses at Delhi, Kanpur, Madras, Calcutta and Bombay. Another is the University of Madurai in Tamil Nadu.

The Jawaharlal Nehru University is a national institution established in 1970 with the Prime Minister as Chancellor. It has six schools including the School of Environmental Sciences where about 40 studies are presently being undertaken by the staff and graduate students. Some of the areas of specialization of the School are public health engineering, water recycling, ecological impact of engineering projects, marine and estuarine geology and oceanography.

On the research side, India is one of the leading developing countries in this region which fully promotes research efforts. The

three institutes visited during the mission, viz. the National Environmental Engineering Research Institute, the Central Water and Power Research Station in Puna and the National Oceanographic Institute all exhibit excellence in research. The details of research activities observed are included in Part 2 of this report.

The National Council for Educational Research and Training (NCERT) of the DST plays an active role in the co-ordination of national efforts in environmental education at the elementary, secondary and tertiary levels.

REPORT ON MISSION TO INDIA
BY THE
UNEP REGIONAL ADVISORY TEAM

28 August - 13 September 1977

Part Two: Discussion Notes and Appendices

This part of the report summarizes the discussions held with various authorities visited in India. It also contains the appendices that are too bulky to be included in part one of the report.

Report on Mission to India
by the
UNEP Regional Advisory Team

20 August 13 September 1977

Part Two: Discussion Notes and Appendices

5. Brief Notes During Discussions with Officials

The following notes were taken during the visits to the various offices. For convenience, they are listed down chronologically.

5.1 United Nations Development Programme (UNDP) - morning of
2. August 1977

After our exchange of pleasantries, the UNDP Resident Representative, Mr. R. Polgar and his Programme Officer, Mr. V. Padmanabhan, briefed us on the general government structure including various offices and agencies in India which undertake activities pertaining to environmental matters. It seems that there are two major governmental departments or offices that have to do with environment, namely, the Department of Science and Technology (DST), and the Council for Scientific and Industrial Research (CSIR), both under the Prime Minister's Office. Recently, however, the heads of these two institutions have been decided to be merged into only one official the incumbent DST Chairman, Dr. R. Ramachandran. We were also informed that there is at present a move to split the CSIR whose basic research institutions will remain under it, but its several applied research institutions will go to operational units of the governments or to the Ministry that is most concerned with such research, e.g. metal research will go to the Ministry of Mines.

Among the agencies in New Delhi that were recommended by UNDP to be visited in the tentative programme were the DST, the National Building Organization and the UN Housing Centre, the Soil Sciences and Agricultural Division of the Indian Agricultural Research Institute (IARI), the Central Public Health and Environmental Engineering Office (CPHEO), Jawaharlal Nehru University (JNU), the Central Board for the Prevention and Control of Water Pollution (CBPCWP), and the National Institute of Oceanography (NIO) in Goa. We were also informed of three current government projects receiving some UNDP assistance namely: (a) Solar energy project, (b) Food for Work Programme and (c) Construction of a power station of 2000 megawatts capacity right at the coal mine area in Bihar, one of the Indian States.

The second UNDP Programming cycle for India is 1977-1981 but it seems that revisions are being made and they are now planning the country programme for 1979-1984.

The UNDP point of contact in government is the Department of Economic Affairs, a federal office under the Ministry of Finance. The

/National

National Planning Commission, under the Office of the Prime Minister, provides additional inputs to the Department of Economic Affairs and as such also interface with UNDP. We were also reminded that the government of India is a Federal one with the 22 states and 9 union territories and with a population of more than half a billion persons, the second largest in the world. Under the existing Federal system, areas of responsibilities are divided into those that belong to the Union list and are to be handled by the Central or Federal Government such as income tax, foreign policy, defence and so on, and those that belong to the State list to be the responsibility of the states such as water resources, education and agriculture. There is a third, called the Concurrent list of areas, which are coordinated by both Central and State Governments. Among those that may be mentioned in this concurrent list are atomic energy and wildlife. Certain environmental matters also fall under this concurrent list. Although States can levy local taxes, income tax is reserved for the Central government.

Since 50% of the population of India live in villages, the National Planning Commission utilizes the concept of planning for the masses. Under the labour-intensive policy, items that need not be produced by large factories are assigned to small shops so that village workers can become wage earners. There is also an industrial dispersal policy so as to decongest densely populated urban areas.

An interesting fact brought to our attention was that an economic survey, prepared in 1976-1977 and which has just been published by the out-going government of Prime Minister Indira Gandhi, is now being seriously questioned by the new government of Prime Minister Morarji Desai. It seems that two major items are under serious scrutiny: (a) the planning strategy employed and (b) statistical data presented in the economic survey.

Before departure, we were provided with a detailed itinerary for our visits to the various offices mentioned above, including the names of key officials and their staff.

A list of such officials met is given in Annex A.

5.2 Department of Science and Technology (DST) - afternoon of 21 August 1977

During the call on the office of DST, the detailed programme of visits was finalized and is shown in Annex B. Additional suggestions made included visits to Central Water and Power Research Station (CWPRS) in Pune, the Chief Engineer's Office of the Municipal Corporation of Greater Bombay (MCGE) and the IIT Zonal Laboratory in Calcutta (IIZLC). During the DST briefing it was also decided that one of their staff, namely Dr. A. Parabrahmam, Senior Specialist in Industrial Effluents, would accompany the IWT mission during the whole Indian trip.

The DST officials informed us of 5 major projects they would like to pursue in the field of environment and which they felt UNEP might be in a position to provide some assistance. These are the following:

/(a)

- (a) Establishment of an Institute of Marine Ecology;
- (b) Establishment of a Marine Park at Madras
- (c) Training in environmental matters for administrators and planners,
- (d) Training in Wildlife Management and
- (e) Project on 'Transient Settlements' which was proposed to UNRISD.

In addition four other projects of secondary importance were also mentioned, namely:

- (f) Appropriate technology development
- (g) Industrial pollution control in selected urban areas;
- (h) Environmental impact studies and assessment system,
- (i) Water Resources Projects.

Under appropriate technology, special mention was made of biogas production which is now being practised in a few select villages and which they had to replicate in other areas of the country utilizing the result of research undertaken at some research institutes and universities. They are also trying to modify the common village bullock cart, which is universally employed in rural India, and which may have regional implications as well. The Department of Industries, in cooperation with DST has suggested that in industrial development a separate cell on appropriate technology be included in order to insure rapid development in this field. The DST has seriously considered requiring environmental impact assessment as a development planning tool and they are now drawing up guidelines for this purpose. They also mentioned the biogas project of a milk dairy in Kambi Village as having successfully generated biogas sufficient to meet the needs of the rural residents for domestic heating and lighting purposes.

During this briefing, the coordinating role of the National Committee for Environmental Planning and Coordination (NCPEC) now chaired by Dr. B.P. Pal was mentioned. Formerly, NCPEC was under Dr. D. Bagchi, but he is now Vice-Chancellor of J. C. U. University.

One item that DST emphasized to be a serious problem is how to deal with transient settlements. This refers to massive concentration of people during certain annual festivals when large numbers, up to millions, gather at one place for only one to two days. We advised them to officially bring this to the attention of UNEP although we promised to include it in our mission report.

DST officials also recommended that we visit the Central Water Commission (CWC) of the Department of Irrigation, Ministry of Agriculture and Irrigation.

5.3 World Health Organisation (WHO) - early morning of 30 August 1977

In our discussions with Mr. S. Unabul, Mr. H. Acheson and Dr. A. Reyes, we were briefed on the significant activities of WHO relating to environment particularly their Community Water Supply Project, a worldwide programme of WHO. In the WHO Southeast Asia Regional Office (SEARO) they have a professional staff complement which include 22 engineers of which six are stationed in New Delhi. In addition there are a number of engineers under sub-contract status working in the region. We were also informed of the status of the UN/WHO project entitled 'Identification and Preparation of an Inventory of Institutions in the ESCAP region with Capabilities for Monitoring Water and Air Pollution'. This project is undertaken by UNEP/CEP and covers 12 countries, namely, Afghanistan, Bangladesh, Bhutan, Burma, India, Indonesia, Malaysia, Maldives, Nepal, Philippines, Singapore and Sri Lanka. Mention was also made during discussions, of the forthcoming WHO/UNEP Workshop on Air Quality Monitoring scheduled 23 October - 5 November 1977, in Bangkok and in which the UNEP Regional Director will be requested to give the keynote address during the opening ceremonies.

Equipment for air monitoring, in the form of high volume air samplers, have already been delivered to India and Thailand, the latter in preparation for the forthcoming Workshop. A WHO consultant will unpack the equipment and train prospective users. One of the samplers will be located at Chulalongkorn University in Bangkok to be used during the Workshop and later for technical training. A second one is to be located at an industrial site in Thailand, the exact location to be decided later. A third set may be provided to the Government of Thailand, on request. In this connexion we were also informed that Calcutta will be given a similar instrument for comparison purposes.

Certain publications were made available to the regional advisory team.

In the WHO/UNEP/UNESCO project on water monitoring 5 countries have agreed to participate, namely India, Bangladesh, Thailand, Indonesia and possibly Sri Lanka. In 1978 WHO is planning a training course for operators of water quality monitoring stations and one will be conducted in India to service only Indian trainees. A second training programme is being planned in another country, most probably in Jakarta, Indonesia. According to WHO officials pollution control work in India is rather limited.

The regional office in Delhi provides consultants to countries in the region on legislation pertaining to pollution. The country project on environmental pollution in India includes fellowship and consultants on air and water pollution.

During the discussion, it was noticed that SEARO, unlike the WHO/Western Pacific Regional Office did not plan to establish any new center for environmental planning which will emphasize on environmental impact assessment. So far, SEARO has concentrated on the pollution aspects of water and air quality.

5.4 National Buildings Organization (NBO) - late morning of 30 August 1977

Discussions with the National Buildings Organization (NBO) were held with its Director Dr. G.C. Athur.

The Indian government policy on human settlements, which is a relatively new field, is to concentrate action on the rural poor and those on marginal settlements in suburban areas of large cities. It appears that the necessary institutional infrastructure and the local expertise in India are already available and the single greatest problem is lack of capital for investments in low cost mass housing. Rural housing comprise 60% of the total and in a typical rural Indian village there are no latrines, drains or other sanitary facilities. The government, therefore, is very keen on establishing pilot projects to serve as demonstration sites and centers. Twenty such centers in selected villages are planned. Here they envisage improvement of existing sanitary conditions by providing pavements, drainage, latrines, water supply and biogas generation facilities making use of cow dung and other agricultural wastes which are plentiful in rural areas. Five of these demonstrations are already operational, one of which is in Gujarat and the other in New Delhi, adjacent to the University Engineering/Architectural College. The Director informed us that he personally visits these demonstration village to inspect the work being done.

Ultimately it is planned to have one demonstration site in each of the 22 states of India. The plan is to select a village whose population is less than 5,000 with 5-7 persons per household. The village therefore will contain about 1,000 houses (the area is considered an urban one if the number is greater than 1,000). Each state is encouraged to undertake a study and to produce a report under the technical guidance of NBO. Most of these homes will house the rural farmers who work as plantation labourers. NBO has plans of producing films so that new techniques of planning, preparation, construction and occupancy of these model villages can be shown to other places.

Another major activity of NBO is to design urban housing for the poor at a cost of \$200 per unit and containing about 17 sq.m. in area. Such plans are being prepared for the larger cities of Bombay, Delhi and Calcutta. In Delhi, 700,000 people are planned to be shifted to such urban housing colonies. Technologically, NBO is fully capable and only financing the necessary capital investments are needed. They intend to use the people as a resource and the basic shell of the house will be constructed, for the people to finish themselves, with technical advice from NBO.

We were also informed that the concept of appropriate technology is being fully implemented in India where they wanted to utilise unemployed people as a human resource. The NBO Director has been with the Organisation for 20 years and has been very active in rural housing work. By using all available media, appropriate announcements are made to people who are encouraged to secure technical advice in building construction. The present NBO Director has been in close touch with the International Housing Research Association (IHRA) and of course the UNHCR/UNEP. NBO

has presently a staff of 40 engineers and architects and 20 social scientists and economists.

IBO is a national centre and is self-supporting. It can help other countries in the ESCAP region since it also serves as a UN Regional Centre for Housing. Some of the research projects that IBO has undertaken and succeeded in their practical application are as follows:

- (a) Recycling of fly ash using lime and a binding material. This is used as a building block and has a unique property that it floats in water, since its specific gravity is less than 1.
- (b) Asphaltic roofing sheet, utilizing waste papers impregnated with hard tar and jute fibres or hesian.

Such study results are now applied to actual buildings. A sample of these two items was used in a small demonstration building, within the premises of IBO. Laboratory linkage has been established to help scientists stationed at IBO to coordinate research work and field applications.

If the Indian national housing programme succeeds, IBO predicts that in ten years' time there will be a start of urban migration to rural areas. By the year 2000 the urban migration to rural areas is expected to reach a maximum.

National government policies now intend to give priority to rural areas where 60% of the people live. Eventually, there is expected urbanization of such rural areas. It is also envisaged that the programme of rural building materials production will greatly help in solving the employment problem. With people having jobs, it will make living in rural areas more attractive. The construction industry that they expect to develop under this policy will absorb unskilled labour in such rural areas.

One of IBO's major activities is to supply publications, technical papers and similar documents. It has a well stocked library which specialized in references, books and publications in building construction and maintenance.

5.5 Soil Sciences and Agricultural Division, IARI - morning 31 August 1977

Discussions with the staff of Soil Sciences and Agricultural Division (SSA) of the Indian Agricultural Research Institute centered on utilization of agricultural residues from the resources point of view. Among the resources aspects considered were availability, chemical composition, the state of technology, conventional uses of such resources and alternative utilization, gaps in information and the formation of appropriate working groups to undertake needed research. On the other hand, commercial exploitation of agro industrial wastes must necessarily consider the following factors:

- a) nature and type of the agro-industr

- b) availability and volume or amount of residues or wastes.
- c) chemical compositions particularly of the more vital constituents.
- d) possible alternative uses.
- e) information available on the residues and wastes and
- f) economic value of the waste product.

After analyzing such data, the limiting factors are identified and attempts to formulate possible projects are then made. Pilot projects may be set up and commercial exploitation is then considered after careful consideration of (a) availability, (b) production technology, and (c) marketing.

The end product for which such waste materials may best be used are also investigated and the economics of their production taken into account. Among such possible end products would be pulp and paper, fertilizer, activated carbon or animal protein feed.

We were informed that the SSA Division of IARI is presently working on non-edible oil seeds and they have identified around a dozen species throughout India. This non-edible oil seed will be converted to non toxic substances by removal of tannins and glucosides. Present research is directed towards developing methods of removing such toxic components. Another research activity being undertaken is the use of humus from urban wastes, through composting or otherwise, as organic soil conditioner and the Division helps to develop practical technology from research results for converting such urban wastes to useful materials.

We were then shown a nearby biogas demonstration set up. Generation of gas was accomplished using animal manure contained in concrete tanks. A brochure was provided showing every detail of how to install and use the Cow Dung Gas Plant which was also given the name Gobar Gas Plant by the Farm Information Unit, Directorate of Extension, Ministry of Agriculture and Irrigation.

Designed in 1939 and revised few times, the gas generated can be used for cooking and lighting as well as for running engines. Suitable appliances for cooking and lighting are already available in the market. Some technical data provided are as follows:

a. Composition of the gas by volume

Methane (CH_4)	50-60
Hydrogen (H_2)	5-10
Carbon dioxide (CO_2)	30-45
Nitrogen (N_2)	1-2
Hydrogen sulfide (H_2S) and Oxygen (O_2)	Traces

b. One kilogram of fresh dung added daily will produce 1.3 cubic feet of gas in winter and 3.3 cubic feet in summer under Delhi conditions.

c. The ranges in N, P, K contents of the residual slurry or sludge on dry basis are as follows:

Nitrogen as N	1.4-1.8%
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Phosphorus as P_2O_5	1.1-2.0%
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Potash as K_2O	1.5-1.2%
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d. Optimum temperature for gas production from slurry is 30-35°C.

e. Calorific (heating) value of gas is 550 BTU. per cubic feet.

f. One cubic metre, or 35 cubic feet of the gas is equivalent to 0.6 litres of crude oil.

g. Consumption of gas for

Cooking (per person per day)	12-15 cubic feet
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Lighting (40 candle power lamp per hour)	10 cubic feet
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Electricity generation (per kwh.)	22 cubic feet
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Gas engine per hour per hp.	10 cubic feet
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5.6 Central Public Health and Environmental Engineering Organization (CPHEO) - afternoon of 31 August 1977

This organization is directly under the Ministry of Towns and Housing and we had discussions with Dr. T.D. Swamy, Adviser on Public Health and Environmental Engineering, and his deputy Mr. T.C. Santharan. The main philosophy guiding this organization is environmental protection in national projects involving works and housing. Through CPHEO efforts, a draft of separate legislation on air and water pollution control had been prepared, the latter having been already enacted into law by Parliament. Other functions of the CPHEO are:

a) Preparation of guidelines for both water and air pollution prevention. In this connexion, 15 of the 22 states have already established a Central Board for the prevention and control of water pollution which acts as a State Board. For the Union territories, the Central Board of the Federal government provides this service.

b) Provision of guidelines to industry; application by individual industrial plants to the state government is in turn referred to the State or Federal Central Boards.

- c) Enforcement of national government standards as approved by the Federal government. In this connexion, stream standards for water pollution and ambient standard for air pollution are set up by the Federal Central Board whereas effluent standards for water pollution control and emission standards for air pollution control are promulgated and enforced by the State Boards, under the supervision of CPM&EO.

Every state adopts a national standard and could possibly make them more strict but not less severe than the national standards. CPM&EO coordinates its work with the Central Board for the Prevention and Control of Water Pollution (CBPCW) in respect of water pollution.

According to CPM&EO the main water pollution problem at present is that caused by domestic sewage. Of the several hundred thousand villages in the country, only about 200 have sewage collection systems. In the very few towns with sewage treatment, only primary sedimentation is employed and the sludge collected from the settling tanks are utilized as fertilizer on the farms.

The national capital of Delhi has, of course, an excellent water supply system which delivers 200 million gallons of water daily. It has also a 120 million gallons per day sewage treatment plant.

Certain parts of certain rivers may be employed by industries as disposal or dumping places for their effluents and probable sites are identified by CPM&EO. Before approval to dispose effluents into a river, industries notify the Minister of Industry, which in turn refer the matter to CPM&EO for appropriate recommendations.

CPM&EO also works closely with the Indian Standards Institution (ISI) which, through its various scientific and technical committees, formulate appropriate standards taking into account health aspects, best available technology and analytical methods available for monitoring such stated standards. However, at present many such standards are still under development. Incidentally, ISI is a government agency under the Ministry of Industry and is located at Bhaskar Bhawan, 9 Bahadur Shah Zafar Marg, New Delhi 110002. RAI was also informed of the existence in India (at Nagpur) of a Buyers' Guide for Instruments used in air and water pollution monitoring.

Each state is supposed to have an inspectorate system for enforcement but not all states have developed full capability. One case has been cited by CPM&EO wherein a fertilizer manufacturing plant in Goa (later visited by RAI) was blamed for nearby fish kills. In another case, a polluted lagoon was deemed to cause pollution of nearby wells.

It is also interesting to note that standards for oil pollution are prepared by ISI with the participation of the Ministry of Petroleum and the Ministry of Chemical and Fertilizers.

Industrial estates, before allowing to operate, are required to have waste water treatment and increasingly, environmental considerations are taken into account in addition to the usual economic cost benefits of such industries.

One function of the CPHEIO is to gather information on industry needs which are passed on to IARI in Jaipur. Results of research at IARI, in turn, are given to CPHEIO and disseminated to all interested parties. Another function of the organization is to conduct training programmes in the form of short courses, taking advantage of nearby local existing universities. CPHEIO at present has one adviser, 3 deputy advisers, 19 assistant advisers, one scientific officer and 3 mechanical engineers, one for solid wastes and the other for equipment operation. In the course of its work CPHEIO has identified 600,000 villages all over the country of which 120,000 have or are suffering from severe and serious water needs, and which have to be supplied within the next 5 years. A budget of US\$ 150 million to supply this need is being considered and will take 4 years to do so.

Water, incidentally, is in the State list (which means that the State has control). Air, however, is in the Federal list and a Bill on air pollution in the Indian Parliament is pending passage.

Among the industries that appear to be causing environmental pollution according to CPHEIO are the following:

- a) Maharashtra - chemicals, textile mills and nuclear wastes
- b) West Bengal - steel mills, coal industry
- c) Uttar Pradesh - sugar mills, steel mills and agricultural wastes
- d) Bihar - iron ores and coal mining.

On a national level CPHEIO feels that the following are the country's needs in the field of environment.

- a) comprehensive environmental legislation
- b) more meaningful participation in the GEMS programmes of UNEP
- c) identification of national projects that have environmental imbalance and the establishment of a mechanism for correcting such existing imbalance
- d) establishment of environmental impact assessment mechanism to prevent environmental degradation.

5.7 United Nations Industrial Development Organization (UNIDO) - early morning 1 September 1977

During our visit to UNIDO office of UNEP, we were informed of the 3 areas of activities they are presently involved in:

- a) Non UNIDO matters such as trade, industr location, infrastructure, social science, minerals, hydrocarbons, ferrous metals, geological exploration and mining.
- b) General support to infrastructure; and
- c) All UNIDO projects where they provide special support, general technical assistance or industrial project designs.

UNIDO is also partly involved in agriculture, irrigation, choice of better seeds and fertilizer production. For example, UNIDO helps in setting up plants and provides short-term technical assistance in agricultural machinery fabrication. UNIDO may also provide technical assistance but not materials. In India, there are at least 2 centres which receive UNIDO assistance and which involves agricultural machinery production. One is the Council for Mechanical Engineering Research Institute (CMERI), under the CSIR, which actually manufactures low cost tractors and other form of machinery. The other is the National Institute of Agricultural Engineering (NIAE) of the Indian Council of Agricultural Research (ICAR) which provides manpower expertise.

We were informed that in 1974, a 4-member joint UNEP/UNIDO team visited India and a report was submitted to the Ministry of Industry in 1976. Unfortunately no copy was available. UNIDO also informed us that major aspects of industrial pollution are brought to the attention of the DST which in turn are referred to the Ministry of Industry.

There is also an Industrial Natural Oil and Gas Company (INOC) which partly deals with oil pollution in India. A move to increase and improve port facilities is not being implemented yet due to financial problems and thus, marine or sea transfer of oil is being practised but ensuring minimal oil spills.

The Ministry of Works and Housing is considering a project to establish an environmental engineering research institute or centre but nothing definite has come out of this plan. There are neither any definite plans for industrial estates on a national scale although certain areas in some key states have been earmarked for specific industries by the National Planning Commission. Such planned industrial estates are required to submit a statement of hazards by the Indian Institute of Petroleum (IIP).

We were also informed that the INOC undertakes research on air pollution through the determination of maximum pollution levels and daily transport undertaking from vehicles. As yet there is no national air pollution law because no substitute for cars, buses and lorries are envisioned in the near future for mass transport. In urban centres environmental pollution of the air is due mainly to industrial plants, passenger cars and diesel engines.

At the present time in India industrial pollution is not considered a priority due to political and economic factors. In Maharashtra state all industrial wastes go to rivers and cause pollution. In New Delhi, very close to the WHO office, there is a power generating plant with 3 huge smoke stacks without any pollution control devices. During winter times this is a major source of air pollution, specially during periods of atmospheric inversions.

In rural areas, pollution is considered due mostly to domestic sewage and inadequacy of refuse disposal. WHO has a project on training and maintenance procedure (including environmental aspects) of oil refineries, entitled Technical Assistance to Indian Oil Corporation. It consists of a pollution control technical adviser for 12 months and it has 2 fellowships in addition to technical assistance for training. In India, all the oil refineries have been nationalized except those that are too small which comprise less than 2% of the total national production. Annually the country consumes about 20 million tons of oil whereas IOGC is capable of only providing 1/3 of this amount.

Another WHO project is entitled Technical Assistance to Indian Petro-Chemical Corporation. The extent of pollution from industry, however, is quite known to the government and conservation measures have been undertaken as follows:

- a) Maharashtra has undertaken a river pollution survey.
- b) The Indian Oil Corporation and the Indian Institute of Petroleum are accumulating data on pollution by oil of refineries and petro-chemical plants.
- c) The Steel Authority of India Ltd. is undertaking a study of pollution from steel manufacture.

India has 2 copper smelters with refineries capable of producing a total of 40,000 tons of metal per year. One is in Jhatri Rajasthan and the other in Ghateville, Bihar state.

5.8 Jawaharlal Nehru University (JNU) - late morning 1 September 1977

The University is a national one and its Chancellor is the Prime Minister himself. It is the Vice-Chancellor, however, who runs the day-to-day operations, and the present incumbent is Professor B.P. Jajchaurhury, who used to be the Chairman of National Committee for Environmental Planning and Coordination. One of the schools under this University is the School of Environmental Sciences which has been newly set up under the leadership of its Dean, Dr. B. Prasad. As a new school, it has only 10 full-time staff members, and is barely 1 1/2 years old. It is a graduate school of JNU offering only a master and Ph.D. programme, it does not offer any social or economics courses since these are given by existing units of JNU. Students accepted to this graduate school are engineers, ecologists, systems analysts, biologists, chemists, fisheries graduates and physicists. Among the core courses

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that all students have to take are environmental management advance courses on ecology and environmental pollution control. Seminars are also required as part of the curriculum. Each student is required to undertake some research and write a thesis before graduation.

The present direction of research of the School may be classified under three major headings.

- (a) Study of eco systems and its equilibrium. Two of the areas presently being studied are
 1. Lake Chilwa, close to the Port of Lengal in Orissa State.
 2. Lake Loktal in the State of Manipur. This lake is 50 to 60 miles long, but only 20-25 miles wide and is located at an altitude of 1,500 metres.
- (b) Pollution of Yamuna River and its regeneration capability. Because this river is a long one and passes through Delhi in its eventual flow to the sea, only certain stretches of the river are studied corresponding to those that receive industrial and domestic pollution. Some portion of and tributaries of this river become dry during summer but cause raging floods during the monsoon season. It has also been noted that fertilizers are getting into the water. Limnological studies of certain parts of the river are also undertaken.
- (c) Soil erosion studies of main rivers in India.

JNU was established in 1970 in accordance with a law passed by Parliament in November 1968. However, it was only a year later, in 1971, that faculty started to be recruited and at present it has five schools (they are not called colleges) in addition to the School of Environmental Sciences. These are:

1. School of Languages where more than 20 languages are offered, but on the under graduate level.
2. School of Social Sciences
3. School of International Studies
4. School of Life Sciences
5. School of Computer and Systems Sciences.

All the four Schools above except the first, offer graduate studies as well. The newest addition is, as noted above, the School of Environmental Science where about 40 studies are presently being undertaken by its staff of 15. Some of the areas of interest of the said School are the following:

- (a) Public health engineering
- (b) Recycling of water
- (c) Ecological impact of engineering projects
- (d) Marine and estuarine geology
- (e) Oceanography

The University could very well service other countries in the region, and the Vice-Chancellor has expressed a desire for UNF to provide assistance where possible. They are at present contemplating to hold a five day seminar/workshop on lake systems ecology to be held between October 1978 and March 1979. They envision a study tour to the nearby lake systems to supplement the workshop. They were thinking of asking assistance from UNF in the form of consultants who could assist in the preparations for the workshop. They intend to involve the IIT and the University Grants Commission (UGC). The lakes they have in mind are Lake Dal and Lake Wular in Jashair, Srinagar. These two lakes are connected by a river which flows from Lake Dal to Lake Wular, the outlet of which goes into the Jhelum River. Jhelum in turn flows into Ramanaputra which connects to Ganges near Dacca while Yamuna River connects to Ganges near Allahabad.

A case was cited in which the life of a dam has been reduced from 100 to only 40 years because of siltation which was not foreseen during the planning and designing stages because of the absence of environmental considerations. The trouble apparently arose when the expected siltation from river flows was much lower than what actually happened. In turn, this resulted from rapid increase of population in some areas along the river which feed the dam waters. The presence of population led to radical changes in topography and soil characteristics which led to such increased siltation.

Observations of the faculty also showed that there is a tendency for a sectoral approach by government planners and fractionization of projects by ministries. They are hoping that their course programmes could lead to an integrated environmental view by national development planners. They realize of course that even at present, there exist many linkages and coordination among offices under different ministries, but during the execution and implementation of these projects, interaction and coordination is often lacking. More and more however, JNU officials feel that the concept and practice are not changed, since the UGC now is attempting to request an environmental impact assessment (EIA) before approval of projects. However, they feel that India is not yet ready for the CEA and EPA approach of the United States.

IIT was also requested to send samples of EIA that have been made in the region for their own guidance and information.

The School is also undertaking studies on preservation and modification of species through genetic changes. They cited certain species

of wild rice which have disappeared. At present, throughout India, they have reduced the species of wild rice from 35 to only 20. Most of them at present are in Assam State. They have also identified three thousand species of orchids in Assam. They recognize the importance of biological research, but these must be provided with the best possible habitat in order to maintain their genetic purity.

Another area of interest that the School is trying to use as a concentration area is research on different soil bacteria and the relationship of plants and soil.

5.9 Central Board for the Prevention and Control of Water Pollution (CBPCWP) - afternoon of 1 September 1977

The Central Board works through the State Boards in the decision governing priorities and actions in the field of water pollution. In the entire country, 14 State Boards have already been established and only eight needed to be established. However, three States are presently using regulations passed earlier so that there are at present only five Indian States that do not have a State Board for controlling and preventing water pollution. These are Jammu, Jharkhand, Meghalaya, Mizoram and Assam. These are small northeastern states where water pollution is not a serious problem, where there is less population and no industries and where forest trees still abound. The Indian Standards Institution (ISI) helps the Central Board by providing standards to start with and the Central Board then adopts these standards with or without modification for various types of industrial effluents such as pulp and paper, textiles, steel, distilleries, fertilizers, etc.

The State Boards have been formed only in 1974 and the standards of the ISI are adopted by the boards after participation by industries concerned. However, industries sometimes complain that standards set are too strict which result in prohibitive costs especially if technology is not available.

There is now under preparation a comprehensive document on industries which will contain standards suggested by ISI. The document will also include studies of existing laws and will start formulating new standards. It will also undertake industrial surveys, physically inspect industrial process, interview employers and employees and try to establish effluent standards as well. Technical procedures such as analytical methods of analysis, parameters, sampling methodology and establishment of a monitoring programme are also envisioned. They hope to engage a consultant who will study each industry and will be guided by a council of advisers representing various disciplines. As mentioned elsewhere, the State Boards can set up their own standards and make them more restricted than the national ones but not less restrictive. In the Union Territory of Daman (Vapi) area, there is now a pilot study on optimizing pollution control by industry itself, utilizing cost benefits and environmental protection.

The Central Board Director also informed us that on the Indian Continent, there are 14 major river basins covering 85 percent of the

land mass of India. The most important of these is the Yamuna River which flows through New Delhi. They have established four permanent sampling stations along this river, namely at De. Pathar, 'Azirabad, Okhla and Agra Canal. They identify the major industries along this river and find out their contributions to pollution and study ways of prevention and control. For industrially clustered areas, the Central Board recommends a common sewer system and common treatment plant. All in all, the Central Board has established 45 sampling points to cover the major river basins. In addition, a few small rivers, three of which are in Kerala will also be studied. We were also informed that the State Boards have also created a State Environmental Committee that sets up policy and direction, the Chairman of which is the Chief Minister of State.

5.10 International Bank for Reconstruction and Development (IBRD) or World Bank - early morning of 2 September 1977

In India the resident mission of the Bank includes 10 professionals according to Mr. O. Yenal, principal economist of the World Bank.

Some sets of guidelines on environmental impact assessment for development projects were formulated in 1972 and these are now used by the World Bank. Each project is reviewed by one or two staff members and if certain aspects of the project goes against the environment these are pointed out so that immediate measures may be formulated or the project modified. It is now a requirement of World Bank to have an environmental impact assessment as a preinvestment work to insure that environmental considerations are given its proper attention. Of course economic and technical considerations and the social welfare improvement of the target groups are still major factors taken into account.

In India almost all consultants to World Bank projects are local and some of these consultants prepare the environmental impact assessment. Projects presently being partly or wholly financed by the World Bank include an oil refinery located 150 km. from Agra. Irrigation and agricultural projects are also funded but industrial projects are not since this comes under the concern of UNIDO. In addition there are 2 or 3 urban projects on sewerage in Madras, Bombay and one of the cities in Punjab. In Calcutta, World Bank has also a project in water supply, sewerage and transportation. The Madras project alone involves about \$60 million and includes water supply provision. We were also informed that water, vegetable and fruits all over India except for a few cities are generally contaminated with bacteria and for this reason, there is a very high infant mortality rate especially from water and food borne diseases.

Perhaps the biggest support that World Bank has in India is on irrigation since from \$400-500 million per year is spent on irrigation projects. This involves mainly construction of dams and main canals in Punjab and the Indus valley. In the late 1960s irrigation projects were initiated and a great number of smaller irrigation canals were constructed. In order to improve agricultural production sources of irrigation water were tapped including ground water wells. Seed selection, crop rotation and extension work by rural agriculturalist were also included as part of the project.

In Rajasthan area there is a communal project worth about 10 million to turn desert like areas into arable lands. In Andhra Pradesh there is another irrigation project worth about 1100 million which is likewise a communal area project. Agricultural development projects are financed through the Agricultural and Refinancing Corporation of India.

It was also brought out that New Delhi has 4 million cases of malaria so that it is a major public health problem in the capital city, particularly since Yamuna River which passes through Delhi is a breeding ground.

There are now oil explorations and exploitation taking place offshore from Bombay and this may have environmental implications. World Bank is financing only the pipelines portions, with the Government of India financing the major component of this multi-billion dollar project.

5.11 Dr. V. Ranganathan, Industrial Consultant - mid morning of 2 September 1977

A retired Indian civil servant, Dr. Ranganathan used to be a leading member and secretary of the Scientific Advisory Committee (SAC) to the Cabinet, the highest advisory body to the Government of India on science matters. From him, we obtained some information on the institutional set up of science, technology and environment in the country.

The SAC, which existed from 1948-1971, used to be chaired by Dr. B.C. Sengchaudhury, now Vice-Chancellor of J. Vellu University. In 1971 SAC became the National Committee on Science and Technology (NCST) and formed part of DST, but it still serves as the highest policy making body and advisor to the government on science matters.

There is also a National Planning Commission (NPC), composed mostly of economists, agriculturists and industrialists, which gives direction and thrust in national development. The NPC is headed by the Prime Minister (P.M.) himself. Its Vice Chairman is selected by the PM and is serviced by a secretariat taken from the Administrative Service of the All-Indian Government service. NPC has also members from the fields of science, agriculture, perspective planning, and industry. States have also local planning commissions but must conform to the national or federal plans and strategies.

NCST is now serviced by DST. It lays broad policies on science as they related to development. An Air Pollution Act has been formulated by NCST and is now awaiting action and approval by Parliament.

One of the big problems India is faced with is the difficulty of implementing plans due to lack of trained manpower and resources. They are also suffering a large brain drain to the western or developed countries where Indians with professional skills migrate for better economic opportunities and remuneration.

We were also told that India has not withdrawn disincentives to family planning except two, namely (a) raising the minimum marriage age to 18 for girls and 23 for boys and (b) proportional representation in parliament will be frozen until the year 2000.

5.12 National Committee for Environmental Planning and Coordination (NCEPC), Delhi - late morning of 2 September 1977

The Committee is now headed by Dr. T.P. Pal as Chairman. Formerly, Dr. Pal was Chairman of Indian Council for Agricultural Research (ICAR), past President of the Indian National Science Academy (INSA) and was Director for 15 years of the Indian Agricultural Research Institute (IARI). The NCEPC is a special body dealing exclusively with environment within the framework of the DST whose Office of Environmental Planning and Coordination serves as a secretariat of the NCEPC.

What ICST is for science and technology so is NCEPC for environment. In both ICST and NCEPC, there are also members coming from CSIR, ICAR, ICNR, Atomic Energy Development and the Atomic Research Centre at Phala. NCEPC has 25 members with its Chairman and Secretary coming from DST. Other offices represented are Forestry, IARI, Ministry of Works and Housing, Central Water Commission and state representatives. A representative from the Wildlife Board is also a member.

Work of the NCEPC is done mainly through two committees; the Man and the Biosphere (MAB) committee which deals with conservation of genetic resources, biosphere reserves and general ecology and the Environmental Research Committee (ERC) which deals with environmental pollution, instrumentation and monitoring and industrial pollution. There is also a council which deals with environmental education, namely, the National Council for Educational Research and Training.

CSIR started in 1972 and among others it encourages research in the environmental field. In India, approximately 1.1% of GNP is allocated to research in all fields. More than 90% of scientific research is conducted by the Government. Private financing of research is almost non-existent because of lack of capital. It is for this reason that CSIR undertakes the research function. Altogether there are about 44 research institutions under the umbrella of CSIR, including IARI at Varanasi and its 9 zonal laboratories, one of which is in Calcutta and visited by PAT. CSIR conducts various types of research but they also give particular attention to specific commodities such as jute, rice, rubber, tobacco and potato.

NCEPC provides the leadership and direction in environmental matters including policies, education and strategies. We were informed that environmental education now is included from nursery and kindergarten through elementary, secondary and tertiary levels. Aside from CSIR, various units of universities also undertake research in various fields including environment. There are, in the whole of India, 21 agricultural universities with land grants. Research involving the study of intermediate hosts of certain parasitic diseases are undertaken in these

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universities and research institutions. Gradually evolving in the concept of balancing economic development without undue disturbance of the environment.

About 23% of land area of the country is forest and India would very much like to preserve this figure. In the Bombay region, industrial pollution is a major problem, caused mainly by mining operations, manufacture of chemicals, coal industry and steel works. We were also informed that opium growing is under very strict government supervision with the product being utilized only for medical purposes.

5.13 Central Water Commission (CWC) -- afternoon of 2 September 1977

This Commission is under the Ministry of Agriculture and Irrigation and its secretariat comes from the Department of Irrigation of the said ministry. CWC is headed by a Chairman, Mr. Y.N. Purthy, and is the premier coordinating body in all technical matters pertaining to water resources. During our briefing, we were informed that the work of CWC is conveniently divided into 4 categories or divisions as listed below.

a) Design and Research Division Under this heading is included the engineering design of concrete dams, major canals, laterals and similar development projects. Advice and assistance are also given to states as requested. CWC has two major research stations. One of which concentrates on hydraulics and is located in Pusa near Bombay and the other deals with soils, rock mechanics and construction materials, techniques and this is located in Delhi. The country utilizes expertise that are available locally. A good example of this consulting firm is the Water and Power Development Consultancy Services, Limited (WPDCL).

b) Water Resources Management Division This part of the work of CWC involves gauging, hydrology, irrigation and proper utilization of water to prevent wastes and maximize usage through multiple use. We were informed that the consultant WPDCL has a counterpart in the Philippines called the E.D. Engineering Company and they are doing multi purpose dam studies on Agusan River in Agusan del Sur and Tago River, Surigao del Sur, both in northeast Mindanao. These two projects will include flood control, irrigation and power generation. The company is also making studies to double the irrigated areas in the two places.

c) Flood Warning Division This includes widespread dissemination of information concerning imminent occurrence of floods and their control by water diversion and frequent and proper drainage maintenance to insure their optimum carrying capacity during heavy rains. Mention was made of a very peculiar phenomena in the State of Kerala where 3 to 4 months a year during the monsoon season, there is a terrific erosion problem and a resulting mud bank formation, north of the eroded area. Coastal area affected may be up to 300 kms. in length and could represent 60% of the coast line of south western tip of India.

d) Projects and Progress Monitoring Division This refers to the monitoring activity of CWC. The planning and progress of various projects

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and plans are monitored and evaluated in the light of original designs with modification as deemed necessary. Special concern is given to the monitoring of plans to irrigate 0.5 million hectares of agricultural land per year up to 1.4 million hectares per year. Eventually they expect to be irrigating 2 million hectares a year. In Andhra Pradesh State, which is the granary state of the country, they are able to raise 3 crops a year.

There is a Central Rice Research Institute in the city of Cuttack, Orissa. This CRRI is under the ICAR and under the 6th Plan there is a project to eventually irrigate 16 million hectares. Funds for such projects come from both state and federal resources. The two states of Punjab and Haryana are the most progressive. Other states that are active in irrigation work are Uttar Pradesh, Maharashtra and Madhya Pradesh.

The Deputy Chief of CWC, who is also the Head of the Water Resources Division, Mr. C.V. Gole, informed us that they have more than 1,000 engineers in the staff spreaded all over the country. They are maintaining several hundred gauging stations on 14 rivers with catchment of more than 20,000 sq.km. and 44 rivers with catchment between 2,000 to 20,000 sq.km. Most of these rivers, however, have measurable flows only during the 4 months of the year, July, August, September and October corresponding to the monsoon season. In northern India 80% of the water flows during the monsoon season and only 34% during the eight non-monsoon months. Over the entire Indian subcontinent, about 1/3 of river flows come from the Ganga River, another third from Brahmaputra and the remaining third from all the other rivers.

The main thrust of the CWC at present is how to get water to areas suffering from droughts and backward areas that need irrigation badly. Some 400 dams have already been constructed and another 400 are under construction. The water area of these dam reservoirs varies from one to 5 sq.km. in size. However, one third of total land area is still drought-prone, and the government has plans to construct 800 more dams. Another problem that they frequently encounter is the relocation of populations in the flooded areas, sometimes amounting to 80,000 people, control of deforestation on watersheds of the dams and avoiding failure of dams such as what happened in Pondicherry. In dam and water resources planning, CWC refers to DTF for environmental impact assessment which has yet to be comprehensively undertaken. It is interesting to note that there has not been any serious incidences of schistosomiasis in India.

Fisheries in the reservoirs are also encouraged to provide food and employment opportunities to residents along the reservoir areas. The Ministry of Agriculture and Irrigation planned to issue guidelines for fisheries and CWC is expected to undertake surveys of reservoirs and river flows into these reservoirs.

The ISI helps in the measurement of river discharge and silt carrying capacity of rivers. Their standard procedure is to use 25 vertical and one mean (at 0.6 depth) in the measurement of river velocities and discharge. For sediment measurement, they collect samples in bottles which are then sent to the laboratories for sediment analysis. In the 400 key gauging stations, samples are collected regularly and water quality

is determined for possible use in agriculture, industry or public water supplies by DGT.

Incidentally we were also informed that the All-India Government Service has 9 categories, namely:

1. Civil and Administrative Service
2. Engineering Service
3. Railway Service
4. Forest Service
5. Foreign Service
6. Auditing and Account Service
7. Revenue and Finance Service
8. Medical Service
9. Agriculture Service

A separate entity, the Union Public Service Commission, conducts the necessary recruitment through appropriate examinations and interviews.

5.14 National Environmental Engineering Research Institute (NEERI)
- 5 September 1977

We were met by Dr. S.B. Dabodghao, Scientist and Head of the Training, Information, Library and Extension (TILE) Division of NEERI, and subsequently we paid a courtesy call on the incumbent director, Dr. B.B. Sundaresan. Later we were briefed by senior staff members of all the divisions. Their 1975 Annual Report (1976 was still in press) was made available to us. In addition to the main laboratories at Nagpur, NEERI serves the country through its 8 zonal laboratories located respectively at Ahmedabad (Gujarat), Bombay (Maharashtra), Calcutta (West Bengal), Delhi, Hyderabad (Andhra Pradesh), Jaipur (Rajasthan), Kanpur (Uttar Pradesh) and Madras (Tamil Nadu).

The headquarters in Nagpur is organized into 12 research divisions: air pollution, engineering, epidemiology, industrial wastes, instrumentation, life sciences, rural sanitation, sewage treatment, solid wastes, water, consultation and training, information, library and extension. There are also support services such as construction and maintenance, preventive maintenance, glass blowing, photography, central data processing and workshops.

This Institute is the top environmental engineering research body in India, and it plays an important role in the study and research on air and water pollution monitoring, liquid and solid wastes treatment and

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accurate determination of significant environmental parameters. At present, some of their more important research activities are directed towards the use of sewage for crop irrigation and recycling of wastes from pulp and paper mills.

However, they feel that their priority projects are the following:

- (a) Development of pollution measurement instrumentation.
- (b) Training of middle management personnel and their acceptance by environmental offices and industry.
- (c) Administration of transient settlements where severe environmental pollution occurs over a brief span of time.
- (d) Relocation, provision of basic services and rehabilitation of displaced persons in project areas such as highways, dams and similar infra-structures.

(4) Water Division

According to Dr. K.R. Pulusu, Scientist in charge of Water Division, NEERI is one of the 48 laboratories of CSIR. Historically, NEERI started in 1959 when an epidemic of infectious hepatitis broke out in New Delhi, and the national government leadership decided to establish a permanent laboratory to undertake the study of the causes of such epidemics and to develop ways and means of controlling and preventing the occurrence of similar incidents in the future. The present staff now at NEERI number 585 of which 150 are scientists and 180 are located in the other eight zonal laboratories. Annual government budget is Rs 7.5 million with additional Rs 1.0 million from contracts and outside sources.

The present thrust of the activities of the Water Division covers waste water treatment, analytical techniques, use of polyelectrolytes and defluoridation. We were informed that four states; Punjab, Rajasthan, Maharashtra and Tamil Nadu, have areas where fluoride concentration in natural waters is high, ranging from 3 to 18 part per million of F. In some states waters have also been found to contain more than trace amounts of mica, bicarbonates and cryolite (aluminium fluoro complex).

Research studies of the water Division have also shown that:

- (a) There are naturally occurring polyelectrolytes coming from seeds of certain plants. Polyelectrolytes are excellent coagulants in water and waste water treatment.
- (b) Use of activated silica as a coagulant is not practical.
- (c) Use of phosphates in water treatment is feasible in many instances. Already tested were meta-, tripoly-, ortho- and poly-phosphates. Dosage of 3 to 4 parts per million of such phosphates may be employed as a water conditioner to prevent corrosion of pipes.

- (d) Iron and manganese could be removed by contact aeration since these two metals usually are dissolved in water in the lower valence forms and upon oxidation in air are converted into ferric and manganic forms, which are insoluble and therefore could be filtered out;
- (e) The laboratory can produce membrane filters from synthetic cellulose acetate with pores between 0.4 and 0.5 microns;
- (f) Reverse osmosis in desalinisation is expensive and prohibitive for practical application at the present state of knowledge.
- (g) Fourteen of seventeen products developed by NEERI for water purification have been successful, in particular the use of magnetic iron oxides to remove viruses.

Several methods of chlorination techniques and the use of natural and synthetic resins for ion-exchange to remove undesirable substances in water have been developed for industrial and domestic water purification.

The Division has also developed a few special chemical analytic methods, particularly for detecting trace elements in water. In this regard, wet methods of analysis are emphasized to conform with the labor intensive policy (employ more chemists) of the government.

It is of interest to note that India is now making and producing more than 2,000 different chemicals but it still needs to import many of them for economic reasons - it is cheaper to import than to make them locally. They are also conducting studies on how to extend the shelf life of these chemicals.

(ii) Instrumentation Division

NEERI has successfully manufactured sophisticated instrumentation but these are exported since there are not enough local demands. According to Dr. D.R. Bhawe of the Instrumentation Division, their present research and development work is geared to the needs of the various divisions of the laboratories as a whole. They have, for example, successfully developed a chloroscope kit for orthotolidine test to determine the residual chlorine content of chlorinated waters. Some of the other instruments and equipment developed by the division are: high velocity vacuum pump, wind speed recorder and direction detector, temperature inversion measuring device and thermistor with negative temperature coefficient, silicon-controlled rectifiers, motor speed control for continuous feed for chemicals and velometer for measuring gas plumes. They have also constructed analytical instruments such as gas chromatograph, ultraviolet and infrared spectrophotometers, recorders, densitometers, and mercury flameless spectrophotometers using indigenous materials and locally available parts and technology.

The Instrument Manufacturing and Development Association (IMDA) publishes a Manufacturers' Guide which may be obtained from Central

Scientific Instrument Organizations, Sector 30, Chandigarh, Haryana. Even such sophisticated instruments such as gas-liquid chromatograph and spectrophotometers are now made in India.

Together with those of zonal laboratories, the NEERI scientific equipment and instruments are worth more than Rs 2.5 million.

(iii) Industrial Wastes Division

From Dr. P. V.R. Subrahmanyam, assistant NEERI director and scientist in charge of the Division, we learned that the Water Pollution Control Act had been passed in 1974 although the State of Maharashtra had one way back in 1969. Because industrial wastes and effluents discharged into rivers cause water pollution, their cooperation is badly needed by the government if such water pollution is to be controlled. Both public and private industrial sectors contribute to industrial pollution and ISI is in the process of promulgating standards for various types of industrial effluents. State Water Pollution Control Boards that have not yet determined such standards usually adopt ISI standards with or without modification. Alternative treatments for industrial wastes are suggested, but industry managers are given time to bring down the effluent concentrations of undesirable pollutants. Research has been undertaken successfully in the treatment of wastes from the following industrial establishments:

- (a) pulp and paper mills
- (b) synthetic drugs and manufacture of pharmaceuticals
- (c) textiles
- (d) petroleum products
- (e) plasticizers manufacturing (DEP or diethyl phthalite)

The Division also undertakes industrial pollution surveys in order to identify common problems of industry. For example, some scientists of the Division are working on an effluent channel project in the Baroda (Gujarat) feasibility study where more than eight industrial plants dispose their effluents into a river flowing into the Gulf of Cambay.

Calcutta Metropolitan Development Authority (CMDA) has also requested NEERI to identify and help control the pollution of the Hooghly River. The effects of disposal of pulp and paper mill effluents on land used for agricultural purposes is being studied in relation to the base-exchange capacity of soils, color removal and direct effect on soil fertility. Other industries that have been referred to NEERI for pollution control are sugar mills, pesticides manufacturing plants and cash crops processing mills such as for peanuts.

Studies have also been undertaken to determine effects of industrial effluent discharge into land used for raising crops. Other studies relate to the use of night soil for bio-gas production and use of bio-gas sludge for fertilizer, making night soil fully recycled. Oxidation ponds

have been successfully tested whenever its total solids is below 13 to 14 percent and diluted to 8 percent with water.

The Division has established minimum water requirements for flushing night soil to effect desired decomposition and results show that only about 1.5 to 4 percent of night soil remains after decomposition. The All-India National Project on Bio-gas, mentioned elsewhere, is intended to increase agricultural production since at present, only about 30 percent of the potential amount of biogas production is actually used.

(iv) Sewage Treatment Division

We discussed with Dr. G.B. Shende, scientist of the Division, on the utilization of domestic sewage effluents for irrigation. In rural India, socio-economic conditions are favourable to utilization of domestic sewage for irrigation. During the dry season, sewage cannot be discharged to rivers directly since it will cause water pollution of the river with its low flow, and this is the time when irrigation water is also badly needed. During the monsoon season, of course, domestic sewage can be diluted by the flood waters. Moreover sewage contains many nutrients and can be made productive for aquatic life and has potential therefore for fisheries. For reasons of climate, increased agricultural production and wastes treatment, sewage can be successfully disposed of by irrigation.

Effluents may also be enriched by addition of nitrogen, phosphorus and potash and 1 to 1 dilution with unpolluted water from rivers or ground waters will enable the technique to cover more area. However the potential of spreading gastro-intestinal diseases must be considered, for example through consumption of raw vegetables irrigated with sewage. To prevent this, sewage should not be used less than two months before harvesting and raw consumption of vegetables. During the two months prior to harvesting, ground water or clean water should be used instead of sewage.

The Division has established that secondary treated sewage contains important nutrients and in the three years' experience at NEERI, no untoward effects have been observed as long as soil formation is not of extreme clay composition.

Sludge may be profitably utilized by mixing it into farm soils. In general, the characteristics of the soil will eventually determine the fate of dangerous micro-organisms originally present in the sewage. It has also been found that algae can be raised for protein and used as animal or poultry feed. This Division, in cooperation with the life sciences division, also undertakes studies on the biology, microbiology and virology of both water and wastes water. They also undertake studies on aquaculture and fisheries in oxidation ponds. Data are being accumulated and evaluated on primary production, harvest or yield of fish, recharging of effluents and on the operation of oxidation ponds.

(v) Life Sciences Division

Dr. K.I.P. Krishnamoorthy, scientist in charge of this Division, informed us of their studies on indicators of pollution such as biotic

density, limnology and distribution of various species of plant and animal life in natural and waste waters. Parasites are also studied but not including schistosomiasis. They have found that algal growth determines the success of oxidation ponds and that salmonella organisms are eliminated completely if oxidation ponds are operated in series and not singly.

The Division undertakes studies on the utilization of domestic wastewaters in fish culture. Another interesting experiment being conducted is the utilization of bagasse for cultivation of microorganism for producing animal feed.

(vi) Engineering Division

Dr. R. Paramasivam, scientist in charge of the Division, briefly informed us of their present activities. In collaboration with the Asian Institute of Technology (AIT) in Bangkok, they have undertaken research on horizontal flow through coarse materials. This study has applications on pre-filtration and is a part of WHO-assisted project on slow sand filtration. The rate of slow sand filtration is only 1/10 of that of rapid sand filtration, that is, 10 cms. per hour compared to 100 cms. per hour in rapid sand filtration. Other aspects considered are effects of shading and sunshine; behavior during intermittent nature of operations; effects of organic pollution in the raw water; and type of sand used.

Results of these studies can have far reaching implications both in water purification treatment and wastes water treatment.

(vii) Solid Wastes Division

Both Dr. A.D. Bhide, scientist in charge, and Dr. S.K. Titus furnished us the following information.

The Division is presently undertaking research on an EPA-funded research on solid wastes management. It plans to work for the World Bank on the collection and transportation of solid wastes in Calcutta. In particular, they are studying the theory, design and operation and maintenance of different composting methods. More than 45 composting plants are in current existence all over India. Two principal results they have found so far in composting are that parasites are relatively unaffected and that there is a need to use mechanized operations if the method is to be economical and feasible.

Some of the criteria or guidelines in composting are the following:

- (a) No single plant should be of more than 200 tons per day capacity.
- (b) The capital investment is estimated at Rs. 4 million to Rs. 7 million for a 200 tons/day plant.
- (c) There is a need to generate bio-gas during composting and use the resulting sludge from bio-gas production together with the finished compost as fertilizers.

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- (d) There is a need to set up an individual pilot plant to determine the optimum conditions and equipment before construction of the composting plant.
- (e) Unused compost and non-compostible materials should be used to reclaim unproductive land and later use them for parks and playgrounds.
- (f) Air and water pollution aspects must be taken into consideration.
- (g) Compost should be marketed for use as garden soil. It has been found that heat generated during the composting process is 3,000 B.T.U. per pound in India whereas the figure is 5,000 B.T.U. in the United States.

(viii) Air Pollution Division

This Division, headed by Dr. P.K. Yennawar, is in charge of developing local equipment and techniques for monitoring air pollution. While developing such methods, they are also looking at possible pollution control techniques and applicability to existing industries. We were again informed that there is as yet no legislation on air pollution unlike water pollution.

NEERI, through this Division, may serve as consultant to industries to monitor emissions, accumulate data and test alternate methods of air pollutant removal or reduction to the satisfaction of both industry and government authority. They emphasize use of wet chemistry methods to utilize local manpower and expertise available.

Sources of air pollution in India are mostly cement plants, power stations using coal and high sulfur bunker oil, textile mills, passenger cars and diesel engines. To control air pollution from motor vehicles they recommend traffic re-routing and training of drivers in the proper operation and maintenance of the motor vehicle. India has a very strict law on importation of motor vehicles and almost all passenger cars are completely manufactured in India. No emission standards have been promulgated in the automobile industry as yet. For 1978 and 1979, plans for New Delhi call for traffic modification and vehicle maintenance to reduce air pollution. The standard imported high volume air sampler commonly used in air monitoring has been replaced in India by a locally manufactured vacuum cleaner motor.

(ix) Training, Information, Library and Extension Division

The training component of NEERI is undertaken with the assistance of WHO-financed community water supply project and the slow sand water project. In air pollution monitoring training, NEERI can make facilities available to other developing countries. Right now it is accessible only to visitors but minimum inputs can be made to enable other developing countries in the region to make use of the existing training facilities at Nagpur. The zonal laboratories have permanent locations and arrangements with the State governments, except in Calcutta where there is already a

plan to construct a multi-storey building to house the zonal laboratory. The 585 staff of NEERI is broken down into the following:

Scientists	-	220
Technical	-	200
Non-technical	-	165

It is unfortunate that due to the nature of its researches which are contracted to outside private companies, reports of NEERI are mostly restricted in circulation. It is understood that NEERI is attempting to circumvent this problem so that its publications may be distributed to higher learning institutes and other interested organizations.

5.15 Central Water and Power Research Station (CWPRS) - 6 September

The briefing was given by Dr. V. Chitale, Joint Director and his staff. Later we were taken to see actual models of the research studies being undertaken in the premises.

This station, we were informed, is under the Ministry of Agriculture and Irrigation and its Secretary is Dr. Patel, a member of the Central Water Commission. The main sources of power generation in India are coal, oil and nuclear fuels. This particular research station concentrates its activities on hydro-electric and more than 90 per cent of its clientele are government agencies or institution. It is therefore not surprising to know that 99 per cent of its funds come from the government. It is not a profit making research institution but special interests may request the Station to undertake particular research work.

Present industrial policy calls for purely government funding of oil exploration and development and of steel mills. Private funding is concentrated on consumer products manufacturing sector whereas heavy industries such as oil refineries or petro-chemical plants need joint funding by both government and private sources. In the manufacture of pumps for example, small ones of less than 5 cu. m. per second capacity is given to private firms but turbines and heavy machinery used in pumps rated at 10 cu.m. per second or more are manufactured by the government.

CWPRS is recognized by ESCAP as a regional laboratory for both inland and coastal water research studies. Historically, it was founded in 1916 originally for research only on irrigation. In 1937 it was taken over by the government of India and in 1973, it was recognized by ESCAP as a regional laboratory. It occupies a 180 hectare area outside of the City of Poona, Maharashtra. In their premises, they are able to construct hydro-electric models on a scale 1:1,000 horizontal and 1:100 vertical.

A major function of CWPRS is research and hydraulic modelling, with the design and investigation conducted by the Central Water Commission. A brief survey of the various models and works presently undertaken was made by us and they are briefly mentioned as follows:

- (a) Ship modelling, resistance measurement of ship hulls and current meter testing,

- (b) Port modelling and tidal power studies where tidal range is 11 meters or more; studies at Kandla in the Gulf of Kutch in Western India with tidal range of 7.0 meters; Gulf of Cambay tidal power studies where tidal range is 11 meters and the tidal power studies in Sunderbans at the delta of Ganga where tidal range is 5.8 meters. Models of these estuaries have been constructed.
- (c) West Tripoli thermal power station in Libya. Construction of cooling water system, channel capacity and thermal dispersion studies.
- (d) Wave plume studies for breakwaters and ports.
- (e) Studies on Baina beach at Marmagao near Zuari Agro Chemicals (ZAC) factory. Studies on arsenic-containing wastes water and development of Port Marmagao.
- (f) Hewlett-Packard 32 K computerized data acquisition systems of 5 million bytes with a capacity of (a) 0.5 million operations per second (79708 Digital) and (b) 0.75 million operations per second (9603A measurement and control system).
- (g) Alternative outfalls of cooling water at Satpura thermal power station at Madhya Pradesh.
- (h) 12-megawatt Nepal power plant. The problem of siltation and sedimentation was solved using the Trisuli desilting tank.
- (i) 250-megawatt and 200-megawatt at Obra thermal power station where 400 cu.m. per second of cooling water is raised 9°C and 2,700 cu.m. per second additional water is needed to cool it further.
- (j) Mahim Creek north of Bombay - 800 hectares of water surface have been reduced now to only 360 hectares because of the Bandra-Kurla reclamation scheme. There were also some pollution problems after re-channeling of the creek.
- (k) Bombay Port model studies started in 1953 and are still continuing. Main channel is studied for siltation, possible extensions of breakwater, oil berthing locations and pollution patterns. Estimate of siltation differs by a factor of 2 between Indian and British consultants.
- (l) Expansion of Visakhapatnam Harbour in Andhra Pradesh on the Bay of Bengal. Use of sand traps to ensure maintenance of minimum harbour depth between dredging times.
- (m) Singapore harbour development including petro-chemical complex, harbour berthing, and 26 associated studies.

- (n) Malaysia hot water outfall near Coney Island reclamation area where polluted water with BOD of 20 parts per million (ppm) is reduced to less than 3 ppm BOD.
- (o) Instrumentation unit of CWPRS, where they manufacture and test pump impellers current meters, automatic contact mechanisms for thermistors, low and high frequency water level fluctuation pressure meters, wave height meter-recorders, short (less than 90 seconds) and long (more than 90 seconds) period wave maker and telemetering devices.
- (p) Cavitation laboratory, where there is located a \$1 million UNDP/Government of India project. In this laboratory are tested turbines and pump samples of large sizes for determination of cavitation phenomenon, which can cause mechanical failure.
- (q) A photo-elasticity laboratory where stress analysis and pictorial representation of stress concentrations are made.
- (r) Epoxy testing laboratory, where various types of epoxies are tested for their strength, durability and other properties.

With the accumulated experiences by the CWPRS technical staff on more than 200 studies completed, it is beyond doubt that CWPRS is one of the leading institutes in inland and coastal water resources research.

Exchange programme should be developed with similar institute in other developing countries of ESCAP so that in-service training may be provided to scientists from those countries to take advantage of the existing expertise available in Poona.

5.16 Municipal Corporation of Greater Bombay (MCGB) - morning of 7 September 1977

Our visit to this office was delayed due to unforeseen events. The UNDP car sent to fetch us from the hotel met with an accident and it was only after an hour later that we were notified and able to make alternate arrangements for transport.

We were met by Mr. V.D. Desai, Deputy Commissioner of MCGB in charge of "special engineering" - which takes care of water supply and sewerage of Greater Bombay. His office was formed by merging former smaller offices to handle water and sewerage only. All other public works activities are under the regular city engineer's office.

The area serviced by Bombay water and sewerage works has increased by almost 7 times over the last quarter of a century:

1950	-	68 km ²
1957	-	260 km ²
1976	-	442 km ²

Its population in 1961 was 6 million and in 1977 is estimated at 7.2 millions.

Bombay is known as the industrial capital of the country since 65% of all the industries are located within the city or in the state of Maharashtra. About 50% of all cotton textiles mills are in Bombay. Other industries present are chemicals, oil refineries, machinery, electrical equipment and shipping.

Water needs of Greater Bombay at present amount to 450 million imperial gallons daily (migd) and by 1984 it is expected to be 550 migd. Almost all come from surface supplies and impoundments. Since April 1976 the MCGB has hired the services of Metcalf and Eddy, American consultant whose Indian counterpart is the Environmental Engineering Consultants, to undertake feasibility studies on:

- (a) deep marine sewer outfall about 3 kms. outside west Bombay into the Arabian sea;
- (b) sewage treatment for sewer-serviced areas east; and
- (c) sewage treatment for sewer-serviced areas west of the Bombay peninsula.

The sewage treatment project is the first one to be financed by World Bank. It will include a complete sewage treatment down to chlorination of the final effluents to maintain a coliform count of less than 10 per 100 ml. The amount involved for the first stage is Rs 200 crore and for the second stage is Rs 50 crore or a total of Rs 250 crore (1 crore is 10,000,000). Funding for the project is envisioned as follows:

- 38% - from World Bank (20% of actual costs)
- 40% - from MCGB
- 22% - from national and state assistance.

Although sewer outfall design is contracted to outsiders, design and construction of sewers are done by MCGB. Hydrology and marine studies on effects of disposal are done by CWPRS and NIO.

The solid wastes or refuse, generated daily in Bombay is about 2200 tons of which more than 60% is organic. Responsibility for collection and disposal and management of solid wastes, however, rests with the city engineer's and office and not to Special Engineering. There is a 300-ton/day composting plant under construction which is expected to be finished in March 1978. The compost is planned to be sold to farmers within a radius of 100 km from the plant at Rs 60 per ton. If the NPK value is above 1% for nutrient the selling price may be up to Rs 100 per ton. The non-compostible components of the solid wastes will be used as landfill for low lying areas or swampalands being reclaimed.

There is due to be submitted an "Interim Report to MCGB on Methods for Treatment and Disposal of Waste Water from Greater Bombay: Vol 1, by Metcalf and Eddy and Environmental Engineering Consultants."

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There is a severe drainage problem in Bombay because the city's average elevation is in the average about 4 - 5 meters above mean sea level with the tidal fluctuation about 5 meters. The Maharashtra Water Pollution Control Board was formed in 1971 and Mr. Dessai is the chief of its Technical Committee. A Regional Plan has also been under preparation by the Bombay Metropolitan Regional Planning Board (BMRPB) from the period 1970 - 1991. BMRPB estimates that the population of GB will be 9.4 million by 2005. Sewers were laid in Bombay as early as 1891 and the original city area of about 70 sq. mile is 99% sewerred. However, residential subdivisions in suburban areas are only 60 - 70% covered by sewers.

5.17 National Institute of Oceanography (NIO) - 8 September 1977

This Institution forms part of CSIR and was formerly organized in 1966. It is presently headed by a forward looking and dynamic director, Dr. S.Z. Qasim. The Institute has in addition to its headquarters at Dona Paula, Goa, three centres, at Bombay (Maharashtra) on the Arabian Sea, Cochin (Kerala) in Malabar Coast and Waltair (Andhra Pradesh) in the Bay of Bengal.

It is organized into seven divisions and the staff strength including the three centres is about 390 in 1977. The divisions are:

- (i) Physical Oceanography
- (ii) Chemical Oceanography
- (iii) Geological and geophysical oceanography
- (iv) Biological oceanography
- (v) Instrumentation and electronics
- (vi) Planning and Data Processing
- (vii) Ocean Engineering and Erosion.

Funding comes mostly from CSIR, but NIO now embarks on contractual projects which are funded by sponsors. Its 1976/77 budget is Rs 6 million compared to Rs 3.7 million the year before. By 1980, NIO expects to earn most of its budget.

In Goa headquarters the total staff is about 300 of which about 120 are scientists. During our courtesy call on the Director we were provided with several information brochures and materials on NIO and technical reprints.

We were also informed about India and NIO's participation in the Integrated Global Ocean Station System (IGOSS).

The biological oceanography division, which is of direct interest to UNEP work, undertakes research and studies on primary production or phytoplanktons, secondary production (zooplanktons), benthic production

or bottom flora and fauna, exploration of living resources (pelagic fisheries and aquaculture), ecology of mangroves and estuaries, bio-energetics, biodegradation of hydrocarbons through bacteria and fungi, toxicity of urea, ammonia, ammonium sulphate, copper, zinc, heavy metals, arsenic and lead including 48-hr median tolerance limits of mussels, oysters, shrimps and fin fishes.

The geological/geophysical oceanography division conducts investigation on marine sediments, geochemistry and marine geotechnical surveys for offshore contractors such as submarine pipelines and offshore mineral exploration.

NIO has a well equipped library, which receives some 200 periodicals and 300 journals, an information unit, a data processing system and various specialized laboratories. There is also provided a residential colony with a director's bungalow, 50 staff quarters, a hostel with single and double rooms, a guest house and 2 canteens.

For cruises, the NIO has 1900-ton ocean-going research vessel R.V. *Gaveshani* with accommodations for 19 scientists and 45 ship officers and crew and can cruise for 25 days at a time. Powered by two 1400 hp marine diesel engines, it has a cruising speed of 11 knots. The Institute has also two small boats and 4 fibre glass boats for estuarine and riverine work. However, NIO has no facilities or equipment to combat any significant oil spills.

Before allowing us to go and discuss in some detail with the scientists at the Institute, the Director took us along a guided tour of the Institute laboratories and library facilities.

The NIO Director mentioned several national projects that have regional implications as well and which they would like to bring to the attention of UNEP for whatever it may be worth. These are:

- a. Environmental protection of coastal areas that are severely polluted such as Bombay and Madras (urban areas with sewage and industrial pollution);
- b. Environmental protection of coastal areas with intermediate or medium pollution such as Goa;
- c. Environmental protection of clean areas.

In the above projects the activities envisioned are determination of coastal area pollution and mapping of industrial areas along the Indian coastline, identification of priority pollutants (such as oil and petroleum, heavy metals and pesticides) and the use or choice of standardized equipment and instruments to monitor such marine pollution.

- d. Exchange of marine and other scientists wherein NIO scientists can interact with others from the ESCAP countries and establish the needed linkage. UNEP may wish to support such exchange and help establish a marine scientist network mechanism.

- e. Training of national and foreign technicians, middle level scientists, or fresh university graduates in the NIO laboratory.
- f. Ship board training during the regular NIO cruises. Studies conducted on board include course planning, bathymetry, ocean physics, residual times, dispersion and flushing rates of pollutants.

If UNEP is willing or able to provide international return air travel to and from Goa, DST or other international agencies can provide subsistence and NIO will provide facilities in (d), (e) and (f) above, according to the NIO Director.

The Director also mentioned that the first UNEP Executive Director, Mr. Maurice F. Strong, visited Goa sometime in 1974 that NIO has already started a cooperative linkage with the National Institute of Oceanography of Indonesia, headed by Dr. Aprilani Soegiarto.

a. Physical Oceanography Division

The NIO Deputy Director, Dr. V.V.R. Varadachari, heads this Division which does work on air-sea interaction and storms surges, energy exchange and upwelling, ocean waves and currents, transmission of light and sound and thermal structure, circulation patterns and hydrodynamic modellings.

The Division has prepared a "Wave Atlas" for every 5° square of latitude and longitude for the entire Indian Ocean for each of the twelve months. Tidal predictions, however, is not part of NIO work. It belongs instead to the Geodetic and Research Branch, DST Survey of India.

b. Biological Oceanography Division (aquaculture)

We were briefed by Dr. S.C. Goswami, scientist of the aquaculture branch of the Division. They have studied the life cycle of Macrobrachium Rosenbergii, a giant fresh water prawn which goes to the estuary for breeding during the monsoon (June - September) season. It tolerates salinities of 3,000 - 16,000 ppm even if they are fresh water prawns. M. Rosenbergii grows to a maximum size of 31 ins and usually are abundant 10 - 15 miles upstream from the mouth of rivers. However lately fish landing centres have shown a reduction of prawn catch.

Studies undertaken include sex ratio, growth rates, population densities, salinity tolerance and preferred food. While molting and prawn becomes slightly smaller. Preferred food, under artificial breeding conditions, is the tiny brine shrimp Artemia salina which seldom grow to no more than a few millimeters. Lately, this too has diminished and consequently is now more expensive.

c. Biological Oceanography Division (mangrove and estuaries)

Dr. A.D. Intawale, senior scientist of the unit gave us the briefing in the absence of the Division head who is out on cruise.

India has about 27 species throughout the continent but only 5 or 6 are predominant. The unit undertakes studies on the distribution, ecology and utilization of mangroves. The four more common species are: Rhizophora mactronata, Avicennia officianalis, Bruguiera Gymnorhiza, and B. Parviflora.

NIO has a nursery of mangrove seedlings for possible planting along berms or earth mounds of fishponds. The importance of mangroves lie in their being utilized for (a) bank erosion control, (b) firewood and charcoal and (c) aquaculture. Mangroves are also helpful because of their detritus content, photosynthetic bacteria and fungal growths which serve as important factors in fish spawning.

Studies have identified two main organisms causing the so-called red tide along the Indian ocean: Trichodesmium and Erythraeum species of algae.

One noteworthy arrangement which may contribute to the success of NIO is its financial incentive scheme, whereas 40 per cent of the project generated from contracted researches will be provided to in-house scientists while the rest will be submitted to CSIR.

5.18 Zuari Agro-Chemicals, Ltd. (ZAC) - 9 September 1977

This factory, which manufactures urea, ammonia, and complex fertilizers, was visited as a typical industrial plant. It was suspected to be the cause of fish kills, on the Marmagao Beach in front of the factory in September 1973, because of the use of the Vetrocoke process of CO₂ removal in the plant. In this process cooling water from the CO₂ removal plant was designed to contain not more than 0.1 ppm of arsenic.²

Even though it was not established that the factory effluent had anything to do with the fish mortality, the Goa government directed ZAC to change the Vetrocoke process to some other alternatives. At the same time 3 shifts of government chemists were deputed to the plant to monitor the effluents being discharged into the sea so as to insure that the standard of 0.1 ppm of arsenic is never exceeded. Also monitored are pH, oil, ammonia nitrogen and urea nitrogen. Eventually (after 18 months) the Vetrocoke processes was replaced by the Benfield system and cost the company Rs 260,000.

In order also to keep the ammonia nitrogen below the 50 ppm prescribed by the Central Pollution Board, a technical committee appointed by the national government recommend the installation of an ammonia hydrolizer/stripper which was finished in April 1977. This, together with other improvements made to ensure safe effluent marine disposal, cost the Company at a total of about Rs 2.65 million, the hydrolizer/stripper alone costing Rs 1.28 million.

We paid a courtesy call on the company Vice President Mr. R. Kapoor and his managing director, Mr. K.A. Varugis. It was the production manager Mr. G.S. Keshavamurthy, however, who led us on a brief tour of the plant including the small effluent monitoring laboratory.

The factory has a total labour force of about 600 people and the total original capital investment in the plant is about Rs 5.7 million. It has annual output of 430 tons of fertilizer as follows:

Urea	-	280,000 tons
NPK	-	150,000 tons

Urea, it may be recalled, is produced by reacting naphtha with ammonia, with a main by-product of carbon dioxide produced. Ammonia in turn, is obtained by reacting nitrogen (from air or liquefied air) with hydrogen from naphtha. The plant produces 220,000 tons of ammonia a year and the principal complex fertilizers are the 28/28/0, 19/19/19, and the 18/46/0, the numbers referring to the percentage amount of nitrogen, phosphorus and potassium respectively. Naphtha is supplied by the Indian Oil Corporation at the rate of 220,000 tons per year or 660 tons per day.

The plant is a highly automated one, designed equipped and constructed on a turn-key basis by the Toyo Engineering Corporation of Japan and its associate Toyo Engineering Corporation of India. Construction started on 10 April 1970 and was finished on 8 July 1972 and the first output of urea was produced on 26 May 1973. It is the newest in India but there are at least three larger plants.

The plants overall effluent production is 300 - 500 m³ per hour or about 3 mgd. During the installation of the Benfield CO₂ remover and ammonia hydrolizer/stripper the plant was shut down for 75 days and it took at least 7 days to restart operation.

5.19 Notes on Discussions with Officials of NEERI Zonal Laboratory in Calcutta (NZLC), 10 September 1977

The main areas of activities of this Zonal Laboratory are air pollution, water pollution, industrial wastes and to a lesser extent solid wastes and rural sanitation. According to Dr. A.K. Basu, its Director, the present staff total about 60 with 40 scientists and technicians and 20 non-technical personnel. About 20 of their staff work on air pollution and 40 on water pollution and industrial wastes. Occasionally, they assist the Ministry of Health in solid wastes management work and in rural sanitation activities. The laboratories are located in two separate buildings with a total area of about 5300 ft². A new location is expected to be occupied by early December with an area of some 12,000 sq.ft. of space. Actual needs, as projected, call for a space of some 42,000 sq.ft. and a 6-storey building is being planned. Four motor vehicles are presently provided but they have no boat of their own for river sampling. Water sampling on the Hooghly River is done with the use of a watercraft borrowed from the Central Indian Water Transport Organization.

The water pollution laboratory is equipped with standard equipment, except atomic absorption spectrophotometer and gas chromatographs. Sampling is done to monitor inland, estuarine and marine pollution. The NZLC budget amounts to Rs 1.5 million, of which Rs 1.2 million is given by the Calcutta Metropolitan Development Authority (CMDA) and Rs 0.3 million is given by the NEERI. The Zonal Laboratory covers 8 states and two union territories

/(Assam,

(Assam, Bihar, Manipur, Meghalaya, Nagaland, Orissa, Tripura, West Bengal, Arunachal Pradesh and Mizoram). The laboratory performs some rural development work for the CMDA but its main function is to monitor industrial pollution. Among the more important industries in Calcutta and in the region are pulp and paper mills, distilleries, dairies, breweries, cotton and synthetic textiles mills, iron and steel mills and coke ovens.

For air pollution monitoring, a rather complete survey has been made in 1970 - 1971 under the auspices of NEERI alone. For the year 1972-75, the CMDA has started to contribute funds. The laboratory determines the state or quality of metropolitan air over Calcutta, identifies and surveys the sources of air pollution and its professional staff suggests way of air pollution abatement. A programme of air monitoring is now in progress with 21 stations of type A and 12 of type B. In type A stations 7 parameters or pollution indicators are measured: sulfation rate, settleable particles (on plastic paper), suspended particulates (from high volume air samples), total oxidants, hydrogen sulfide, carbon monoxide and carbon dioxide. In type B stations, only sulfation rate and suspended particulates using high volume air samples are determined. Sampling is done once a week at each of these stations.

Overall, during summer time and the monsoon season, air pollution is not a problem. It is only during winter time (November to February) that air pollution becomes a problem because the use of coal and cow dung for domestic heating coincides with the occurrence of atmospheric temperature inversions.

Major sources of air pollutants are stationary power stations, industrial stacks and motor vehicles. Calcutta area uses a great deal of coal and coke in the various industries, amounting to about 7 million tons a year. Also, in Calcutta area, the estimated industrial emissions total 632 tons per day, composed of particulates - 45%, carbon monoxide - 28%, sulfur dioxide - 10%, nitrogen oxides - 7.5% and hydrocarbons - 9.5%. Of the particulates, about 50% is of organic origin and in the monsoon months July to October, the average concentration is however, still way below 300 ug per m³.

Results of a recent study by NZIC show that the percentage amount of four major pollutants from various sources are as follows:

Percentage Amounts of Air Pollutants
by Sources in Calcutta

Sources of Pollutants	Major Pollutants			
	Particulates	CO	SO ₂	NO _x
Power Generation	52	2	71	36.0
Industry	38	1	18	15.4
Domestic sources	0	19	9	15.2
Transport	1	78	2	33.0
Others	-	-	-	0.4

Note: Number of industries in Calcutta - 345; in Howrah - 484;
Source: NEERI Zonal Laboratory in Calcutta.

Due to the abject living conditions in the city, where survival itself preoccupies the poor masses, pollution control is severely neglected. The lack of regulation and enforcement has hindered the good technical work conducted by the NEERI Zonal Laboratory.

5.20 Final Debriefing at UNDP and DST - 12 September 1977

At the end of the two-week mission and prior to departure a debriefing call was made to the UNDP Resident Representative to whom we expressed our thanks for the kind backstopping they have provided.

We briefly outlined what the government officials considered were significant environmental problems and possible regional projects that may be developed for South Asia.

We also expressed our appreciation for the warm reception during our call on the Indian officials which we felt was due to the ground work arrangements made by UNDP. We felt that we have established important and hopefully long-lasting personal contacts and official linkage with the senior officials of the government of India responsible for environmental affairs. We assured Mr. Polgar, in conclusion, that the RAT is always at the service of UNDP and while in India we considered ourselves part of his staff.

In our debriefing with the DST and NCEPC officials we reiterated the original objectives of the RAT mission and how we thought these were accomplished. We met and have laid the ground work for future relationships with the key government personnel responsible for environmental affairs. Among the offices visited were NBO, IARI (SSA), CPHEEO, CBPCWP, CWC, NEERI and of its zonal laboratories, CWPRS and NID.

We reported that key problem areas brought out during our discussion were the following, not necessarily in order of importance:

- a. Industrial pollution control
- b. Wildlife management
- c. Mountain ecology
- d. Environmental education
- e. Training in environment management for administrators and planners
- f. Transient settlements
- g. Marine parks
- h. Environmental aspects of natural disasters
- i. Instrumentation and monitoring of environmental parameters.

/Basic

Basic environmental problems facing India today, as considered by the officials met and to which the mission concurred, were:

- a. Provision of housing in rural and suburban areas
- b. Provision of sanitary facilities in human settlements
- c. Environmental management including impact assessment
- d. Lack of environmental legislation, in particular, air pollution control law
- e. Lack of adequate energy supplies
- f. Inadequacy of environmental information dissemination.

We also pointed out the national projects on environmental management, some of which have regional implications, which were brought to light as desirable. These are:

- a. Series of small workshops on impact studies on development projects
- b. Water quality modelling
- c. Strengthening and codification of environmental legislation
- d. Exchange of scientists in marine sciences
- e. Establishment of marine parks
- f. Strengthening of environmental education
- g. Training for administrators and planners, probably in association with JNU.
- h. Strengthening of local industry for environmental instrumentation by monitoring market survey of requirements with the region, especially since environmental control depends on assessment which in turn relies heavily on monitoring.
- i. Training programme for treatment plant operators, since about 85% of treatment plants are not operated properly due to lack of training.
- j. Strengthening information centre on environment, and establishment of regional journals.
- k. Carrying out the second phase of the UNEP-supported project, being implemented by NIO, on "Marine Pollution Monitoring and Marine Living Resources Assessment for the Indian Ocean Region."

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When a reference was made to the forthcoming International Conference on Water Pollution Research and Control in developing countries to be held in Bangkok at the Asian Institute of Technology in February 1978, we indicated a possibility of UNEP co-sponsoring the Conference and possible assistance to enable candidates from developing countries to attend. We also mentioned the Environmental Education Conference due to be held at Tbilisi, USSR, in October 1977; but as of 12 September 1977 no pertinent papers have yet been received by the DST.

MISSION TO INDIA

Institutions Visited and Officials Met

28 August - 13 September 1977

I. NEW DELHI

(a) United Nations Development Programme (UNDP)

1. Mr. Roger Polgar, UNDP Resident Representative
2. Mr. K. Padmansabhan, Programme Officer
3. Mrs. Sonia Thakur, Staff Officer
4. Mr. Gerd Merrem, Assistant Resident Representative
5. Mr. M.R. Malhotra, Programme Officer for UNIDO Affairs

(b) Department of Science and Technology (DST)

1. Dr. M. Ramachandran, Director-General, DST
concurrently Chairman, Council of Scientific and
Industrial Research (CSIR)
2. Dr. B.P. Pal, Chairman, National Committee on
Environmental Planning and Co-ordination (NCEPC)
3. Dr. S. Venkatesh, Joint Secretary, DST
4. Dr. E.L. Ramanathan, Director for Environment Planning, DST
5. Dr. N.R. Krishnan, Director for Administration, DST
6. Dr. M.K. Biswas, Senior Specialist and Secretary, NCEPC
7. Dr. M. Parabrahman, Senior Specialist on Industrial
Effluents, DST
8. Dr. E.V.R. Sastry, Senior Specialist, DST
9. Mr. B.K. Bansal, Senior Specialist on Human Settlements, DST
10. Dr. A. Lahiri, Senior Specialist on IRS, DST
11. Mr. O.P. Bhardwaj, Senior Environmental Analyst, DST

(c) WHO, SEARO

1. Mr. Somnuek Unakul, Regional Adviser on Environment Health
2. Mr. Michael A. Acheson, Regional Adviser on Environment Health
3. Dr. Wilfredo L. Reyes, Sanitary Engineer, Community Water
Supply and Sanitation Project

(d) National Buildings Organization (NBO), Ministry of Works
and Housing

1. Dr. G.C. Mathur, Director

- (e) Soil Science and Agriculture Division, Indian Agricultural Research Institute (IARI)
1. Dr. O.P. Chawla, Soil Scientist and member, NCST
 2. Dr. R.K. Chibber, Soil Scientist
 3. Dr. O.P. Vinsal, Soil Scientist
- (f) Central Public Health and Environmental Engineering Organization (CPHEEO)
1. Dr. T.S. Swamy, Adviser, PHEE, CPHEEO, Ministry of Works and Housing
 2. Mr. T.G. Sankaran, PHEE, Deputy Adviser CPHEEO
- (g) Jawaharlal Nehru University (JNU)
1. Prof. B.D. Nagchaudhury, Vice-Chancellor, JNU
 2. Dr. B. Bhatia, Dean, School of Environment Sciences
- (h) IBRD (World Bank)
1. Mr. Oktay Yenal, Principal Economist
- (i) Central Board for the Prevention and Control of Water Pollution (CBPCWP)
1. Dr. Nilay Chaudhuri, Chairman
 2. Dr. M. Miskhan, Member-Secretary
- (j) Central Water Commission (CWC)
1. Dr. Y.K. Murthy, Chairman, CWC
 2. Mr. C.V. Gole, Member for Water Resources
- (k) Others
1. Dr. V. Ranganathan, Industrial Consultant

II. NAGPUR

- (1) National Environmental Engineering Research Institute (NEERI)
1. Dr. B.S. Sundaresan, Director
 2. Dr. P.V.R. Subrahmanyam, Assistant Director and Scientist-in-Charge (Industrial Wastes)
 3. Mr. D. Raghuraman, Scientist-in-Charge (Consultation)
 4. Dr. S.B. Dabodghao, Scientist-in-Charge (Training, Information, Library and Extension)

5. Shri P.K. Yennawar, Scientist-in-Charge, Air Pollution Division
6. Dr. R. Paramasivam, Scientist-in-Charge (Engineering)
7. Dr. V.R. Bhawe, Scientist (Instrumentation)
8. Dr. K.P. Krishnamoorthi, Scientist-in-Charge (Life Sciences)
9. Dr. V. Chalapati Rao, Scientist (Life Sciences)
10. Dr. M. Vithal Rao, Scientist (Life Sciences)
11. Dr. S.V. Waghmare, Senior Scientist (Life Sciences)
12. Dr. G.B. Shende, Scientist (Sewage)
13. Dr. A.D. Bhide, Scientist-in-Charge (Solid Wastes)
14. Dr. S.K. Titus, Scientist (Solid Wastes)
15. Dr. K.R. Bulusu, Scientist-in-Charge (Water)
16. Dr. V. Hanumanulu, Scientist (Consultation)

III. POONA

(m) Central Water and Power Research Station (CWPRS), CWC

1. Dr. B. Pant, Joint Director
2. Dr. S.V. Chitale, Joint Director
3. Dr. Z.S. Tarapore, Chief Research Officer
4. Dr. P.P. Vaidyarama, Chief Research Officer
5. Mr. T.P. Yegnan, Senior Staff Officer

IV. BOMBAY

(n) Municipal Corporation of Greater Bombay (MCGB)

1. Mr. V.D. Desai, Deputy Municipal Commissioner (Special Engineering)
2. Dr. Deepak Kantawala, Environmental Engineering Consultant (with Metcalf and Eddy of USA), Special Consultant to MCGB

V. PANAJI (Goa)

(o) National Institute of Oceanography (NIO)

1. Dr. S.Z. Qasim, Director
2. Dr. V.V.R. Varadachari, Deputy Director and Head Physical Oceanography Division
3. Dr. R. Sen Gupta, Scientist, Chemical Oceanography Division

4. Dr. Arvind G. Untawale, Scientist (Mangroves),
Biological Oceanography Division
5. Dr. S.C. Goswami, Scientist (Aquaculture),
Biological Oceanography Division

VI. DABOLIM (Goa)

(p) Zuari Agro-Chemicals Ltd.

1. Mr. Romesh Kapoor, Vice-President for Commercial
2. Mr. K.A. Varugis, Managing Director
3. Mr. B. Powell, Technical Director
4. Mr. K.S. Sarma, Deputy Technical Director
5. Mr. G.S. Keshavamurthy, Production Manager

VII. CALCUTTA

(q) NEERI Zonal Laboratory

1. Dr. A.K. Basu, Scientist-in-Charge, Zonal Laboratory
2. Mr. G.S.G. Rao, Head, Air Pollution Division

Itinerary of RAT Mission to India

28 August - 13 September 1977

28 August, Sunday

- 1900 Departure from Bangkok via JAL 461
 2115 Arrival New Delhi, stayed at Hotel Janpath

29 August, Monday

- 1000 Courtesy call on UNDP Resident Representative and discussions on scheduled visits, UNDP Offices, Lodi Estate
 1500 Discussions with Dr. S. Venkatesh and other Department of Science and Technology (DST) officials on details of visit, DST Offices, Technology Bhavan, New Mehrauli Road
 1930 Dinner at Mandarin Restaurant, Janpath Hotel, tendered by Dr. W.L. Reyes of WHO

30 August, Tuesday

- 0830 Discussions with Mr. M.A. Acheson and other WHO officials, WHO House, Indraprastha Estate
 1130 Discussions with Dr. G.C. Mathur, Director, National Building Organization (NBO), Nirman Bhavan
 1930 Dinner at Sheesh Mahal Room, Akbar Hotel given by Dr. W.L. Reyes of WHO

31 August, Wednesday

- 0900 Final arrangements of travel outside Delhi, UNDP Travel Unit
 1130 Discussions with Dr. O.P. Chawla, Senior Scientist and his staff on agricultural residue utilization at the Soil Science and Agriculture Division, Indian Agricultural Research Institute, Pusa
 1500 Discussions with Dr. T.S. Swamy, Adviser, Central Public Health Environmental Engineering Office (CPHEEO), Nirman Bhavan
 2200 Dinner at Maharani Room, Claridge Hotel given by Dr. R.M. Lessa

/1 September

1 September 1977, Thursday

- | | |
|------|---|
| 0230 | Discussions with Mr. Gerd Merrem, UNDP Assistant Resident Representative and Mr. M.R. Malhotra, UNDP Officer for UNIDO matters, UNDP offices |
| 1030 | Discussions with Dr. B.D. Nagchaudhury, Vice-Chancellor, J. Nehru University |
| 1400 | Courtesy call on Ford Foundation, UNDP compound |
| 1500 | Discussions with Dr. Nilay Chaudhuri, Chairman, Central Board for the Prevention and Control of Water Pollution (CBPCWP), Ex AFO Mess, Rajendra Prasad Road |
| 1950 | Dinner at Supper Club, Akbar Hotel, given by Dr. W.L. Reyes of WHO |

2 September, Friday

- | | |
|------|---|
| 0900 | Discussions with Mr. Oktay Yenal, Principal Economist, World Bank, UNDP Office |
| 1130 | Call on Dr. B.P. Pal, Chairman, National Commission on Environmental Planning and Co-ordination (NCEPC), DST, Technology Bhavan |
| 1500 | Discussions with Mr. Y.K. Murthy, Chairman, Central Water Commission (CWC), Bikaner House, Shah Jehan Road |

3 September, Saturday

Free

4 September, Sunday

Free

5 September, Monday

- | | |
|------|--|
| 0630 | Departure for National Environmental Engineering Research Institute (NEERI) at Nagpur via IC 439 |
| 0750 | Arrival Nagpur, met by Mr. D. Raghuraman of NEERI |
| 0930 | Discussions with NEERI staff headed by its Director, Dr. B.B. Sundaresan |
| 1950 | Depart Nagpur via IC 130 |
| 2200 | Arrival Bombay, stayed at President Hotel |

/6 September

6 September, Tuesday

0820	Departure by car from Bombay for Poona Central Water and Power Research Station (CWPRS)
1300	Arrival at CWPRS and lunch, courtesy of CWPRS
1400	Visits to different CWPRS installations
2000	Departure Poona for Bombay via IC 158
2040	Arrival Bombay

7 September, Wednesday

0900	Check out of hotel wait for UNDP car.
1000	Received telephone call, UNDP car had accident
1240	Arrival of Dr. M. Parabrahman at hotel, proceeded to Municipal Corporation of Greater Bombay (MCOB) for brief discussions on sewerage and sewage pollution problems
1550	Departure Bombay for Goa via IC 524
1650	Arrival at Dabolim, proceed to hotel Mandovi at Panaji

8 September, Thursday

1000	Discussions with Dr. S.Z. Qasim, Director, National Institute of Oceanography (NIO), and visits to its various offices and laboratories, Dona Paula, Goa
1230	Lunch at NIO, Courtesy of NIO
1330	Continuation of visit to laboratories

9 September, Friday

0920	Departure call on NIO Director
1020	Proceed to Zuari Agro-Chemicals (ZAC), a factory making fertilizers, located at Jaikisaan Bhavan, Zuarinagar near airport
1300	Lunch courtesy of ZAC
1420	Departure for Calcutta via Bombay IC 523/IC 274
2100	Arrival Calcutta, stayed at Park Hotel

/10 September

10 September, Saturday

1000	Visit to NEERI Zonal Laboratory in Calcutta (NZLC) with Dr. A.K. Basu, Director
1300	Lunch, courtesy of NZLC Director
1500	Visit to Air Pollution Laboratory
1800	Return to hotel

11 September, Sunday

0930	Check out of hotel
1000	Visit to sampling points of Calcutta water monitoring programme
1300	Lunch courtesy of NZLC Director
2030	Departure for New Delhi via IC 402
2240	Arrival Delhi, stayed at Janpath Hotel

12 September, Monday

1030	Debriefing at UNDP
1200	Visit to Indian Standards Institute
1450	Courtesy call on DST/CSIR Director, Dr. R. Ramachandran
1515	Debriefing at DST with Dr. B.P. Pal and Dr. S. Venkatesh and staff
1930	Dinner at International Centre near UNDP hosted by Dr. and Mrs. V. Ranganathan

13 September, Tuesday

0900	Check out of hotel
1450	Departure for Bangkok via TG 304
2220	Arrival in Bangkok

Basic Information about India

A. Political Sub-divisions of India (India is also known as Bharat)

India is a federated country consisting of 22 states and 9 union territories, with a 1971 population of about 548.1 millions.

(a)	<u>States</u>	<u>Capital</u>	<u>Area, Km²</u>	<u>1971 Population</u> <u>(1,000)</u>
1.	Andhra Pradesh	Hyderabad	276,814	43,503
2.	Assam	Guahati	78,523	14,625
3.	Bihar	Patna	173,876	56,353
4.	Gujarat	Gandhinagar	195,894	26,695
5.	Haryana	Chandigarh	44,222	10,037
6.	Himachal Pradesh	Simla	55,673	3,460
7.	Jammu and Kashmir	Srinagar (Summer) Jammu (Winter)	222,236	4,617
8.	Karnataka	Bangalore	191,773	29,299
9.	Kerala	Trivandrum	38,864	21,347
10.	Madhya Pradesh	Bhopal	442,841	41,654
11.	Maharashtra	Bombay	307,762	50,412
12.	Manipur	Imphal	22,356	1,073
13.	Meghalaya	Shillong	22,489	1,012
14.	Nagaland	Kohima	16,527	516
15.	Orissa	Bhubaneswar	155,842	21,944
16.	Punjab	Chandigarh	50,362	13,551
17.	Rajasthan	Jaipur	342,214	25,766
18.	Sikkim	Gangtok	7,107	198
19.	Tamil Nadu	Madras	130,069	41,199
20.	Tripura	Agartala	10,477	1,556
21.	Uttar Pradesh	Lucknow	294,413	88,341
22.	West Bengal	Calcutta	87,853	44,312
Total of 22 states:			3,168,187	541,470

/(b)

(b)	<u>Union Territories</u>	<u>Capital</u>	<u>Area, Km²</u>	<u>1971 Population</u> <u>(1,000)</u>
1.	Andaman and Nicobar Islands	Port Blair	8,293	115
2.	Arunachal Pradesh	Itanagar	83,578	468
3.	Chandigarh	Chandigarh	114	257
4.	Dadra and Nagar Haveli	Silvassa	491	74
5.	Delhi	Delhi	1,485	4,066
6.	Goa, Daman and Diu	Panaji	3,813	858
7.	Lakshadweep	Kavaratti	32	32
8.	Mizoram	Aijal	21,087	332
9.	Pondicherry	Pondicherry	480	472
Total of 9 territories			119,373	6,674
Grand total			3,287,560 sq.km.	548.144 millions

(c) Areas under Zonal Laboratory of NEERI at Calcutta
(8 states and 2 union territories)

1. Assam	6. Orissa
2. Bihar	7. Tripura
3. Manipur	8. West Bengal
4. Meghalaya	9. Arunachal Pradesh
5. Nagaland	10. Mizoram

B. Land Area and Population Distribution

The 328 million hectares of land in the sub-continent is broken down as follows:

Arable	42.37 %
Forest	20.03 %
Pasture	3.99 %
Uncultivated	33.61 %
Total	100.00 %

/In

In 1971 the population was as follows:

Hindus	453.4 millions	82.72 %
Muslims	61.4 "	11.20 %
Christians	14.2 "	2.59 %
Sikhs	10.3 "	1.88 %
Buddhists	3.8 "	0.69 %
Jains	2.6 "	0.47 %
Others	2.4 "	0.45 %
Total	548.1 millions	100.00 %

C. Government Structure

As a federated country, the Indian government structure is similar to that of the USA and the USSR. It has three co-equal and independent branches of government - the legislature, the judiciary and the executive.

The executive branch is headed by an elected President but real power is vested in the Prime Minister. There are some twenty-six Ministries as follows:

1. Agriculture and Irrigation
2. Atomic Energy
3. Chemical and Fertilizer
4. Commerce, Civil Supplies and Co-operation
5. Communications
6. Defence
7. Education
8. Electronics and Space
9. Energy
10. External Affairs
11. Finance
12. Health and Family Welfare
13. Home Affairs (Interior)
14. Industries
15. Information and Broadcasting
16. Law, Justice and Company Affairs
17. Parliamentary Affairs

18. Petroleum
19. Prime Ministers Office
20. Railways
21. Rehabilitation
22. Shipping and Transport
23. Social Welfare
24. Steel and Mines
25. Tourism and Civil Aviation
26. Works and Housing

A separate Department of Irrigation and of Agriculture exist in the Ministry of Agriculture, while a Department of Economic Affairs is under the Ministry of Finance.

In the Prime Ministers Office, there are three important agencies concerned with environment:

- a. Department of Science and Technology (DST)
- b. Council of Scientific and Industrial Research (CSIR)
- c. National Planning Commission (NPC)

D. Some Social and Infrastructure Statistics (from 1977 Asia Year book and 1976 ESCAP Annual Statistical Yearbook)

Population density (1971)	- 167
Crude Birth rate per 1,000 (1973-74)	- 35
Crude death rate per 1,000 (1973-74)	- 15
School enrollment (1974)	
Primary	- 63.19 millions
Secondary	- 22.17 millions
Tertiary	- 3.17 millions
Hospital beds (1974)	- 303,000
TV station (1974)	- 9
TV sets (1974)	- 275,400
Radio stations (1974)	- 71
Radio sets (1974)	- 14.84 millions
Telephones (1974)	- 1.77 millions
Highways (1973)	- 1.19 million kms.

/Railways (1974)

Railways (1974)	- 60,234 kms.
Airports	- 83
Sea ports	- 170
Tourist arrivals (1975)	- 465,000
Unemployed (1975)	- 8.7 millions
Motor vehicles (1974)	- 1.15 millions

E. Economic Indicators (1975-76) (from 1977 Asia Yearbook and 1976 ESCAP Annual Statistical Yearbook)

Government Revenue	- Rs 165,280 millions
Government Expenditure	- Rs 163,400 millions
Exchange rate	- About Rs 3.70 - 9.20 to US\$1
Gross Domestic Product	- Rs 684,600 millions
GDP (1975)	- Rs 633,700 millions
GDP Per capita	- Rs 1,022 (US\$115)
GDP sectors	
Agriculture	- 49.6 %
Manufacturing	- 13.6 %
Commerce	- 11.2 %
Services	- 9.8 %
Construction	- 4.5 %
Others	- 11.3 %
	100.0 %
Imports (1976)	- Rs 51,578 millions
Exports (1976)	- Rs 39,416 millions
Major Imports	<u>Origins</u>
Food grains	- 25.9 % USA - 23.1 %
Petroleum	- 23.7 % Iran - 8.9 %
Machinery	- 14.5 % W. Germany - 7.1 %
Fertilizer	- 8.5 % Japan - 6.9 %
	USSR - 5.9 %
Major Exports	<u>Destination</u>
Sugar	- 11.9 % USA - 12.8 %
Engineering Goods	- 10.3 % Japan - 10.8 %
Jute Products	- 6.3 % USSR - 10.4 %
Tea	- 6.0 % U.K. - 10.2 %
Handicrafts	- 5.9 % Iran - 6.8 %

F. Miscellaneous

India frequently uses the following units of measures:

1 lakh	=	100,000
1 crore	=	10,000,000 = 100 lakhs
1 imperial gallon	=	1.20 US gallons
	=	0.004542 m ³
	=	4.542 liters

Assorted Newspaper Clippings
collected during the
Regional Advisory Team Mission to India

28 August - 13 September 1977

The Times of India (Delhi)
1 September 1977

Posts of CSIR chief and DST secretary merged

NEW DELHI, August 31 (Samachar) The posts of the secretary of the Department of Science and Technology and the director-general of the Council of Scientific and Industrial Research have been merged.

The Union government has already issued orders merging the two posts, according to official sources.

The sources explained that this step would make the CSIR an integral part of the DST to bring about better co-ordination and cohesion in scientific research.

Until now the director-general of CSIR enjoyed independent status as secretary to the government.

Though the CSIR was technically part of the DST until now, the independent status enjoyed by the director-general, CSIR, as secretary created some problems of co-ordination by the department, it is pointed out.

Dr. A. Ramachandran, Secretary of the DST, will now hold both charges in the integrated set-up where there will be only one secretary instead of two secretaries.

According to the sources, the government has not taken any decision on a proposal to detach the Botanical Survey of India and the Zoological Survey of India from the DST and attach them to the Agriculture Ministry or Indian Council of Agricultural Research.

The advantages or disadvantages of such a step would be carefully weighed by the government before taking any final decision, the sources pointed out.

NO DECISION

There is also no decision taken on a proposal to detach the National Research Development Corporation (NRDC) from the DST and attach it to the Industry Ministry.

The sources denied that there was any proposal to attach the Atomic Energy Department to the Ministry of Energy. There was also no proposal to attach the DST to the Education Ministry as has been reported by some newspapers.

The sources pointed out that the different scientific departments of the government such as atomic energy, space, electronics, and the DST are likely to retain their independent status.

The CSIR, after becoming part of the DST, will enjoy the same position as the Atomic Energy Commission, the Electronics Commission and the Space Commission.

Official sources explained that the criticism voiced by a section of scientists on the proposed reorganisation of the CSIR is based on an inadequate understanding of the government's intentions.

The Cabinet, which discussed the proposal last month, only took a decision in principle based on the Administrative Reforms Commission's recommendations that the science and technology organisations should be reorganised to make them more user-oriented.

A suggestion was accordingly made to the governing body of the CSIR to examine the proposal and decide which of the laboratories should be taken out of the CSIR and attached to ministries, public sector undertakings or other research bodies like the Indian Council of Medical Research and the Indian Council of Agricultural Research.

The governing body of the CSIR, of which the Prime Minister is the president, will discuss the proposal

thoroughly before approving the proposal.

It is pointed out that a large number of scientists working in the 44 national laboratories of the CSIR are frustrated now because the processes developed by them, after long years of research, are not accepted by the industry.

The arrangement now proposed is expected to remove this lacuna as the host-ministries or organisations will now be conscious of the fact that there are research facilities available with them before looking for imported technology.

The laboratories, so transferred, will enjoy full autonomy as they will be societies like the CSIR or ICAR and they will be fully within their rights to take decisions on research projects within the overall availability of funds.

Coordination of these laboratories with other similar institutions will be brought about by appointing representatives of these outside bodies, industry, and public sector undertakings on the governing body.

The by-laws of the societies of the laboratories will be framed by the DST in consultation with concerned scientists so as to ensure full autonomy.

The sources denied that the concerned secretaries of the science departments were not consulted on the proposal. The secretaries of the DST and electronics and the technocrat secretaries of the government, particularly Industry Ministry, were involved in the formulation of the proposal.

A review of the functioning of the laboratories as to how the objective of promoting economic development has been achieved by the new arrangement will be made after five years. Any changes, if needed, could be made then in the set-up.

It is proposed to undertake a cost-benefit analysis of research projects before they are approved so that the nation benefited from them.

Out of 28 laboratories proposed to be detached from the CSIR, 12 are research associations of various sectors of industry like tea, textiles, jute, cement, automation, and plywood and two are museums.

All the institutes under the CSIR, concerned with medical problems, except the Central Drug Research Institute, will go to the Indian Council of Medical Research.

Similarly, all laboratories dealing with agriculture and food will be attached to the Indian Council of Agricultural Research.

The museums are likely to be attached to the Education Ministry.

Malaria Threat Alarming, Admits Khurana

The Statesman 2 Sept 77
p 2

By A Staff Reporter

The Executive Councillor (Health), Mr Madan Lal Khurana, admitted in the Metropolitan Council on Thursday that malaria had reached alarming proportions in Delhi and that the Administration was somewhat helpless since the mosquitoes had become immune to insecticides.

Replying to a calling-attention on the epidemic which had affected "more than 400,000 people", tabled by Mr Viresh Pratap Chaudhury and eight other Janata members, Mr Khurana said insecticides used in Delhi and other parts of the country had lost their efficacy. Even DDT was not doing much good.

One reason for the epidemic was that, as instructed by the Central Government, DDT was sprayed only in rural areas, inferior insecticides being used in cities. The number of cases, 37 in 1968, 1,036 in 1970, 3,451 in 1973, 12,163 in 1974, 37,879 in 1975, 49,330 in 1976 and 101,337 this year indicated the gravity of the situation.

Earlier, the Chief Executive

Councillor, Mr Kidar Nath Sahani, informed the House that the issue of land given to J. D. Tytler School during the Emergency at a concessional rate by the Delhi Development Authority had been referred to the Central Bureau of Investigation.

In reply to a question by Mr Charti Lal Goel (J), Mr Sahani said the school got 1.64 acres for only Rs 7,500 when the market rate was Rs 10 lakhs per acre. This was the only school which got this concession. It was well known that the person connected with the school was close to the "Caucus". When Mrs Vimal Nagi (C) asked who had given the land, Mr Sahani named Mr Jag Mohan, former Vice-Chairman of DDA.

In reply to another question Mr Sahani said he was sure Delhi University would accept the lists of governing bodies of the colleges, the Administration would submit to it. There were 15 colleges and the Administration had submitted lists for 14 of them, one college having gone to court.

Later Mr Sahani told reporters he had informed the Vice-Chancellor that he would not accept "double standards" and that there was no question of his attending any meeting in the latter's office.

He recalled that during Congress rule at least three members appointed to a college's governing body were non-matriculants. He saw no reason for the University to object to the present lists since many of the nominees were professional men like lawyers, doctors, journalists and business men.

JNU staff still split on probe

3 Sept 77 P.1
Hindustan Times Correspondent

NEW DELHI, Sept. 2—Once again today the sharply polarised teaching community at the Jawahar Lal Nehru University failed to reach an agreement on the nature of inquiry to be demanded for the university.

The issue, which has been the subject of intense politicking on the campus for several weeks, remained unresolved after a general body meeting of the JNU Teachers Association which dragged on for more than four hours.

No decision was reached on whether the inquiry should be limited to the period of emergency or whether it should be a review of the university's functioning since its inception. A resolution put forward by the ex-

ecutive committee of the JNUTA was not accepted.

The main point on which this resolution ran into trouble was on its suggestion that the inquiry should be conducted by the university court.

The opposing faction among the teachers rejected this as ultra vires the Act governing the Jawahar Lal Nehru University specifically states that only the Visitor of the university is competent to hold an inquiry. The President is the Visitor.

A substantial number of both students and teachers are reluctant to invite an inquiry by the Visitor on the ground that this may interfere with the university's

autonomy. They want an internal inquiry, conducted by a panel composed of teachers, students and karamcharis.

The Students Union circulated a statement today reiterating its demand for an internal fact-finding committee which will look into all alleged instances of misuse of power during the emergency.

A parallel resolution was put forward at the teachers meeting suggested that the JNUTA general body nominate a panel of distinguished academics from outside the university.

Both factions today compromised on forming a committee which has been charged with drafting a 'composite resolution' by Tuesday.

Heavy rain *Hindustan Times* paralyses *3 Sept* Bombay *P.14*

BOMBAY, Sept. 2 (Samachar)—Bombay lay almost paralysed after being pounded by nearly 100 mm of rain in 24 hours ended at 8.30 a.m. today.

Suburban services of the Central Railway came to a virtual stop, while those of the Western Railway remained suspended on water-logged sections. Vehicular traffic on the roads came to a crawl as rain water caused mini-floods in several areas.

Several buses of the municipalised BEST, many taxis and cars lay immobilised in knee-deep water along the roads linking the city to its distant suburbs.

School children were sent back home, colleges remained closed and with attendance very thin work in offices was hit.

Loading and unloading operations at the port came to a standstill and at the airport the domestic flights and one international service were diverted.

Two Indian Airlines flights were diverted to Pune while the Air-India flight from Kuwait flew to Delhi because of poor visibility, airport sources said.

The rain, which started last night, was continuing without break till 2 p.m.

Hindustan Times Sewerage for *3 Sept 77* regularised *P.3* colonies

Hindustan Times Correspondent

NEW DELHI, Sept. 2—The Delhi Water Supply and Sewage Disposal Undertaking of the Municipal Corporation has decided to provide water supply and sewerage facilities in regularised colonies.

DWSSDU Chairman Madan Mohan Abrol said in a statement today the residents would have to pay at a uniform rate of Rs 12 per square metre (Rs 4.50 for water supply lines and Rs 7.50 for sewerage) of the area of the plot to the undertaking.

A minimum of 20 per cent of the amount, irrespective of the number of plots, shall be payable within three months of publication of the public notice in the Press. The remaining 80 per cent would have to be paid in 15 equal instalments with 8 per cent interest per annum, he added.

Water staff put on special duty

Hindustan Times Correspondent

NEW DELHI, Sept. 2—The Delhi Water Supply and Sewage Disposal Undertaking has put its supervisory staff on a round-the-clock duty to ensure there is no disruption of water supply to citizens due to the one-day strike by the Lal Jhanda Mazdoor Union from midnight tonight.

The undertaking has also appealed to the people to store water to meet any contingency.

Shortage *Hindustan Times* of cooking *3 Sept 77* gas for 3 years

Hindustan Times Correspondent

NEW DELHI, Sept. 2—A kitchen trouble is brewing. The Indian Oil Corporation says there is likely to be persistent shortage of cooking gas (liquid petroleum gas) for the next two to three years as its refineries are reporting a declining output of LPG.

There is less and less quantity of associated gas available from the oil fields and the refineries are not in a position to meet the expanding demand of gas without expansion.

IOC chairman C. R. Dasgupta told reporters yesterday that the shortage of cooking gas was likely to persist in the next two to three years.

However, with the completion of the submarine pipeline, it would be possible to receive not only an abundant quantity of Bombay High's associated gas (now being flared) but also the untapped natural gas of the Bassam offshore field.

IOC caters to over 80 per cent of the domestic demand for LPG. It services about 1.43 million consumers in 209 towns. Currently, it supplies 400,000 tonnes of LPG.

Mr Dasgupta said as the supply position improved with the availability of Bombay High gas and the expansion of the refineries, the additional availability of cooking gas by 1980 would be about 600,000 tonnes. This would take care, he hoped, of about 4.5 million additional consumers all over the country.

(Delhi)

Reduced oil imports in 1978

Hindustan Times Correspondent

3 Sept 77 P 6

NEW DELHI, Sept. 2—The stopping up of Bombay High crude oil production from 2 million tonnes to 4.5 million tonnes next year and of onshore production from 9.4 million to about 10 million tonnes will enable India to reduce oil imports from the present level of 14 million tonnes to 13 million tonnes next year.

This is, of course, keeping in view that the consumption level will continue to grow at the present rate of 7.5 per cent each year.

The 1977-78 likely crude consumption is estimated at 23.4 million tonnes. The demand is proposed to be met from onshore production of 9.4 million tonnes, Bombay High output of 2 million tonnes and imports of 14 million tonnes.

Stating this at a Press conference here yesterday, Mr C. R. Das Gupta, Chairman of Indian Oil Corporation (IOC), explained that by 1980 when the six-million tonne Mathura refinery would be commissioned, IOC would establish a refining capacity of 19.5 million tonnes of crude, against the present combined capacity of 9.25 million tonnes represented by Gauhati, Barauni, Koyali and Haldia. The total refining capacity in the country would be 30 million tonnes.

The additional IOC capacity would come from the expansion of Koyali by three million tonnes, Barauni to 1.25 million tonnes and Mathura which will have six million tonne capacity.

Mr Das Gupta said with the commissioning of the lubricating plant at Haldia, self-sufficiency had been achieved in the production of base stocks for lubricating oils except for a small quantity of special products which were being imported.

Koyali expansion was in an advance stage of completion and significant progress had been made in laying the pipeline between Salaya and Koyali. Mr Das Gupta hoped the expansion of the refinery which would receive Bombay High crude would be completed by the middle of 1978.

About Mathura, he hoped that it would be possible to commission it in the first quarter of 1980. By then the production from Bombay High was likely to reach 10 million tonnes.

It was proposed to feed the refinery with three million tonnes of Bombay High crude and the balance would be either from Iraq or from any other Middle Eastern source.

Switchover

While deciding to switch from hydro cracker to cat cracker for obtaining a larger quantity of middle distillates which were in demand in the north which Mathura would mainly cater to, IOC would secure 50 per cent of its equipment from the Soviet Union and the balance partly from indigenous and partly from foreign sources. It was also proposed to lay a product pipeline connecting Mathura with Haryana.

Talking to newsmen, a day after IOC's annual general meeting, Mr Das Gupta said IOC had registered a sales turnover of Rs 2,661 crore during 1976-77 and a record profit of Rs 100.33 crore before tax.

The net profit, after depreciation, interest and tax provision and other adjustment, worked out to Rs 48.41 crore against Rs 29.91 crore in 1975-76.

Mr Das Gupta, however, felt that the government's acceptance of the Oil Pricing Committee's report would "substantially reduce IOC's profitability in the future."

The implementation of the committee's report would rob IOC of the price advantage it now enjoyed in respect of non-formulation products, he said.

The IOC had declared a dividend amounting to Rs 7.13 crore which represented the highest dividend paid by a public sector corporation on the paid-up capital.

Over the year, Mr Das Gupta said IOC had made substantial progress and had increased its net worth to its 273 crore in 1976-77 whereas the subscribed capital was only Rs 82.1 crore and the loans from the Government sources amounted to only Rs 36.81 crore.

IOC, he said, had generated large internal resources and the entire cost of Haldia refinery (about Rs 83 crore) had been met from IOC's internal resources.

Indian Oil had increased its sales from 18.51 million kilo litres to 19.50 million kilo litres representing a market participation of 62.9 per cent.

Mr Das Gupta said that almost 98 per cent oil industry had now come under the purview of the public sector. In the changed situation, oil companies would have to function as partners in the national efforts towards economic progress and the competition between the oil companies was now to be solely motivated by the desire of serving the interests of the consumers, he said.

Under the annual sales plan formulated by the Government providing for a more rapid growth in sales volume of smaller companies, IOC's total volume of sales would undoubtedly go up, but its share in the total sale would decline. Mr Das Gupta anticipated that IOC's share in total sale would fall below 63 per cent next year. The sales of other oil companies were expected to go up correspondingly.

The company's R & D Centre at Faridabad set up for the formulation of lubricants, greases and special products had made good progress. Previously the formulation of these products was mainly in the hands of the foreign oil companies. According to Mr Das Gupta, more than 80 per cent of the volume of the lubricants and special products were being formulated with Indian know-how.

He hoped IOC would achieve self-sufficiency in this vital area, including aviation and marine lubricants, in near future.

The R & D Centre was at present securing approvals from national and international manufacturers of equipment and engines for products developed by the Centre, said.

for bilateral co-operation on the basis of mutuality of interests, understanding of each other's problems and where necessary willingness to share sacrifices on an equitable basis. We have institutional frameworks of co-operation with each of our neighbours. A considerable amount of investigative and directly beneficial work is being carried out."

Dr Swaminathan said the definition of desertification given in the draft plan was wide enough to encompass processes caused by extreme hydrological phenomena such as floods and drought. This required both national effort for water management and in case of shared water resources co-operation between the countries concerned.

Dr Swaminathan suggested four areas which needed added stress by the conference. They are: intensified research on medium-term weather forecasting to provide early warning of unfavourable weather conditions, increased attention to problems of women and children particularly children's education in desert areas, stepping up research on shrubs and trees for arid and semi-arid areas and establishment of desert agro industrial complexes. These complexes based on local material and readily available form of energy would eliminate unemployment and under-employment and thereby create conditions which render nomadism unnecessary.

India favours consortium to check desertification

NAIROBI, Sept. 2 (Samghat)—India yesterday made a constructive proposal for establishing a joint consultative group for the control of desertification (CGCD) to ensure effective implementation of the plan of action to tackle the problems of arid and semi-arid areas.

The group designed to function as a "symphony orchestra" of various agencies engaged in the work would include the United Nations Environment Programme, the FAO, the UNESCO, the World Meteorological Organisation, the World Bank and the International Fund for Agricultural Development.

The proposal made by the leader of the Indian delegation Dr M. S. Swaminathan at the plenary session of the UN conference on desertification here was part of a three-point plan for setting up a machinery for follow-up of the plan of action to be adopted by the conference.

Dr Swaminathan said immediately after its establishment the CGCD should form a consortium of international agencies, countries, regional banks, foundations and organisations interested in extending financial support to programmes in this field.

A consultative group-cum-technical advisory committee mechanism would provide an organised forum for generating multilateral resources and for stimulating bilateral and multilateral collaboration. It would provide a forum for governments, international agencies, banks and voluntary organisations to join together. Membership of the CGCD should include not only donors but also some countries seriously affected by desertification.

Dr Swaminathan made an indirect reference to Wednesday's speech by the Bangladesh delegation leader who sought by implication to raise the Parakka issue. He said in regard to international rivers which India shared with her neighbours "our quest had been

PLAN TO CLOSE DOWN C.S.I.R. CRITICIZED

By A Staff Reporter

At a public meeting organized by the Congress Socialist Forum in New Delhi on Saturday the speakers criticized the proposed decision to dismantle the Council of Scientific and Industrial Research.

Mr Shashi Bhushan, ex-MP, said that the decision should be opposed unitedly by all scientists in the country. The Government, he said, should do some rethinking and put away the advice given by the World Bank which might not be in the best interests of the country.

Dr B. D. Nag Choudhury, Vice-Chancellor of the Jawaharlal Nehru University said that this decision should have been taken only if wide ranging discussions by the scientific community had taken place and this had been recommended. He called the Government's proposed decision "unfortunate and somewhat depressing". Science, he said, was for the benefit of the country and if we politicize it great damage is done to science and the country.

Mr H. D. Malaviya, MP, said that this proposed decision would take the country back to the "cowdung age". The outsiders, he said, did not want scientific advancement in our country as that would lead to import substitution. He cautioned the Government not to give in to these outside pressures.

Mr Nural Hasan, former Education Minister, said that this subject was of grave importance and should be kept above party politics. He cautioned the Government by saying that if primitive technology could remove poverty India would not have been a poor country. Even for simple solutions of problems, he said, the most advanced concepts of science have to be utilized. He added that those research laboratories which were working under Ministries had been autonomous they would have shown much better results.

In a resolution signed by some MPs the members at the meeting appealed to the Government to delay the implementation till serious consideration is given to the proposal and its implications are examined.

'Verbal accord' on Ganga waters

DACCA, September 3 (Samachar): A Bangladesh government spokesman said yesterday that a verbal understanding had been reached between India and Bangladesh on the quantum of share of the Ganga waters at Farakka "only for the driest period of the year," according to the official news agency, B.S.S.

The spokesman was explaining the position when his attention was drawn to a reported statement by the Prime Minister of India at a Press conference in New Delhi on September 1 that India and Bangladesh had reached a short-term agreement on sharing of the Ganga waters between the two countries, the agency said.

Working Plan On Deserts Drawn Up

NAIROBI, Sept 3.—The first week of the U.N. conference on desertification here has dramatized the world community's interest in the problem—and its ignorance about it, reports AFP.

The 1,500 delegates from about 100 countries opened their conference on Monday, three years after the idea of such a gathering had been approved by the U.N. General Assembly. In the interval,

500 experts had drawn up the meeting's basic working document—an action plan against the encroachment of wastelands on the fertile areas of the earth.

The first two days were more political than scientific, with echoes of West Asian conflict and past or present liberation struggles on the African continent. Then the delegates got down to work.

The plenary sessions are still devoted to general debate which meant an exposition of each country's stand against desertification. In general, countries which suffer from the phenomenon have sought to explain how it affects them and what they are trying to do about it. And those which are not threatened by aridity have suggested how they might be able to hold the others.

CONCRETE RESULTS

More concrete results may come from the plenary committee, where each nation is represented, but where the procedural rules are more flexible. The committee is hard at work on the documents submitted to the conference. A broad study of the causes and the "action plan".

Although many of the delegates are scientists or civil servants, there has been emphasis on the human aspects of the problem.

There has been discussion, for example, of nomadic peoples and their eventual transition to sedentary life.

The experts have also analyzed how such plagues as trypanosomiasis can lead to desertification. This cattle disease is spread by the tsetse fly. As a result, vast areas of Africa are unfit for raising livestock, but other areas are overcultivated and the worked-out land tends to become desert.

In other approaches, through climatology and attempts to chart desertification the experts have recognized their still-limited knowledge and the need to rely on guesswork.

Dacca Statement On Farakka Accord

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The spokesman made the statement when his attention was drawn to a reported statement by the Prime Minister of India at a Press conference in New Delhi on September 1 that India and Bangladesh had reached a short-term agreement on sharing the Ganga waters between the two countries, the agency said.

The spokesman said the sharing of the Ganga waters at Farakka on the basis of 10-day periods over the dry season has to be worked out. A verbal understanding has been reached on the quantum of share only for the driest period of the year (generally April 21 to 30).

Other issues yet to be resolved include the shares for the other periods of the dry season; the total period of the dry season over which water will be shared ensuring the availability of water at Farakka and necessary machinery for implementation.

Talks on all these and other related issues are in progress at the official level.

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Self-sufficiency in crude unlikely soon

By Our Correspondent

ALLAHABAD, September 3: The Union Minister for Petroleum, Chemicals and Fertiliser, Mr H. N. Bahuguna, said here today that there was no possibility of India becoming self-sufficient in its crude requirements in the next five years.

Talking to newsmen, Mr Bahuguna said that though domestic production of oil in the country had increased during the last few years, the consumption had also increased, with the result that the gap between domestic production and consumption had risen to 14 million tonnes per annum. The country, he felt, would continue to import crude till 1983.

Asked whether there was any likelihood of an increase in the price of petrol, Mr Bahuguna said that although Saudi Arabia had increased the price of crude by five per cent, the Union government did not propose to increase oil prices.

Mr Bahuguna said that the government would do its best to make fertiliser available to all the farmers in the country. It was also thinking of bringing down the price of fertiliser.

Action Against Four J.N.U. Officials Demanded

By A Staff Reporter

Trouble is brewing at Jawahar Lal Nehru University, because the Government has not yet taken action against four officials including the Vice-Chancellor, who enthusiastically supported the Emergency. The students consider these people "criminals" and have prepared separate charge-sheets against them, but the Government has not even inquired into the charges.

The Students' Union has therefore decided to start a series of protests from Monday demanding Mrs Gandhi's resignation as Chancellor and the removal of the Vice-Chancellor, Dr B. D. Nag Chaudhuri, the registrar, A. B. Chandrasekhar, the Co-Ordinator of Academic Affairs, Mr P. N. Sharma and the Security Officer, Mr Darsan Singh.

At a Press conference in New Delhi on Saturday, the President of the JNU Students' Union, Mr Sitaram Yechuri, said that on Monday at 4-30 p.m. about 400 students would march from Connaught Place to Mrs Gandhi's house to demand her resignation. They first asked her to resign after the Allahabad judgment in 1975.

On September 8 there will be a token strike on the campus and the next day they will march to the Prime Minister's house. He said that action had become necessary because of the Government's indifference to their demands. "In addition we are disturbed by certain other things that are happening—Mr P. N.

Sharma, whom we have identified as a criminal, is being sent to Australia on a four-week administrative course by the Government. So instead of action being taken to remove these people they are actually being promoted."

The Registrar's term expired on July 31, but he has been given an extension by the Vice-Chancellor.

Mr Yechuri pointed out that they were simply reminding the Janata Party of its election promises to take action against all those who actively helped Emergency measures. The students feel that they have given the Government enough time. They first spoke to the Education Minister, in May and have met him twice since then but without being able to get a commitment; either ways from him. The Minister of State, whom they met on Friday evening, told them that the removal of these officials would require the approval of the whole Cabinet and may even need to be taken up in Parliament, so it would take some time.

According to Mr Yechuri, however, the Visitor, who is the President, Mr N. Sanjiva Reddy, is entitled to remove the officials.

The Students' Union is only demanding action against those officials who went out of their way to implement Emergency laws.

In the charge-sheet they alleged that during the Emergency "1,000 policemen raided the hostels, 13 students were arrested under DIT, four under MISA, the students' union was banned, students were denied admission on political grounds; students were expelled for political reasons, the campus was swarmed with plain clothesmen; student participation on academic bodies was denied; there was persecution of all dissenters and total disregard of all student problems. They have then listed the individual charges against each of the four."

PLENARY BODY

More concrete results may come from the plenary committee, where each nation is represented but where the procedural rules are more flexible. The committee is hard at work on the documents submitted to the conference: a broad study of the causes and the "action plan."

Although many of the delegates are scientists or civil servants, there has been emphasis on the human aspects of the problem.

There has been discussion, for example, on nomadic peoples and their eventual transition to sedentary life.

The experts have also analysed how such plagues as trypanosomiasis can lead to desertification. This cattle disease is spread by the tsetse fly. As a result, vast areas of Africa are unfit for raising livestock, but other areas are overcultivated and the worked-out land tends to become desert.

In other approaches, through climatology and attempts to chart desertification the experts have recognised their still limited knowledge and the need to rely on guesswork.

Poddar urges fresh look at industrial policy

By Our Special Correspondent

HYDERABAD, September 3.

MR B. P. PODDAR, president of the Federation of Indian Chambers of Commerce and Industry (FICCI), yesterday urged the Centre to take a bold initiative to look at the industrial policy package afresh, chop off the deadwood and graft new and constructive policy measures.

Addressing the Andhra Pradesh industrial development conference organised by the Federation of Andhra Pradesh Chambers of Commerce and Industry, he pointed out that the industrial policy had been devised in response to situations arising from time to time keeping in view the larger national objectives. He felt that in the past year or so there had been a drastic change in economic conditions which had made some of the country's policies completely obsolete. This was true, for example, of industrial licensing, import control, price control and a variety of other regulations affecting industry.

Mr Poddar pleaded that industrial development should be healthy and balanced. The different types of industries—small, medium and large—had to grow in harmony. Indeed, the growth of small-scale industries had

to be at a much higher pace because it enabled greater specialisation and helped large-scale industries to reduce the cost of production and final prices.

What was even more important, he pointed out, was that the development of small industries widened the entrepreneurial base and provided support to massive industrial development.

While appreciating the emphasis on small-scale industries by the Centre, Mr Poddar hoped that it would not imply negation of development by large and medium-scale sectors.

He regretted that private trade in our country had been exposed to severe limitations and undeserved criticism. The sales tax had created tremendous administrative problems. "The arguments for merger of sales tax with excise duty are convincing. What comes in the way is possibly the weakening of the financial autonomy of the state governments. He felt that a via media could be devised and the administrative burden of the sales tax considerably reduced."

Inaugurating the conference, the Andhra Pradesh Chief Minister, Mr J. Vengal Rao, offered the state government's unqualified willingness to assist in the setting up of new industrial ventures in the state.

Emphasis on human aspects at Nairobi meet

NAIROBI, September 3 (AFP): The first week of the U.N. conference on desertification here has dramatised the world community's interest in the problem — and its ignorance about it.

The 1,300 delegates from about 100 countries opened their conference on Monday, three years after the idea of such a gathering had been approved by the U.N. General Assembly. In the interval, 500 experts had drawn up the meeting's basic working document — an action plan against the encroachment of wastelands on the fertile areas of the earth.

The first two days were more political than scientific, with echoes of the West Asia conflict and past or present liberation struggles on the African continent. Then the delegates got down to work.

The plenary sessions are still devoted to general debate which meant an exposition of each country's stand against desertification. In general, countries which suffer from the phenomenon have sought to explain how it affects them and what they are trying to do about it. And those which are not threatened by aridity have suggested how they might be able to help the others.

The Times of India (Delhi)
4 September 1977

Planners to discuss new priorities

By Our Special Correspondent

NEW DELHI, September 3.

THE reconstituted Planning Commission at its second full meeting scheduled for September 10 will discuss proposals on how best to reflect the Janata government's new priorities on rural development and employment-intensive investment in the plan document.

These priorities require a substantial change in the pattern of allocation and the government is, therefore, anxious to incorporate them in the document as soon as possible, in the annual plan for 1978-79 itself if feasible.

Although official sources describe

as premature reports that the fifth Plan may be terminated in March, a year in advance, they are certain that the annual plan for 1978-79 would be substantially different from what was originally planned.

It would be used to smoothen the process of change from old to new priorities in the sixth Plan. The approach paper for the sixth Plan being prepared by the Planning Commission is expected to be ready before the end of the year, in time for discussion at the next meeting of the National Development Council.

DISCUSSIONS SOON

Since discussions with the states on financial allocations for projects in next year's plan are expected to start shortly, the Planning Commission's forthcoming meeting may also take some tentative decisions about its own role and scope in the light of the observations made by the Prime Minister, Mr Morarji Desai.

The Prime Minister in a note to the Deputy Chairman of the Planning Commission, Dr. D. T. Lakdawala, has suggested that the commission should concentrate on long-term planning and strategy without being bogged down in immediate problems.

As he reiterated at his Press conference, Mr Desai does not propose any reduction in the importance of the Planning Commission, which would continue to be involved in not only the preparation of the five-year plan but also its monitoring, implementation and evaluation.

The Prime Minister has, however, inquired whether the Project Appraisal Division should continue to be part of the Planning Commission in view of the fact that this task was being performed by three other units, in the government.

The commission at its meeting will also discuss a suggestion to make planning flexible. Since it is not easy to revise a five-year plan which has a rigid framework, the idea is to have rolling plans, implying thereby that the annual plans would be subject to revision in the light of latest trends on the economic scene.

Power crisis likely in N.-E. region

By Our Special Correspondent

SHILLONG, September 3: A severe power crisis is likely in the north-eastern region in the near future, according to observers here. The shortfalls by the end of the fifth and sixth Plans have been assessed at 307 MW and 1011 MW respectively.

Fear of a crisis has been strengthened by the fact that the power generation has not been proceeding at the desired pace despite strenuous efforts made by the north-eastern council.

The biggest single factor responsible for the threatened power crisis has been the inordinate delay in the execution of the Loktak hydro-electric

project in Manipur, which according to the original estimate, was due for commissioning in the second quarter of 1976. It is now expected to be on steam by 1981-82. The 45-km long Loktak lake, one of the biggest landlocked lakes in the country, which has so far played no purposeful role except bringing arrows to the people by causing floods during monsoon, is to be harnessed not only to supply electricity to the power starved states of the region but also irrigate 23,000 hectares of land for a second and possibly a third crop.

To prevent flooding of areas around the lake and Imphal town, a flood

control scheme known as "Sugma Hump" scheme has also been proposed. The 105-MW project initially estimated to cost Rs. 10 crores will now consume about Rs. 80 crores signifying an eight-fold increase in the cost due to a delay of four years. Sophisticated machinery valued at Rs. 40 lakhs has been ordered from abroad to expedite the tunnelling at the project site; the equipment is yet to be received.

The Dambut hydel project in Tripura, already inaugurated with one generator supplying 4.3 MW, makes the state's power supply position just enough to meet its requirements. With the second generator commissioned, there will be a small power surplus in the state for the time being. The delay in commissioning this project was mainly due to non-availability of raw material, spare parts and "labour famine." Moreover it suffered a setback in 1970 when rebel Mizos raided the project site. At least 20 persons had died in accidents while four others were killed by rebel Mizos.

Orissa seeks Central aid for flood control steps

By Our Staff Correspondent

BHUBANESWAR, September 3.

THE chairman of the National Flood Commission, Mr Jakub Lal Hathi, who is here for an aerial and ground survey of the flood and cyclone-prone areas, has been urged by the state government to facilitate a central aid of Rs. 236 crores for long-term flood

and cyclone control measures.

Mr Hathi, who addressed a conference of ministers and top officials yesterday, is understood to have conceded that Orissa faced a major flood problem and extensive efforts were needed to solve it.

In a memorandum to the National Flood Commission, the Orissa government has demanded Rs. 236 crores for executing flood control programmes like big reservoirs and dams on the Brahmani, Vaitarni and Subarnarekha rivers, strengthening of the 16,319 km of bunds along rivers, construction of 1,138 km of bunds and a drainage system for the cyclone-prone coastal areas in Cuttack, Puri and Balasore districts.

Earlier in his welcome address, the Chief Minister, Mr Nilamoni Routray, hoped that the commission would appreciate the recur-

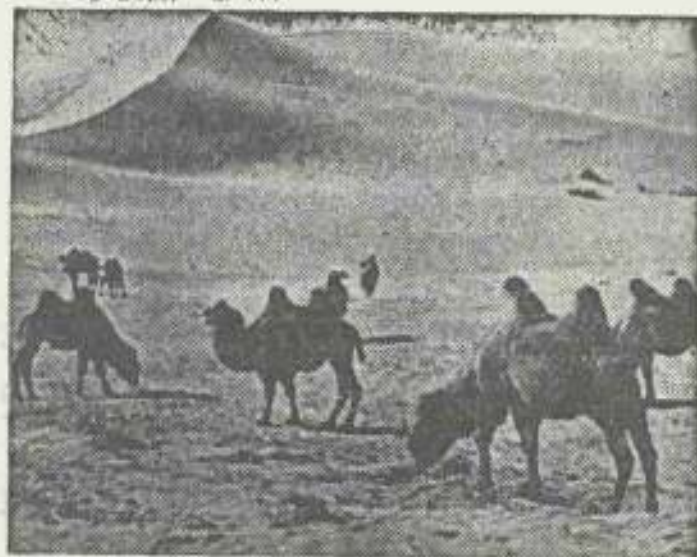
ring flood problem of the state and pump in "adequate central financial and technical assistance for a permanent solution."

The Agriculture Minister, Mr Prahalad Mallick, recalled that as the Union Minister for Irrigation and Power, Mr Hathi had extended assistance for the construction of the Hairakud dam and reservoir. The flood problem in the Mahanadi valley had thus been contained substantially. But the problem of floods in the Brahmani, Vaitarni and Subarnarekha was yet to be controlled.

Mr Hathi is understood to have discussed the flood problem with the Union Steel Minister, Mr Biju Patnaik.

UNDERSTANDING THE DESERT

Sunday Statesman by RAI SINGH



Camels are still the mainstay of people in the deserts of Central Asia. They provide wool, milk and transport.

THE desert is a harsh unfriendly place. Over the ages it has not only killed many who ventured to unlock its mysteries, but has reached out to extinguish entire civilizations. The names dug up from sand are an honour roll of our ancient history—Ur and Mohenjodaro, Dilmun and Babylon, Harappa and Lothal. They were centres of human excellence once, the earliest known civilizations on earth. Why did they disappear under the sand in areas that were once the "fertile crescent?"

We do not know all the answers. But we do know that desert is not a stable factor. It can grow and shrink. In the late sixties when the drought in the countries along the southern border of the great Sahara caused much suffering and loss, it was feared that the desert there was indeed growing. But the world could only watch helplessly for no one knew what could be done. The lack of knowledge was so glaring that the United Nations called for an international conference that would focus attention on the matter.

It seems that despite the present day lack of knowledge about deserts our forefathers did understand them. What does treeworship in north-western India have in common with the traditional Iraqi farming practice of using irrigated land for fallow grazing every alternate year? And what do

both have in common with the United Nations Conference on Desertification (UNCOD) that is being held in Nairobi from August 28 to September 9, this year?

The answer is that all the three—tree worship, alternate year fallow grazing, and the U.N. Conference—are "coping mechanisms". They are the means by which the societies at the local and international levels try to deal with the widespread problem of maintaining the productivity of arid lands. Tree worship helps to cope with desertification because it leads to the regular watering of plants. The Iraqi farmer copes by leaving his irrigated fields for cattle to graze every other year; thus not only supplying his animals with fodder, but also pre-

venting land from becoming waterlogged and saline. The U.N. Conference on Desertification is the first attempt to cope globally with what is increasingly a world problem; decreasing productivity of land in the earth's extensive arid regions.

The problem of desertification assumes tragic proportions when it is realized that of some 45 identified causes of desertification only 13% are due to natural changes; 87% can be traced to human mismanagement of soil, water, energy, flora and fauna.

According to the study conducted by Dr Manuel Anaya Garduno of the Graduate College, Chapingo (Mexico), there are many examples of successful programmes which use

technology appropriate to the control of desertification processes. These include programmes of management of watersheds, salinity control, drainage installation, soil conservation, rangelands management, sand dune fixation,

afforestation and re-afforestation. Before trying to establish new systems of land use, the traditional technologies developed by farmers should be considered. The change to modern technologies should be planned and gradual. Appropriate technology in itself is not the answer; it must be supported by social and economic structures and the earnest involvement of the popu-

lation. The following examples of the uses of technology as applied to the five basic factors in land use illustrate the point:

Water: The total area of irrigated land in the world is estimated at 200 million hectares. This is only 4% of the total arid and semi-arid areas. Water technologies related with on-off and water har-

vesting are thus of crucial importance. Management includes locating, achieving access to, transporting and conserving water. The technologies involved range from the traditional forked stick of the water diviner to the latest desalination and sewage recycling plants.

Soil: Soil erosion is as old as

the earth but the detailed understanding of both land degeneration and regeneration is very new. Several estimates have placed the total annual loss of dissolved solids carried to the oceans by rivers and streams at about 3,000 million metric tonnes. Technologies to deal with the problems of soil erosion differ with climate, nature of terrain and other factors. They range from the use

of tilling instruments that leave crop residue on the soil surface to terracing slopes and maintaining the proper balance of grazing animals dependant on the land. Soil salinity and water-logging are also major problems; an estimated 25% of the world's irrigated area is affected. Remedial and preventive tech-

physical (drainage), biological (crop selection and rotation) or chemical.

Flora: Plant life sustains both animal and human populations and has to be properly managed. To prevent desertification the useful methods are revegetation, rotational grazing, deferred grazing, crop rotation, controlled use of wood fuel and creation of wind breaks and shelter-belts.

Fauna: About 50% of the world's cattle, one-third of its sheep, and two-thirds of its goats exist in arid and semi-arid zones. Bio-products are important food sources for human populations in these areas. Problems related to de-

sertification involve animal use, selection of animal type, animal welfare and rangeland management.

Energy: Such practices as the use of wood and animal-dung for fuel or strip mining for coal can encourage desertification. To remedy this, alternative sources of energy and proper use of the existing sources are necessary. The potential of alternative sources is indicated by the estimate that the solar energy falling on Saudi Arabia in one year is equivalent to the entire proved reserves of coal, oil, and natural gas in the world.

About a third of the world's land surface is desert or semi-desert and about 15% of the world's population lives there. We know very little of how these areas fit into and interact within global climatic systems. We do not know what potential wealth lies hidden under sand and shrub, nor how our use of them will affect the societies involved and the world at large. How can we reclaim the desert margins where life exists now at the uncertain mercy of the wind and the sun? And how can we do so without damage to the complex and fragile ecosystems of these areas? Such problems press with even greater urgency in a world where the human population is expected to double in the next 30 years.

Desertification transcends national boundaries. It must be tackled, therefore, regionally, globally as well as nationally. But we must first know the problems and their causes. This can only be done by obtaining a more profound knowledge of desertification processes. Then, the action needed to stop these processes or to reverse them, can begin.

The initiative was given by the 29th session of the United Nations General Assembly. In December 1974 it called for a world conference to be held in 1977. In charge of the preparations is the Executive Director of the United Nations Environment Programme, with the Programme's 58-member governing Council serving as intergovernmental preparatory body. Assisting in preparations is a "task force" whose experts are drawn from the diverse parts of the United Nations system of organizations. Also involved is a panel of consultants: scientists specializing in a variety of relevant disciplines. Responsible for these activities, under the Executive Director, is a small secretariat headquartered in Nairobi.

The Conference will find its focus in a Plan of Action to Combat Desertification. The knowledge about the desert made available for the Conference constitutes only the scientific underpinning for a plan of action which is to be implemented ultimately by the participating States. Knowledge, control and maintenance of ecological balance can go a long way in understanding the desert.

Putting the cart before the horse in U.P.

By B.L. Sah

Not only at a snail's pace but also lopsided has been the progress of rural electrification in Uttar Pradesh during the past years. And to think of expanding the village industries before ensuring power supply is like putting the cart before the horse. Unless steps are taken to accelerate the pace of rural electrification, the Janata Government's proposal to set up a network of cottage units will remain a slogan.

Small-scale and village industries have been one of the neglected sectors in the state. Financial allocations for this sector could not be fully utilised because of administrative delays, bottlenecks and lack of infrastructure.

The main thrust in the state's industrial policy will now be promotion of rural-based labour-intensive units. Industrial complexes will be set up in villages. Priority will be given to small and cottage industries. Traditional and agro-based industries will also be developed. During the current financial year, under the rural industries programme, it is proposed to establish 1,400 units which are expected to provide additional income of Rs. 45 crores and payment of to 7,200 persons.

Imbalances

There are imbalances in the rural electrification. Without ensuring power supply to backward and neglected areas the Janata Government cannot achieve their objective of "industrial decentralisation". Besides, there will be problems of procurement of raw materials, supply of new skills and marketing of the products at competitive rates.

Why has UP lagged behind other states in rural electrification? Official sources attribute it to shortage of power, lack of infrastructure, financial loss involved, absence of definite programme, difficulty in preparing viable schemes and apathy of officers of the state electricity board towards the rural electrification programme. Moreover, political pressure has been brought to bear on the Government in the selection of villages for electrification. That is also responsible for creating imbalances.

The latest evaluation by the Planning Department of the state Government reveals that at the present rate of electrification it would take 20 years to cover the remaining unelectrified villages. Before the planned development was taken up only 110 villages were electrified in the state. At the end of 1976-77 the electrified villages numbered 33,098. It worked out to 29 per cent of the total villages in the state. The all-India average was 35.2 per cent. Both Haryana and Punjab had electrified 100 per cent and Tamil Nadu, Kerala, Maharashtra and Karnataka 95.5 per cent, 56.5 per cent and 54.9 per cent respectively, of the total villages.

That the formulation and implementation of the rural electrification programme was faulty is evident from imbalances not only in five regions in the state but also among districts in each region. At the end of 1976-77 the percentage of electrified villages against total villages was 42.9 in eastern, 25.6 in western, 12.1 in central, 6.9 in hills and 2.4 in the Bundelkhand region. Within each region the percentage of electrified villages was 42 in western, 28.74 in eastern, 23.9 in central, 17.8 in Bundelkhand and 15.2 in hills. It is evident that due attention was not paid to electrification of villages in central, eastern, hill and Bundelkhand regions.

For instance, the percentage of electrified villages is 80.35 in Muzaffarnagar district as against only 21.02 in Shahjahanpur. In 10 out of 18 districts in the western region the percentage of electrified villages is much below the average of 41.93 for the region. Similar is the case in nine out of 13 districts in the eastern region and five out of nine districts in the central region. The imbalances are worse in the hill region. While 43.70 per cent of total villages are electrified in Nainital district, the percentage works out to only 4.79 in

Pithoragarh district. The position in the Bundelkhand region is also depressing.

By the end of 1976-77 the number of tube-wells/pumping set energised in UP was 2,54 lakhs as against 39.30 lakhs in the country. UP's contribution was only eight per cent in the national achievement. The region-wise percentage of energised tube-wells/pumping sets was 53.1 in west, 32.1 in east, 10.6 in central and 2.2 in hills and Bundelkhand. Western UP is ahead of other regions in agricultural development. Yet a big imbalance in the energisation of tube-wells/pumping sets in various districts of the region is not understandable.

Finance

As regards the utilisation of financial allocation, the achievement against target in 1976-77 was only 33.2 per cent in the electrification of villages, 31.4 per cent in the construction of high-tension line, 35.7 per cent in erecting low-tension line 32.5 per cent in the energisation of private tube-wells/pumping sets, 5.3 per cent and 10.0 per cent respectively, in ensuring industrial and domestic connections. Eight schemes were approved and 31.65 per cent of the total outlay was secured. But the progress in the implementation of the schemes was almost zero. The targets for 1977-78 are electrification of 2,800 villages and energisation of 8,300 private tube-wells/pumping sets. In April last 176 villages were electrified and 210 tube-wells/pumping sets were energised. The progress in one month is a far from satisfactory.

The shortfall in the utilisation of financial allocations for the rural electrification was Rs. 92 lakhs in 1974-75, Rs. 3.75 crores in 1975-76 and Rs. 2.12 crores in 1976-77. What is surprising is that tough money allocated was not fully utilised the physical targets were exceeded. It merits a review of the yardsticks used for setting physical targets.

The state electricity board has prepared a Rs. 24.67 crore-rural electrification programme for 1977-78. Besides, it proposed to clear the backlog at a cost of Rs. 19 crores. Schemes launched seven or eight years ago have still been not completed, although 55.4 per cent of the financial allocation has been secured. Naturally, the delay in the implementation of the schemes has upset the envisaged returns. The board will have to cut down expenditure on other schemes to repay loans received from the Rural Electrification Corporation.

It is distressing that the board could utilise only Rs. 15.89 out of 37.85 crores secured from the Rural Electrification Corporation in 1976-77 for the execution of the schemes. What was worse was that the board diverted the utilised Rs. 22.16 crores to its other programmes. The corporation has taken a serious exception to diversion of the funds and decided not to approve any new schemes for 1977-78. It has placed certain conditions for approving new schemes in the future. If the corporation does not make available adequate funds in the future, the rural electrification programme will suffer a severe setback.

If the state Government decide to accelerate the pace of rural electrification, a time-bound plan will have to be prepared, setting target for each district and fixing responsibility on the officers of the board for the timely and proper execution of schemes. Existing schemes will have to be reviewed and, if necessary, revised. Selection of areas for electrification should be such that the schemes prove viable. A definite and firm policy is called for.

It seems that the state Government's thinking on the expansion of village industries is still nebulous. The Industries Minister, Mr. Ram Prakash, is toying with the idea that areas around tube-wells can be suitable sites for the new cottage units. Seeing the dismal performance of the state electricity board in the past, there is reason to doubt whether the board will be able to ensure uninterrupted power supply both for the tube-wells and for the proposed small units.

MONDAY, SEPTEMBER 5, 1977 p.5

Monday, September 5, 1977

A national project

The deadlock on the Thein Dam should be resolved so that work on the project can be started as early as possible. The project, which has huge power and irrigation potential, should be considered a national project and not the exclusive asset of one or two states. Parochial approach to multi-purpose projects has done immense harm to the country. The intransigence of some state Governments has delayed the starting or completion of a few major projects. Inter-state disputes on river waters have been a costly pastime and these should not be encouraged. The inter-state talks on the Thein Dam have apparently failed and the Rajasthan Chief Minister has sought the intervention of the Prime Minister to resolve the differences. If the Union Energy Minister and the Union Agriculture Minister are helpless in the matter, the Prime Minister's intervention is obviously the next step.

There is no point in trying to establish which state is reasonable or unreasonable in its demand. Rajasthan, Kashmir, Punjab, Haryana and Himachal Pradesh are concerned with the project in one way or the other and each state seems to think that its claim is only correct and the claims of other states are false. The site chosen for the Thein Dam is fifteen miles upstream of the Madhopur headworks on the inter-state boundary of Punjab and Kashmir. Himachal is pressing for the site at Barla as an alternative to Thein. The first need is to dissuade Himachal from pressing its demand. It has been pointed out that Himachal has several projects of its own to pursue but even so the state Government will agree to give up its demand only if they get an adequate share of power generated by the Thein project. Eighty-four per cent of the Ravi's catchment area is in Himachal territory. The Himachal Government, therefore, want thirty per cent of Thein power at production cost but Punjab has virtually rejected the demand on the ground that the catchment area principle is rarely taken into account. Kashmir, where 13,000 acres of land will be submerged when the

project is completed, has been offered twenty per cent of the power at cost price and ten per cent more if the state invests in the project. The Ravi does not pass through Rajasthan but it is in the picture because of a commitment made by the Pratap Singh Kairon Government in 1955. Mr. Kairon had "gifted" away water to Rajasthan. The Punjab Government are prepared to honour the commitment about water but they find no reason why Rajasthan should be given a share of Thein power. Haryana does not lag behind its neighbours in insisting on its share.

Maybe, each state is justified in its claim but the project can be taken up only if all the concerned states resolve their differences. What is important is the interest of the country and not of any particular state. When completed, the project will generate 400 mw of power and the delay in starting it results in national loss. Eight years will be required to complete the project and some time has already been wasted. Tributary of the Indus, the Ravi passes through Pakistan also but under the Indus Waters Treaty of 1960, the waters of the Beas, the Sutlej and the Ravi have been allotted to India. The waters of the Sutlej and the Beas have been already harnessed and the Thein Dam will harness the Ravi. The economic importance of the dam can be realised if it is known that the waters of the Ravi could have been utilised much earlier to irrigate at least eight lakh acres of land. Similarly, a big difference would have been made in the hydel capacity of the country if the project had been taken up earlier. Once the five states involved in the project realise that time lost is power lost and irrigation facilities lost, they should not remain intransigent. Besides, barring Kashmir, all the concerned states are under Janata rule and that should help the state Governments to be more accommodative to one another. Now that the Prime Minister has been approached to bring about a settlement, it will be difficult for the state Governments to reject his advice, whatever it is.

Direct use of coal preferred

NEW DELHI, Sept. 4 (Samachar)—Direct use of coal for various purposes rather than its conversion into oil, will be the Government's policy for the present.

A decision to this effect was taken at a high-level meeting here yesterday held under the chairmanship of the Energy Minister, Mr. P. Ramachandran. The meeting attended by the representatives of the Planning

Commission, Ministries of Petroleum and Chemicals, Industry, Defence, External Affairs, the Department of Power and the Department of Coal, considered the report of expert group, headed by Dr. K. R. Chakravarty, on the conversion of coal to synthetic oil.

The Minister of State for Energy, Mr. Fazlur Rahman, also attended the meeting, which among other things, decided to concentrate on substitution of oil by coal for the time being.

The view expressed in the meeting was that under the present circumstances, substitution of oil by coal by the consumers would be more viable than going in for a costly project of converting the coal into oil.

The meeting also decided that concerted efforts be made for conversion of coal to gas and other domestic fuels.

INCENTIVES

It was decided to appoint a standing committee for substitution of oil by coal. The committee would also suggest other uses of coal.

The standing committee would also look into the need for providing incentives to achieve the objective of substituting oil by coal.

In view of world wide oil crisis of 1973, coal industry in the country has been stressing the need for substitution of furnace oil by coal irrespective of those industrial units where this is technologically feasible.

MONDAY, SEPT. 5, 1977

DESERTS CAN YIELD A PROFIT

NAIROBI, Sept. 4.—Mankind could make a tidy profit by clearing up the planet's deserts, according to research done for the U.N. Conference on Desertification, reports Reuter.

Some 100 nations are represented here to approve a global plan of action to stop the spread of arid wasteland through man's misuse. To encourage them to action, the U.N. has provided a profit motive in the form of a report on the economic aspects of desertification.

U.N. experts added up the land mass already affected by deserts and estimated the value of what his land could be producing each year if it were not so afflicted. They arrived at \$16 billion of agricultural produce alone.

They then calculated the annual fall in land values due to desertification. The resulting figure is \$900 million but an yearly expense of about \$400 million could eventually halt the deterioration, turning a "profit" of \$500 million annually.

Least these figures be considered U.N. environment programme propaganda, the report also looks at some World Bank and Inter-American Development Bank anti-desertification projects. The least successful showed a rate of return of 1% which most corporations might envy. The best yielded a 100% profit.

THE INFORMAL GOAL

The conference has set an informal goal of "zero desert growth" by the year 2000. This means the combination of desert encroachment and desert reclamation would cancel one another out.

Mr Ruben Mendez, financial and economic adviser to the conference secretariat and largely responsible for the sums, feels that his zero growth target could be achieved in 10-15 years with an annual outlay of \$450 million.

Once zero growth has been achieved, man can start whittling away at the deserts that are left, trying to reclaim a large part of that \$16 billion.

The report calculates that to make all desert land productive to the maximum extent possible it would cost \$5.2-6.2 billion.

As the nations, working as "the committee of the whole", put the plan of action into final form before the conference ends next Friday, a working group of that committee is trying to estimate, how to pay for it all.

Most of the poorer countries most threatened by the desert creep are calling for a new international fund, such as the International Monetary Fund. Most Western nations oppose the idea. They feel the plan can be implemented by existing U.N. units such as the Environment Programme, the Food and Agriculture Organization and the Development Programme.

SPECIAL CONSORTIUM

Money should come through existing channels, they feel with perhaps a special consortium of donor nations set up, as was done in the case of the Sahel drought in the late 1960s and early 1970s.

U.N. sources say that many of the developing nations also oppose a new fund. These nations are concentrating on gaining trade concessions from the rich countries, and fear that yet another "charity" might jeopardize these concessions.

The pre-conference economic report also recommends a consortium, which would "have the advantage of spreading the burden of financing rather than concentrating it on one single source of funds."

The "service unit" of such a consortium would keep tabs on needs and activities and stay in touch with all the appropriate U.N. bodies.

Noting both the enthusiastic support for and the success of such recent programmes as those to control the desert locust in West Asia and to eradicate river blindness in West Africa, the conference secretariat, head, Mr Ralph Townley said: "There has always been money available for good projects. The problem is coming up with a good project."

World Bank aid for housing squatters

Express News Service

NEW DELHI, Sept. 4.

The World Bank is likely to give financial assistance to the Housing and Urban Development Corporation for the cities and services projects which are aimed at facilitating proper settlement of the urban squatters. The government-owned HUDCO which already has had discussions with the bank officials is sending detailed outlines of the projects.

It is learnt that the bank has already conveyed its approval in principle to provide a line of credit to finance the "sites and services" projects. But, judging by the pace of progress so far, it may take some time before the bank commits a specific amount. The projects have been the subject of discussions since 1973.

The sites and services concept evolved in the early 60s has immense potentialities in improving squatter housing conditions in crowded cities in the developing countries. Since the World Bank first aided a project in 1972, such schemes are currently under execution in at least ten developing countries in South-East Asia, South America and Africa.

In fact, the resettlement colonies developed around the Capital are somewhat on the same principles, though the execution and in manner has left much to be desired and falls short of the objectives laid down for such sites and services projects.

The underlying idea is to give the poor and the squatters in the crowded cities levelled plots in colonies provided with access roads, proper drainage and sewerage facilities, water and electricity, schools and health clinics. The emphasis

New industrial policy next month: Fernandes

Indian Express 5 Sept 77 p1

Express News Service

NEW DELHI, Sept. 4.

The Industry Minister, Mr George Fernandes held out the assurance here today that the Government would announce the new industrial policy in the light of the new programmes drawn up by the Janata Party within the next few weeks.

Addressing a news conference here, Mr Fernandes announced that the new strategy for industrial development would be discussed with the Industry Minister of different states at a four-day deliberations beginning here tomorrow.

The basic strategy for planning for industrial development, he said, should be at the micro level. Beginning in this direction had already been made while planning for the creation of one million jobs, in North Bihar.

The discussions with the Chief Ministers, Mr Fernandes said, would cover the entire gamut of the economic policy, but the basic aim would be to give a thrust in the new development programme to the small and village level industry which gave employment to a large number of people. According to him, any discussion of strategy to industrial policy should be related to the creation of employment opportunities. Otherwise, it had no meaning.

The Janata Government, Mr Fernandes said, viewed at matters relating to industrial development and employment from a different wave length than the previous government. "By the month of October, the Government should be

ready with a new resolution industrial policy".

Replying to questions on the industrial development, Mr Fernandes said that the government envisaged a growth rate of 8 per cent for 1977-78 as compared last year's figure of 10 per cent. Based his calculations on the existing power situation and the expectation of a peaceful labour situation throughout the country.

In fact, he felt, the picture labour unrest as painted in the national press was grossly exaggerated.

When questioned on the relative roles of the public and private sectors in the national economy, Mr Fernandes said that "both of them are expected to compete with one another. But other things being equal, the public sector will

continued on p 5 col 4

No revival of Coca-Cola

NEW DELHI, Sept. 4 (Samachar)

The Industries Minister, Mr George Fernandes, today ruled out the question of giving licence to Coca-Cola even for a temporary period.

"I am having no second thoughts he made it clear at his news conference here.

The new Indian drink, "77" would come into the market in the next few weeks, he said. Bottles who had been bottling Coca-Cola had agreed to bottle the new drink. In addition, the government would encourage setting up of plants in uncovered areas.

to equip such towns with basic civic amenities.

The allottees are then helped to build their dwellings using self-help construction methods and locally available materials with the amount which is within their resources. Some financial help may be given but that again should be within their capacity to repay in easy instalments.

The residents are then left to improve the dwellings with their ingenuity and resourcefulness as their capacity grows with the increase in their family earnings. Since basic amenities are ensured, there are lesser chances of such settlements turning into slums again.

Once they are assured of plot ownership, they will take up improvement works on their own to make the dwellings more livable and comfortable.

In other countries where the sites and services concept has been adopted care is taken to provide employment opportunities within the settlements. In Nicaragua, Jamaica and El Salvador, for instance, provision is made for small industries to generate employment near the place of residence. Elsewhere even sites for big industries have been located.

Breakthrough in pipeline transport

NEW DELHI, Sept. 4 (Samarbar)—India is on the threshold of achieving a breakthrough in the vital sphere of pipeline transport in the next few years.

The total length of steel pipelines, now laid in the country or are in the process of being laid would come to over 5,000 kilometres. The total cost of these pipelines, including all assets, would be around Rs. 700 crores on today's terms, a sizeable investment.

With pipeline transport assuming great importance in the coming decade, experts in the oil industry as well as in the Planning Commission think that the time has come when India should set up a pipeline corporation to coordinate pipeline activities, from its design, construction and operation level up to maintenance. This is considered very important for the security of these vital pipelines and also for putting India on the pipeline map of the world. With considerable indigenous expertise developed in the country in all aspects of pipeline construction and maintenance, the experts feel that the time was now ripe to go forward in setting up a Central body to coordinate and direct all activities related with the expansion of pipeline transportation.

Modern pipelines were introduced in northeast India during the World War II to pump petrol to the forces along the Burmah road, around 1000 submarine pipelines were designed to feed crude oil and oil products to the refineries in Bombay and the Bombay Crudeplex from Butcher land. These are still in use.

The discovery of crude oil in remote and inaccessible areas of Assam in the 50s led to the locating of refineries away from oilfields serviced by modern pipelines. It was at the time that the Government of India formed a

partnership with the Burmah Oil to explore, produce and transport crude to the eastern refineries, to be operated by the newly formed Oil India Limited. The 158 kilometre pipeline connects oilfields in Assam with the Guwahati and Barauni refineries. Indians, experienced marine engineers, were specially recruited for the construction of this cross-country pipeline traversing dense tropical forests, difficult Himalayan terrain and crossing 78 rivers en route including the mighty Brahmaputra, and the tur-

bulent Teesta and the Kosi. This pipeline was recently expanded to pump additional crude to Barauni, Bongaigaon and Guwahati by laying a 212-km loop line.

LIMITATIONS

The limitations of the Assam and Bihar markets prompted the Indian Oil Corporation (IOC) for the construction of product pipelines connecting Guwahati-Silguri, Barauni-Baidia and Barauni-Kanpur. The discovery of crude oil and gas in Gujarat led to the laying of pipelines by the Oil and Natural Gas Commission (ONGC) from Ankleshwar oilfields to Baroda.

Currently the IOC is engaged in laying the biggest trunk pipeline in the country, which will be 1,400 km long. One fork of the pipeline will connect Salaya to Koyali via Viramgam and the other will be from Viramgam to Mathura. Construction on the Salaya-Viramgam-Koyali section is now progressing and is expected to be commissioned by the middle of 1978. The IOC has called for tenders for the Viramgam-Mathura pipeline. The cost of the project will be of the order of Rs. 250 crores.

The ONGC is currently inviting tenders for its subsea pipeline from Bombay High to Uran in Bombay, comprising one gas line of 26-inch diameter and one crude line of 30-inch diameter. The distance will be in the region of 200-km for each pipeline and the cost of the 30-inch line would be of the order of Rs. 55 lakhs per km. With the further development of Bombay High the ONGC plans to lay more subsea pipelines in the area.

A new field in which pipeline transport is developed is at the Kudremukh Iron ore Mines. At Kudremukh, iron-ore pipelines are being designed to pump iron ore (mixed with water) to facilitate its movement. From a height of 2,500 feet above sea level in the western ghats, the ore will be pumped upwards to 3,000 feet and thereafter down to the port of Mangalore for loading on to cargo vessels for Iran.

Organisations controlling pipelines in India today are primarily concerned with exploration, production or mining and are, therefore, apt to relegate the development of the pipeline industry to a secondary position. With the great importance of pipelines now and the huge investments that it entails, experts feel that the time has come to reorganise the industry.

THE INDIAN EXPRESS

New Delhi: September 5, 1977

Waste flows the Ravi

HOPES that the long-standing Thein dam tangle was close to at last being resolved have been dashed again. Optimism had stemmed from the initiative taken last month by four of the five concerned northern States to thrash out the differences in high-level discussions among themselves and with the Union Ministers for Agriculture and Energy. The talks are reported to have helped in narrowing down the differences but at the week-end there was no sign of an agreement. Meanwhile, the Ravi flows down the drain, as it has all these years.

The Indus Water Treaty of 1960 gave India exclusive rights to the waters of this major river, opening grand vistas of many-sided benefits from the millions of acre feet of water that constitute the Ravi. However, it was not till a full decade later that the multi-purpose Thein dam project was conceived at an estimated cost of Rs 64 crores. The subsequent, and continuing, wrangling among the would-be beneficiary States of Punjab, Haryana, Jammu & Kashmir, Himachal and Rajasthan have denied their people and peasantry a substantial increase in irrigation facilities and energy availability. It has also resulted in shooting up the estimated cost to Rs 223 crores.

According to reports, one of the main remaining hurdle is Haryana's insistence on sharing also the power from the hydro-electric project, a demand which Punjab finds unreasonable. Another is Rajasthan's fear of being kept out of the project which would, among other things, significantly augment the flow of water in the Rajasthan canal. Rajasthan is reported to have sought the Prime Minister's intervention in the matter.

Whatever the precise nature of the differences, one thing is clear: whether it is the Thein project or any of the several dozen other similarly pending disputes, the basic problem is that the States just do not see beyond their own territories, and apparently prefer contention at all costs to compromise of any sort. The result is that a truly national asset continues to go waste. This is a shame. Whether the proposed meeting between the Prime Minister and the five Chief Ministers yields the elusive accord remains to be seen.

Letters

Concern over CSIR

Sir, — We want to voice our personal concern and disappointment at the reported decision to transfer about 25 constituent laboratories, institutes and research organisations of CSIR to other Government ministries, departments, undertakings and agencies. We believe we are reflecting the genuine views of a majority of scientists both within and outside CSIR, when we say that the way in which the reported decision has been taken to dismantle the CSIR sets a bad precedent and is not in the national interest.

We are upset that the decision has been arrived at surreptitiously, without consulting scientists in the country, without evaluating the performance of CSIR in general and of the laboratories proposed to be transferred, in particular, without recognising the fact that CSIR, as presently constituted, has many achievements to its credit, without spelling out precisely what specific advantages will accrue by the proposed transfer and without determining what the causes are for the genuine lacunae in the present functioning and performance of CSIR and how best they can be removed.

It would appear that no note has been taken of the fact that the accomplishments of research organisations in the country, like CSIR, that are outside the direct and immediate control of a ministry, have in general been superior to those of comparable research organisations controlled directly by a ministry—except, of course, where the ministry was created specially for the organisation as in the case of Atomic Energy and Space.

We believe the well-established fact that management of scientific research requires a different type of structure than is obtained in the ministries has been ignored. This requirement was repeatedly pointed out by Dr Bhabha, among others. One of the virtues of the CSIR set-up has been the recognition by it, in principle, that scientific research is essentially non-hierarchical. For example, today, a working scientist in a CSIR laboratory can get a higher salary than the administrative head—that is, the Director—of the laboratory, in the same grade. Such a situation would be inconceivable within the ministerial set-up.

The assurance reported in the newspapers in regard to safeguarding the autonomy of the laboratories to be transferred, is vague, un-

convincing and unlikely to be honoured in actual practice, not for lack of political will, but because the crucial details will be left to bureaucrats. Moreover, the numerous functional advantages of being a part of a large research organisation like CSIR, with very considerable infrastructural facilities, a progressive institutional culture, built over years, a democratic functioning and a liberal outlook, have been overlooked.

We do not mean to imply that the functioning of the laboratories in CSIR—taken individually or collectively—cannot be improved upon, or that their relationship with the development agencies of the government cannot be strengthened, but only that if the objective of the decision-making authorities was to effect such an improvement, one would have expected them to consult the scientists of CSIR (as done by the Barker Committee) before arriving at the decision.

We are also bothered by the timing of the decision. We note that Parliament is not in session and that the matter cannot be debated there. Nor has enough time been given to the scientists and the public to express their views.

According to news reports, the decision of the Government to dismantle CSIR will be put before a meeting of the governing body of CSIR called for September 21. However, the framing of the official announcement seems to be such as to leave the governing body no option but to put its seal of approval on the proposal. We feel that the governing body is morally obliged to take note of the sense of dismay in the scientific community over the reported decision to dismantle CSIR, and we hope that it will ensure that the decision is reconsidered and that the views of the scientists in the country in this regard are sought and taken due note of.

INDRADEV
F. H. BHARGAVA
D. BALASUBRAMANIAM
V. H. PAI-VERNEKER
K. L. VASU and
A. H. YASUDEVA MURTHY
HYDERABAD
and BANGALORE

READERS' VIEWS

Scientists' Concern

The Editor, The Times of India

Sir,—We are writing to voice our personal concern and disappointment at the reported decision to transfer about 28 constituent laboratories, institutes and research organisations of the CSIR to other ministries, departments, undertakings and agencies. We believe we are reflecting the genuine feelings of a majority of the scientists in the country both within and without the CSIR, when we say that the way in which the reported decision has been taken to dismantle the CSIR, acts a bad precedent and is not in the national interest.

The decision has been arrived at without consulting the scientists in the country, without evaluating the performance of the CSIR in general and of the laboratories proposed to be transferred in particular, without recognising that the CSIR (as presently constituted) has many achievements to its credit, without spelling out precisely its specific advantages will accrue by the proposed transfer, and without determining what the uses are for the lacunae in the present functioning and performance of the CSIR and how best they can be removed.

It would appear that no note has been taken of the fact that the accomplishments of research organisations in the country, like the CSIR, that are outside the direct and immediate control of a ministry, have in general, been prior to those of comparable research organisations controlled directly by a ministry—excepting, of course, where the ministry was created specially for the organisation as in the case of atomic energy and space.

We believe that the well-established fact that management of scientific research requires a different type of structure than is found in the ministries, has been ignored. This requirement was repeatedly pointed out by Dr. Bhaia, among others. One of the rules of the CSIR set-up has been the recognition by it, in principle, that scientific research is essentially non-hierarchical. For example, today, a working scientist in a CSIR laboratory can get a higher salary than the administrative head—that is, the Director of the laboratory, in the same office. Such a situation would be conceivable within the ministerial set-up.

The assurance reported in the newspapers in regard to safeguarding the autonomy of the laboratories to be transferred, is vague, unconvincing and unlikely to be honoured in actual practice, not for lack of political will, but because the crucial details will be left to bureaucrats. Moreover, the numerous functional advantages of being a part of a large research organisation like the CSIR, with very considerable infrastructural facilities, a progressive institutional culture built over the years, a democratic functioning and a liberal outlook, have been overlooked.

We do not mean to imply that the functioning of the laboratories in the CSIR—taken individually or collectively—cannot be improved, or that their relationship with the development agencies of the government cannot be strengthened, but only that if the objective of the decision-making authorities was to effect such an improvement, one would have expected them to consult the scientists of the CSIR (as was done by the Sarkar Committee) before arriving at the decision.

We are also concerned at the timing of the decision. We note that Parliament is not in session and that the matter cannot be debated there. Nor has enough time been given to the scientists and the public to express their views.

According to press reports, the decision of the government to dismantle the CSIR will be put before a meeting of the Governing Body of the CSIR called for September 21. However, the framing of the official announcement seems to be such as to leave the Governing Body no option but to put its seal of approval on the proposal. We feel that the Governing Body is morally obliged to take note of the sense of dismay in the scientific community over the reported decision to dismantle the CSIR, and we hope that it will ensure that the decision is reconsidered and that the views of the scientists in the country in this regard are sought and taken into note.

DR. INDRADEV

DR. P. M. BHARGAVA

PROF. D. BALASUBRAMANIAN

PROF. V. R. PAI VERNEKER

PROF. K. J. VASU

PROF. A. R. VASUDEVA MURTHY

Hyderabad, August 31.

CIDCO's new housing scheme

By A Staff Reporter

The City and Industrial Development Corporation (CIDCO) with the financial assistance of the Housing and Urban Development Corporation, has announced a new housing scheme — back again and time and earn six per cent interest — at eight places in New Bombay.

Nepal's policy-makers pin faith on local technology

By MAVIN KURVE

KATHMANDU, September 5.

THE policy-makers in Nepal are gradually veering round to the view that the answer to the kingdom's growing problems of poverty, unemployment and dependence on foreign countries lies in the wider use of local, labour-intensive and intermediate technology.

A shift in this direction is already evident in the greater encouragement being given in the fields of education and development to the learning and use of such technology.

The shift in the policy was highlighted by the education minister, Mr. P. S. Rana, who said on Saturday that Nepal could postpone the study of theory-oriented, high-level engineering for the time being. "The emphasis should be on the training of personnel who could help speed up development of the backward areas," he added.

Officials of various international organisations, including UNDP, the World Bank and the aid-Nepal group, experts of the planning commission and study team of farmers and foresters which toured China recently have expressed themselves in favour of the new thinking.

Meanwhile, a Nepalese economist, Dr. B. N. Suwal, who has just returned after a study of the role of rural technology in India, Sri Lanka and Ghana, said last week that each country should develop a technology appropriate to it.

CHINA'S EXAMPLE

He told Nepal's National Council of Science and Technology that specific problems would have to be identified and local technology developed. In China, the university in Kunming had become a medium for the uplift of the rural masses, he pointed out.

Mr. Bhuvanesh Kumar, director-general of Nepal's irrigation department, who had gone on an extensive month-long study tour of China, commended the manner in which China had reclaimed millions of hectares of land and prevented soil erosion with the use of simple implements.

He felt that in countries like Nepal, the pace of development could be stepped up by making use of the traditional technology.

A joint Nepal-World Bank report recently estimated that local costs of constructing and maintaining aided projects accounted for 85 per cent of the public savings mobilised annually. This left little room for the government projects.

Nepal is likely to take serious note of the recent statement by the UNDP chief, Dr. Manfred Kulesa, that UNDP had to evolve a solution which would enable the recipient countries to continue to operate aided projects after UNDP's withdrawal.

KOIRALA BLAMED: The Prime Minister, Dr. Tolsi Giri, said on Friday that Mr. B. P. Koirala had "misused" the special facility extended to him as an undertrial to go abroad for medical treatment by "appearing in television shows and even granting press interviews abroad."

He was inaugurating a conference on "youth and employment" here. Without naming any country, Dr. Giri also contrasted the treatment being accorded to the former Prime Minister. He said, "King Birendra had allowed a person who could even be sentenced to death to go to America for medical treatment, whereas in some countries, which claim to be more free, the governments are unwilling to issue passports even to former prime ministers."

He said: "If anyone in the United States has any illusions that special facility afforded to Mr. Koirala on medical grounds is part of a compromise or understanding then it must be made clear that such a day dream has no chance of ever materialising."

He said under the leadership of King Birendra and the partyless panchayat system everyone had the right to work for national development. Either by election or by consensus anyone could get elected to the panchayat and help in nation-building directly.

Dr. Giri also made a reference to a large number of "outsiders" employed in Nepal and to the apprenticeship scheme under which the policy of their gradual replacement had been initiated. This freedom was not there when those very elements were in power under the party system.

The scheme is open to all the income groups from the economically weaker section to the higher income group.

The highlight of the scheme is that the interest of six per cent will be paid on the earnest money deposit paid by the applicant for registration.

The registration charges are, economically weaker section Rs. 500, low income group Rs. 1,500, middle income group Rs. 3,000 and higher income group Rs. 5,000.

According to CIDCO authorities, up till now 5,000 application forms have been sold.

Third century BC copper coins found

CALCUTTA, September 6: The tiny Anantberia village on the right bank of the Rupnarayan river in Midnapore district has come on the archaeological map of India with the discovery of five uninscribed copper cast coins dating back to the third century B.C.

The coins, found by a young man of the village while digging his land, have been handed over to the state directorate of archaeology.

In a recent survey of the village, the state archaeology department recovered a few fragmentary elegant vases resembling a flower pot and dish-on-stand besides some pieces of black and red pottery wares.—Samar-

Token strike by JNU students

NEW DELHI, Sep. 8 (Samachar). The students of Jawaharlal Nehru University observed a token strike today demanding resignation of the Chancellor, Mrs. Indira Gandhi the Vice-chancellor Mr. B. D. Nag-Chaudhari, the Registrar Mr. A. B. Chandiramani the Coordinator (Academic Affairs) Mr. P. N. Sharma and the Security Officer Mr. S. Darshan Singh, for their alleged acts of commission and omission and highhandedness during the emergency.

The JNU Students' Union President, Mr. Sataram Yechury told Samachar that university employees also supported the strike. The administrative office and the library remained closed during the day, he added.

About 650 students marched from the Patel Chowk to south block shouting slogans in support of their demand. A delegation met Prime Minister Morarji Desai and submitted a memorandum. The delegation said that the students had submitted a detailed chargesheet against the university officials to the President, the Prime Minister the Home Minister and the Education Minister three months ago. But no action had been taken in this direction.

Mr. Yechury said that Mr. Desai told the delegation that he would discuss the matter with the Education Minister, Dr. P. M. Chunder after he returned from abroad on September 17.

The Calcutta Statesman (Calcutta)
10 September 1977

Quick Decision On University Urged

By a Staff Reporter
Mr. Samar Guha, M.P., in a letter written to Mr. R. K. Chhabra, secretary, University Grants Commission, earlier this week said that the UGC should finalise its decision to set up a "full-fledged" university at Midnapore by September 26, the birthday of Ishwar Chandra Vidyasagar.

Justifying the claim for a university, he said that Midnapore had 35 colleges with about 45,000 students on the rolls. The North Bengal University had about 18,000 students with 36 colleges in five districts affiliated to it. In the University of Burdwan, there were 62 colleges with about 45,000 students from five districts.

The proposed university, to be named after Vidyasagar, would provide higher education facilities for the backward areas of the district and adjoining regions. The university could be made an "employment-oriented university with a rural bias". In keeping with the spirit of the Janata Government.

Mr. Guha said that the idea of having a regional council for Midnapore under Calcutta University would not be a "workable proposition".

Left Front To Discuss Farakka Issue Today

By Our Special Representative

THE Left Front Committee will discuss the Farakka issue on Saturday. According to reliable sources, the Front leaders want to take a definite stand on the issue before the meeting in Delhi between India and Bangladesh representatives on September 20.

Originally, the Left Front Committee was to have discussed the general political situation at Saturday's meeting and prepare a programme for a movement on various issues. However, the Forward Bloc leader, Mr. Asok Ghosh, said on Friday that his party would raise the Farakka issue since it had assumed great importance at present.

The West Bengal Congress president, Mrs. Purabi Mukherjee, said on Friday that the Congress wanted to participate in any programme on the Farakka issue. She said she had contacted the Chief Minister, Mr. Jyoti Basu, and had urged him to involve all political parties in a joint programme of action on the issue.

She said the West Bengal Government should take the initia-

tive in requesting all the State Governments in the Eastern region to participate in the programme because if Calcutta port dried up, not only West Bengal but the whole of eastern India would be affected.

She said she had told Mr. Basu that a joint deputation of all political parties could be sent to Delhi to meet the Prime Minister and the Defence Minister. She also said that if the West Bengal Government hesitated to take steps on the matter, the Congress would take the initiative on its own.

Strike By L.I.C. Employees

By a Staff Reporter

Employees of the Life Insurance Corporation observed "an hour's walk-out strike" starting at 11 a.m. on Friday. A statement by five unions of the corporation said. The agitation was in support of the demand for 15% bonus as was agreed and scrapping of the LIC (Modification of Settlement) Act 1976.

'PROBLEM VILLAGES' Rs. 40 crores for drinking water supply this year

PATNA, Sept. 8 (Samachar). — The Union Government will spend Rs. 40 crores during the current financial year on the drinking water supply scheme for "problem villages" in the country, according to the Union Minister for Housing, Mr. Shkandar Bakht.

Problem villages, Mr. Bakht told newsmen yesterday, had been defined as villages having no source of drinking water supply within a radius of one mile and also villages which had saline water. The scheme for potable water supply to rural areas would have to be worked out by the State Governments, he said.

Mr. Bakht said it would take 30 years to solve the staggering housing problem of the country if 40 lakh units were added annually. India's population was increasing by 1.5 crores every year. At this rate, 30 lakh new houses would be needed annually. The present backlog of eight-lakh houses had also to be covered.

The Minister also said that as the Government by itself could not undertake the construction of houses on this big scale it would be necessary to associate other agencies for building residential houses. The Government would provide house sites in rural areas as well as in the periphery of the urban areas, he added.

NEW DELHI: The Central Ground Water Board proposes to deploy a heavy rig to explore deeper strata in the coastal regions of Tamil Nadu in search of water. The rig can explore up to a depth of 600 metres. Earlier explorations in this region up to a depth of 300 metres proved futile. The quality of water was very poor, according to official sources.

This is part of the COWB drive to locate water resources in the areas of Tamil Nadu perennially hit by scarcity conditions. The coastal belt of Ramanathapuram

district is covered by the exploration programme.

The board has recently constructed a flowing well with a free flow of 35,000 gallons per hour at Devandathavu, about 19 km from the coast in the Tiruvadanai taluk of the chronically drought-affected region. So far three such flowing wells have been yielding good quality water in the Devakottai and Kannanudi blocks situated in the lower reaches of Manimutthar and Pambar river basin.

Three observation wells have also been constructed in the vicinity of the flowing wells for long-term monitoring. All these six wells are being used for irrigation.

In view of the encouraging results, the board is planning further programme in the area to determine the feasibility of sinking more such wells and help the State Government in the formulation of area development schemes.

Heavy rig to explore water in TN

Express News Service

NEW DELHI, Sept. 8.

The Central Ground Water Board proposes to deploy a heavy rig to explore deeper strata in the coastal regions of Tamil Nadu in search of water. The rig can explore up to a depth of 600 metres. Earlier explorations in this region up to a depth of 300 metres have proved futile. The quality of water was very poor, according to official sources.

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Steps to halt deserts expansion outlined

NAIROBI, Sept. 8 (AFP). — Immediate steps must be taken to stop the advance of the desert without waiting for further research, the Plenary Committee of the United Nations Conference on Desertification proposed here yesterday.

The Committee's findings are to be put to the full assembly of the Conference today.

Its report suggests that there were gaps in present-day scientific and technical knowledge on desertification and, in particular, the need to build up "indigenous and autonomous science and technological capacity in the areas concerned."

However, the opinion of scientists was that man "already possesses adequate knowledge and professional skill" to face up to the problem.

Among future research work, the Committee called for detailed maps of desert areas to make it possible to plot the extent of the desert's movement.

Meanwhile, the basic document of the conference, a "plan of action to combat desertification," was approved by the Committee with a number of amendments. In particular, it dropped a suggestion for a new UN agency to assure continuity in the work now begun with the Conference here.

Numerous delegations, especially those from the industrialised nations, were against any further growth in the UN family of agencies.

THE NAVHIND TIMES

FRIDAY, SEPTEMBER 9, 1977

Thought for today

Happy is the nation without a history.

— Cesare Bonesanadi Beccaria

Water of dispute

The Janata Government, while continuing generally the foreign policy of the previous regime, is anxious to establish better relations with India's Asian neighbours. And yet it would appear that efforts to improve ties with some countries are not bearing much fruit. The issue of sharing of Ganga waters is definitely a stumbling block to cordial relations between New Delhi and Dacca. Though it was announced, during Mr. Jagjivan Ram's last visit to Bangladesh, that a tentative agreement has been arrived at which would lead to a permanent solution, nothing concrete seems to have been achieved. Last month the Defence Minister told Parliament that any agreement on the Farakka issue with Bangladesh would be a package deal covering both short-term and long-term measures to augment the water supply of the Ganga; he also asserted that both the countries had to share the shortage of water

during the lean period of about six to eight weeks. Mr. Ram also said that "friendship between the two countries is more important than a few cusecs of water on this side or that."

No one will deny that this is the right approach; however if these "few cusecs" mean the life or death of the Calcutta port, then there will be serious misgivings about New Delhi's approach to the problem. While everything possible must be done to ensure that Bangladesh does not suffer during the lean period, nothing should be done to damage the Calcutta port. And the recent statements, doubts, etc. expressed by some Bangladesh leaders have added to the anxiety of people in West Bengal. This is a delicate problem; but a country's foreign policy should be governed first by its self-interest. The Janata leaders could not be unaware of this cardinal principle.

Enough gas from Bombay High by '81

By A Staff Reporter

BOMBAY, Sept. 8.—About 10 million cubic metres of gas will be daily available from the Bombay High by the end of 1980 when the laying of pipeline connecting the wells in the oilfield to the main hinterland is completed, said Mr. Babubhai Patel, Chief Minister of Gujarat, here today.

Addressing a meeting of the Indian Merchants' Chamber, he said the production of gas from the Bombay High would be enough to meet the entire requirements of both Gujarat and Maharashtra in 1980.

Mr. Patel appealed to the citizens of Bombay to donate generously to the Gujarat relief fund for rehabilitation of flood victims.

Property worth Rs. 35 crores were damaged in the recent floods in Gujarat. About 12,000 houses in Mehsana, Sabarkantha, Banaskantha and other districts were destroyed.

The State Government was making all efforts to rehabilitate over 60,000 families directly affected by the floods, he added.

Mr. P. C. Jain, President of the Chamber, welcomed the Chief Minister and Mr. V. B. Haribhakti, Vice-President, proposed a vote of thanks.

On the farm front

Focus on organic manures

Raj Krishna

THERE is a growing realisation in the country that the use of organic manure is not receiving the due importance and that there has been an excessive emphasis on use of chemical fertilisers. According to experts, exclusive reliance on chemical fertilisers results in a loss of yield over a period of time. In several cases the high-yielding varieties are blamed for the declining trends in productivity and the varieties are sought to be replaced by newer ones.

In tropical parts of the world, it is necessary to add large quantities of organic manure, preferably with calcium phosphate, because the high temperature there makes the organic matter and humus disappear much faster. Soil tests in West Bengal have shown that tropical climate and humidity lead to a rapid decomposition and loss of organic matter in the soil. This results in a sharp decline in yields per hectare in spite of larger investment on the use of inputs.

Certain tests in western Nigeria have shown that the fields which received only chemical fertilisers lost about 75 per cent of their original organic matter after 10 years of cropping whereas the fields receiving a combination of organic manure and chemical fertilisers lost only 50 per cent of the organic matter after 10 years of cropping.

It has been established through a series of experiments under different agro-climatic conditions that a combined application of organic manure and chemical fertilisers would result in significantly higher levels of production and maintain better soil productivity than that obtained by applying either only organic manures or only chemical fertilisers.

Organic wastes are regularly recycled for being used as plant nutrients even in countries which are situated in the temperate climate region, have soils which are quite rich in the organic matter and possess clay materials which preserve plant nutrients

and water. In about 85 per cent of the total cultivated area in China, organic manure is used for fertilising the soil. The argument for stepping up considerably the use of organic manure has much weight in India because it is situated in the tropical climate and has vast resources of organic manure which are being wasted for want of a planned and methodical use system.

According to an expert estimate, the total quantity of organic matter that is wasted every year can yield about six million tonnes of plant nutrients consisting of 2.7 million tonnes of nitrogen, 1.8 million tonnes of phosphates and 1.8 million tonnes of potash. In India, the main elements of a comprehensive programme for the development of manurial resources are the production of rural and urban compost, green manuring, sewage sludge utilisation, setting up of mechanical compost plants and setting up of gobar gas plants.

The progress in regard to all these schemes, however, has been painfully slow and much that could be done remains undone.

In regard to the production of rural compost, India, because of its large cattle population, has a distinct advantage over China. Whereas India has the largest cattle population in the world, China's cattle population was decimated during the period of the civil war there. India is, however, not taking full advantage of its enormous cattle wealth. India's production of rural compost, estimated at 135 million tonnes during 1975-77, is less than even one-third of its potential of about 600 million tonnes in a year. Most of the cattle-dung is still used as fuel. Even half the quantity of cattle-dung which is used as fuel can yield more than two million tonnes of nitrogen.

The work relating to urban composting is currently in progress in 3200 urban centres of the country. During 1976-77, about 5.2 million tonnes of urban

compost was made available as against an estimated potential of about 15 million tonnes in a year.

Green manure can also be used as a source of nitrogen for the crop. The crops generally used for the purpose of green manuring are cowpea, horsegram, lentil, pillipeara, berseem, sunhemp and dhaincha. On a rough reckoning, one hectare of the green manure crop gives about 40-60 kg of nitrogen. The practice of using green manures is, however, not popular yet, and during 1976-77 it had been used over only six million hectares of land.

The schemes for utilising sewage sludge which provide irrigation water as well as plant nutrients and organic matter are in operation in about 220 cities and towns and about 250 MGD of sewage sludge is being used in an area of about 2400 hectares only. The schemes for mechanical composting in the cities has just been started with Ahmedabad and is yet to make any significant impact in terms of acreage benefited.

The number of gobar gas plants established so far is about half of the target of one lakh plants for the Fifth Plan period. But the credit for this achievement goes primarily to the dedicated work of the Khadi and Village Industries Commission (KVIC).

Several alternative formulations of fixing nitrogen in the soil from bacterial and biological sources have been discovered. These nutrients are much cheaper than the chemical fertilisers. The scientists in the Indian Agricultural Research Institute (IARI) had prepared a rhizobial map of India on the basis of a country-wide survey of rhizobial bacteria which fixed the atmospheric nitrogen in association with the roots of the pulse crops.

It has been established that the inclusion of a short-duration, pulse crop added considerably amount of nitrogen to the soil which would be beneficial for the next crop. A short duration

fodder cowpea, crop raised between rabi and kharif cereals, thus, could yield 30-35 kgms of nitrogen per hectare.

The scientists in Brazil have discovered another bacterial species called "Spirillum lipoferum" which fixed the atmospheric nitrogen in association with maize plant and other grasses. The Scientists at IARI have also isolated 15 Indian strains of spirillum from the roots of rice, maize and sorghum which have been found to be efficient in the fixation of nitrogen. Spirillum, thus holds the promise of becoming a bacterial fertiliser for some of the cereal crops in India.

Another important discovery in the field of organic manures has been the development of bio-fertiliser in the form of algae cultures, which also fix the atmospheric nitrogen. Blue-green algae have been found to be particularly promising in the case of rice crop. The field trials in Tamil Nadu show that algae application could give benefits that are equivalent to that of applying 20-30 kgms of nitrogen per hectare.

Unfortunately, however, there is not much demand yet for the bacterial fertilisers, and several small-scale units producing these fertilisers have closed down and the surviving units are also utilising only a very small proportion of their capacity. The poor demand for the bacterial fertilisers is attributable mainly to the ignorance of the farmers in regard to its usefulness and lack of proper interest and efforts on the part of the Government for promoting and popularising its use.

A scheme for popularising bacterial fertilisers and setting up small-scale units all over the country may cost the Government only a few crores of rupees, but it would bring returns in terms of increased production which would be several times the cost incurred. And this would also create some additional employment opportunities in the rural areas.

Seminar on pollution

By A Staff Reporter

A national seminar on problems of environmental pollution in India and in Bombay particular will be held in Bombay beginning September 30.

The seminar is organised by the Indian section of the Instrument Society of America.

About 200 delegates from various countries are likely to participate.

An exhibition of instrumentation and professional electronics has been organised during the seminar which will be inaugurated by Union Minister for Steel and Mines Biju Patnaik.

Bengal team to present view on Farakka

Express News Service

CALCUTTA, Sept. 10 — The West Bengal Cabinet today decided to send an all-party delegation to Delhi for presenting the State's view point on sharing of the Farakka waters. The delegation will include members of all the parties in the Assembly.

At the Cabinet meeting, the Farakka was the main subject of discussion. It felt 40,000 cu m of water was the minimum required to keep Calcutta port alive.

Concern over shaking CSIR

NEW DELHI, Sept. 10.

The National Academy of Sciences at Allahabad has expressed concern at the decision of the Government to detach various laboratories of the CSIR and attach them to various ministries and reorganise CSIR and the Department of Science and Technology.

The Sunday Standard (Bombay)

11 September 1977

In a resolution released here today, the Academy said that while the Government had the right to make decisions on the organisation and structure of the government agencies, it should encourage discussion in the scientific community on the parameters of restructuring before taking decisions. The Academy pointed out that over the last 20 years, India has developed to the stage of being the seventh or eighth nation in terms of technological advancement, industrial ability and the third in terms of scientific manpower.

Most of these developments were due largely to investments in science and the scientific organisations that the Government of India had created. — Samachar.

PLANS TO ROLL

NEW DELHI, September 10.

THE rolling plan concept — first introduced in the Defence plans in the wake of the Chinese aggression in 1962 — was today extended to Five-Year Plans in future at a full meeting of the Planning Commission.

Under the rolling plan concept, a Five-Year Plan would be formulated as before but it would be reviewed and extended year by year.

This, according to an official press release, will enable adjustments to be made in the Plan according to the changing conditions.

The current Five-Year Plan, which ends in 1979, will now be terminated a year earlier in March 1978. Next year will also be the first year of the new rolling plan.

The Commission's meeting was today presided over by Prime Minister Morarji Desai. Defence Minister Jagjivan Ram, Home Minister Charan Singh, Finance Minister H. M. Patel and Deputy Chairman of the Planning Commission D. T. Lakdawala were present.

By adopting the rolling plan concept, the controversy about the functions of the Planning Commission, which were proposed to be curtailed, was side-stepped.

The Cabinet Secretariat had proposed that the Commission be stripped of its powers to formulate Annual Plans and its projects appraisal division be detached from it.

The Commission was known to have been opposed to any dilution of its functions.

The Commission considered the need for innovations in Planning technique to ensure greater flexibility and realism.

Past plans had not adequately provided for inevitable fluctuations in agricultural output and had proved to be vulnerable to changes in domestic and international economies.

The Planning Commission would shortly undertake consultations with the State Governments to ensure wide understanding and acceptance of the new change in planning objectives, the consequent shift in investment priorities and the new Planning strategy.

Presiding over the second formal meeting of the Planning Commission the Prime Minister emphasised the need for comprehensive Planning and control of all outlays by State and Central Governments, whether of a developmental nature or otherwise.

He said future investment plans should be based on a realistic assessment of the savings in the economy, and that the effectiveness of Planning should be judged not in terms of the size of the Plan as measured in money but the results achieved by way of increased employment and income generation.

Mr. Desai added that Plan outlays should not be enlarged at the cost of maintenance of existing assets and improvement in the quality of services.

The Commission noted that to achieve the aims of higher employment and alleviation of poverty a substantial shift in the allocation of resources from other sectors to agriculture, irrigation and small industry was called for.

Plan Funds To Be Reviewed Every Year

From Our Special Representative

NEW DELHI, Sept. 10.—The Planning Commission decided today that a five-year Perspective Plan would be "framed" every year, taking into account fluctuations in savings from agricultural production and other "unforeseen" economic changes, both domestic and international. Agricultural production accounts for about half the national income.

The reallocation of funds will begin next year under a "rolling plan" system to give more to agriculture, irrigation and small industries. The Fifth Plan will end a year earlier, in March 1978.

The Commission's role in scrutinizing Plan expenditure every year appears to have been made stronger than before, contrary to reports that it would be curtailed.

(The Cabinet secretariat had proposed that the Planning Commission be stripped of its powers to formulate annual Plans and its projects appraisal division be detached. The commission had opposed any dilution of its functions.)

The Commission is expected to start consultations with State Governments soon to ensure proper understanding and acceptance of the new planning procedures and the proposed shift in investment priorities.

The Prime Minister, who presided over the second formal meeting of the Commission here today, emphasized comprehensive planning and control over all Government outlays, whether developmental or otherwise.

He said investment should be based on realistic assessment of the savings and the effectiveness of planning should be judged not by the size of the Plan, but by the increase in employment and income it would generate. Mr. Desai also warned against Plan outlays being enlarged at the cost of maintenance of the existing assets and improvement in the quality of services.

The Commission noted that higher employment and reduction of poverty required a substantial shift in the allocation of resources from other sectors to agriculture, irrigation and small industries. It would also be necessary to provide for stocks of certain essential commodities for price stability.

Samachar adds: Earlier Plan had not adequately provided for fluctuations in agricultural output and had proved vulnerable to changes in domestic and international economies.

The Defence Minister, Mr. Jagjivan Ram, the Home Minister, Mr. Charan Singh, the Finance Minister Mr. H. M. Patel, and the Deputy Chairman of the Planning Commission, Dr. D. T. Lakdawala attended the meeting.

The Sunday Statesman (Calcutta)
11 September 1977

FINANCIAL EXPRESS

BOMBAY: SUNDAY, SEPTEMBER 11, 1977

Rolling plans with 5-year perspective proposed

NEW DELHI, Sept. 10. MARKING a major departure from the past, the full meeting of the Planning Commission, under the chairmanship of the Prime Minister, Mr. Morarji Desai, today decided to have rolling plans for development.

Under the new concept, every year there will be an annual operational plan with a fresh five-year perspective.

In other words, there will no more be a rigid five-year framework. But every year, there will be a plan for the next five years.

This new system of planning is intended to enable adjustments to be made in the plans according to the changing conditions.

Next year (1978-79), which was earlier supposed to be the final year of the Fifth five-year Plan, will be the first of the new rolling plan system.

Thus, the Fifth Plan will end one year in advance.

Also, the new priorities of planning put forth by the Janata Party will be reflected in the next year's plan itself.

The new system of planning, which is already in vogue in certain countries like Poland, will involve more sophisticated planning techniques. Today's meeting, in fact, considered the need for innovations in planning techniques to ensure greater flexibility and realism.

In this context, it was noted that past plans had not adequately provided for inevitable fluctuations in agricultural output and had proved to be vulnerable to changes in domestic and international economies.

The Planning Commission will shortly undertake consultations with the State Governments to ensure wide understanding of the new planning system and acceptance of the new planning objectives and the

consequent shift in investment and development strategies.

Incidentally, today's decision sets at rest the controversy over the role of the Planning Commission in annual plan formulation. With a rolling plan coming every year with a fresh five-year perspective, the Commission will be constantly involved in their preparation and assessment.

The Commission noted that to achieve the aims of higher employment and alleviation of poverty, a substantial shift in allocation of resources from other sectors to agriculture, irrigation and small industries was called for.

It would also be necessary to provide resources for building up stocks of certain essential commodities to maintain price stability.

In fact, in view of the need for immediate revision of inter-sectoral priorities, the Commission decided that the annual plan for 1978-79 should be part of a new medium-term investment plan.

Presiding over meeting, which was

the second formal meeting of the Commission, Mr. Desai emphasised the need for comprehensive planning control of all outlays by the Government, whether of a development nature or otherwise.

He said future investment plans should be based on a realistic assessment of the savings in the economy. The effectiveness of planning, he added, should be judged not in terms of the size of the plan in money terms, but from the results achieved by way of increased employment and income-generation.

The Prime Minister also stressed that plan outlays should not be enlarged at the cost of maintenance of existing assets and improvement in the quality of services.

At the Commission's meeting, which was presided over by the Prime Minister, the Defence Minister, Mr. Jagjivan Ram, the Home Minister, Mr. Charan Singh, the Finance Minister, Mr. H. M. Patel and the Deputy Chairman of the Planning Commission, Dr. D. T. Lakdawala, were present.

Stemming the spread of deserts

IN 1969 the winds blew more than sixty million tonnes of the Sahara desert into the Atlantic Ocean. Not all of this sand and soil could have supported livestock or cultivation. But some of it could.

The scientist who made this estimate noted that much of this dust came from the area bordering the Sahara. This included the Sahel, a name only too familiar because of recent misfortunes. The loss of topsoil and some of its components is repeated, more or less, every year. This is one of the processes of desertification or the spread of the desert.

What exactly is this process which has been with us for so long but whose imminence only now looms large in our consciousness? In certain regions of the earth areas of land with sparse vegetation and very low productivity associated with aridity are spreading. When the degradation is persistent and possibly irreversible, we have what scientists call desertification.

This is now a matter for global concern for it diminishes the area of land available to support an ever-increasing world population. In 1977 food for more than 4 billion inhabitants is required; by the end of this century food for at least 6 billion will be needed.

Why are there deserts in certain areas of the globe? Is climate the main factor? Are climatic changes responsible? If there are in fact climatic changes, are they man-made?

To pose these questions is to emphasise the role of the meteorologist and climatologist in finding answers to them. We must turn to the expertise of these two scientific disciplines for answers. We must do this not only to understand fully what is happening but also to have the data which will enable other scientists and technologists to work out effective, concerted efforts to cope with this problem.

Assistance

The weather phenomenon which wreaks the most havoc on food production is drought, to which we are no strangers in this country. Its arrival in a semi-arid zone after a series of good years with favourable rainfall frequently has dire consequences. In developing countries where vaccination of herds allows them to multiply, and where marginal lands have been cultivated, the results of drought can be truly disastrous.

Much thought has been given in recent years to the possibility of dealing with drought and desertification by means of artificial weather modification. However, existing scientific knowledge and technology so far offer little encouragement.

Arid lands are characterised by the absence of clouds which might respond to seeding. The World Meteorological Organisation (W.M.O.) is currently planning an experiment in a moister area to establish the feasibility of significantly increasing rainfall amounts under specified conditions. Results are not expected for several years.



The disastrous five-year drought in the Sahelian region of West Africa took a heavy toll of life — human and livestock. In a desperate attempt to reach the scant foliage of the higher branches, this goat died trapped in a tree.

But much that we have to offer to change the imprudent use of land and technology which have contributed to desertification. To do this, we need far more factual information than we now possess on weather and climate in areas affected by desertification. We require a statistical analysis of rainfall incidence for the drier regions of the earth in order that objective advice can be given on the probability of adverse conditions.

In the United Nations family of organisations, the W.M.O. is more directly concerned with the climatological aspects of the desertification process. The organisation's activities include the study of weather hazards, short-term and long-term forecasting, climatic prediction, weather modification and application of meteorological data of all kinds. It provides technical assistance to developing countries.

The W.M.O. is also planning studies and activities directed toward a deeper understanding of drought. Bilateral aid programmes will finance this work. It will include a rapid assessment of water resources for water supply to settlements, the establishment of basic data archiving and a data bank, study of climatic changes and the use of radar for estimating rainfall distribution in a given area.

During its more than one hundred years of existence, the W.M.O. and its predecessor, the International Meteorological Office, accumulated an immense body of knowledge and experience concerning weather and climate affecting all regions of the earth, including arid and semi-arid areas. Accordingly, there is now a greater awareness of the basic meteorological and hydrological aspects of fragile ecosystems which are particularly susceptible to stress.

The drought that tragically affected the countries of the Sahel in recent years has focussed government and public attention on the problem of desertification. Consequently the United Nations convened a world conference in Nairobi from August 29 to September 9, 1977, to discuss and coordinate the measures required "to stem the spread of deserts."

The conference had at its disposal reviews and case studies on desertification prepared by the agencies concerned and based upon all available knowledge on this subject. The conference was expected to make positive advances through the adoption of a plan of that would be scientifically and politically possible.

It is largely man's interference in dealing with fragile ecosystems in the past which has helped the spread of deserts. It is likely that "to roll back the deserts" an integrated approach, based on whole ecological systems, will be recommended.

The authorities in the countries most concerned can now draw on the expertise of the international community to anticipate or cope with some of their desertification problems. It is important that at all times they should have access to realistic appraisals of drought incidence, and of prolonged adverse or favourable weather.

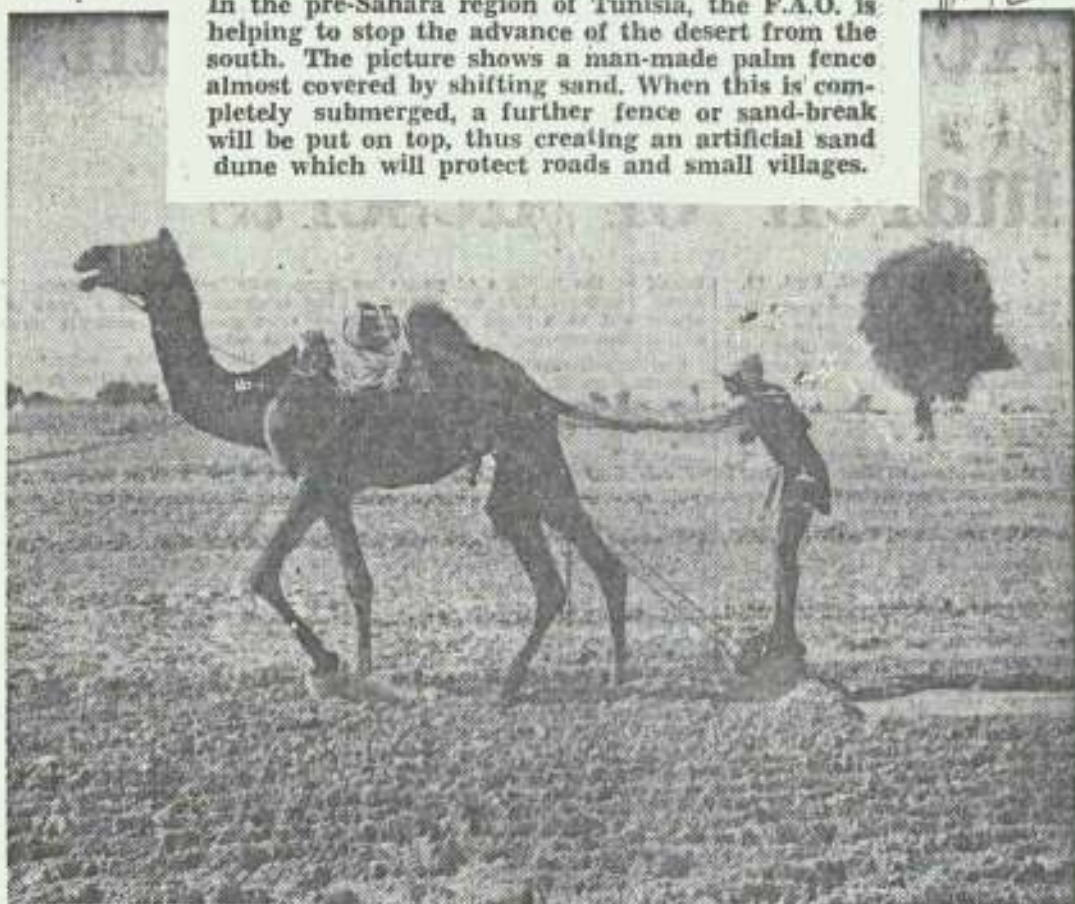
Greater application of meteorological and hydrological knowledge will permit them to make more rational use of their ecosystems in order to obtain the maximum use of their land without triggering the desertification process.

The World Meteorological Organisation has long experience of international cooperation in its field. This will assist the conference to establish a clearer picture of the problem of desertification and work out a strategy for coping with it.



The Sunday Standard
(Calcutta)
11 September 1977

In the pre-Sahara region of Tunisia, the F.A.O. is helping to stop the advance of the desert from the south. The picture shows a man-made palm fence almost covered by shifting sand. When this is completely submerged, a further fence or sand-break will be put on top, thus creating an artificial sand dune which will protect roads and small villages.



A camel used as a draught animal on the Hanumangarh Experimental Farm in Rajasthan. The weighted plank levels the ground. A team of F.A.O. experts is carrying out detailed surveys, experiments and demonstrations for optimum soil and water use there.

The Sunday Standard (Calcutta)
11 September 1977

Action plan to halt march of deserts

NAIROBI, Sept. 10.

The United Nations conference on desertification concluded here yesterday after adopting an integrated plan of action to halt the march of man-made deserts by the turn of century.

After a marathon session presided over by Dr. Julius Kioko, Kenya's Minister for Water Development, the conference also adopted by vote a proposal for the establishment of a joint consultative group to generate resources for implementing the plan.

The plan represents the first serious attempt of the world community to ameliorate conditions of the human and livestock population of arid areas and to develop measures to improve land productivity.

It spells out both short-term and long-term measures to be taken at national, regional and international levels to arrest the desertification process which affects 30 per cent of the globe and over 700 million people.

Recommendations of the conference will now be submitted to the UN General Assembly for approval.

Addressing the closing session, conference chairman Kioko said, "Taste of the pudding is in eating. What we have approved and adopted today must stand up to the test of implementation. Let us resolve on

behalf of the millions of people we here represent that our plan of action will be a plan for continuous implementation."

Secretary-General of the conference Mostafa K. Tolba also emphasised the aspect of implementation.

He was sure the conference had helped reformulate "what will become a world plan for action to combat desertification and make it truly realistic and realisable" on behalf of the United Nations environment programme which he heads. He pledged to join hands with sister organisations in United Nations system to serve the plan of action.

Barier, Chairman of Committee M. S. Swaminathan said for successful implementation of the plan a major ingredient was necessary — appropriate technology, necessary resource backup and public policies which would generate social and administrative infrastructure essential for translating plans into field accomplishment.

While there was general agreement during the 13-day conference about urgency of the problem and need to tackle the desertification process effectively, the conference encountered rough weather when the question of funding the plan of action came up.

Major donor countries were drag-

ging their feet when a proposal for the establishment of a joint consultative group to generate resources was taken up.

The United States seconded by West Germany wanted the group to be strictly temporary and advisory in nature. India's compromise formula that if necessary, the group could be set up initially for three years was not acceptable to them.

United States proposal was put to vote and was defeated by 18 votes in favour to 36 against, with 21 abstentions. The conference then went on to adopt the original proposal of permanent consultative group by an overwhelming majority.

A Sudanese proposal for establishing within the United Nations a special account for implementing the plan of action was also opposed by the main donor countries.

The proposal was adopted by 27 votes to 18.

The plan of action among other things emphasises importance of public participation in preventing desertification socio-economic aspects, environmental impact of roads and all terrain-vehicles, fauna conservation and agricultural ecosystems.

The plan also stresses international co-operation in the management of shared resources for preventing desertification.—Samachar.

Sahibi alone not to blame for floods

By Our Correspondent

DHARUHERA, September 11: The Sahibi river alone is not to blame for this year's unprecedented flood havoc in southern Haryana and Alwar district of Rajasthan. Repeated floods in the numerous torrents that serve as tributaries of the Sahibi between Jaipur and Jhajar and breaches in the bunds all along the wayward river's course are equally responsible for the havoc.

The daily rainfall chart maintained by meteorologists and employees of various Central and state government departments in Haryana and adjoining areas of Rajasthan show that the rainfall in the catchment area on any single day in the first week of August had not warranted the record discharge of over 1.10 lakh cusecs at either Dharuhera or the Kalipur and Mehondwari bridges across the Sahibi between Rewari and Rohtak.

Experts contend that at the most the rainfall on the night of August 3 could swell the river's discharge to 58,000 cusecs and not to 1.10 lakh cusecs recorded at the Dharuhera bridge on the morning of August 4 when a stretch of the national highway No. 8 and the Gurgaon-Rewari section of the Delhi-Ahmedabad railway line were washed away and hundreds of villages in Mahendragarh, Gurgaon and Rohtak districts were engulfed by flood waters.

HARROWING TALES

The mystery behind the additional 32,000 cusecs of water that entered the Sahibi's mainstream upstream of Dharuhera in the Rajasthan area has since been solved. Nearly half a dozen dry hill torrents that used to join the Sahibi at various points in the Aravalli hills ranges upstream of Dharuhera have suddenly re-emerged. At least four of these torrents, according to an expert, have been dry for 122 years.

The position worsened following breaches in the massive Masit and Sareka bunds, besides three others in adjoining hamlets in the Alwar area.

The residents of Salal and Masit villages narrate harrowing tales of how several ring bunds around their localities collapsed one after the other washing away everything that came their way, including men and cattle. Surprisingly nobody living near the hilllocks knows that a major part of Masit village, only a few kilometres towards Rajasthan from the Dharuhera tourist complex has been washed away.

The Salalpur sarpanch, Mr. Net Ram, said that at least three residents of a nearby village, including a woman, were missing and that doors, windows and household goods were washed away on the morning of August 4 from some villages upstream of Masit with the collapse of the ten-metre high bund. The sarpanch has since resigned in protest against alleged official callousness.

The SDM of Gurgaon, Mr. Shankar Lal, claims to have seen seven bodies floating in the river at the Khalipur railway bridge (No. 93-A) on the morning of August 4. The bodies could not be recovered because of the fast current. The dress of the victims resembled that of the tribals of Rajasthan.

The Deputy Commissioner of Gurgaon, Mr. Naseem Ahmed, says that his officials had informed the authorities in Alwar about the bodies and the debris. The latter, according to Mr. Ahmed, denied the existence of any bund either at Masit or at Sareka and Salalpur villages of

Alwar. This correspondent saw on Saturday a series of collapsed ring bunds around these villages. Water is still flowing through the villages.

A 35-year-old resident of Masit said at Salalpur that there was a ring bund around Masit and that it collapsed on August 3-4 night. Gurgaon's SDM and sarpanch say they have seen huge fish in the Sahibi on August 4. They think the fish must have been washed away following the breaches in the bunds in the upper reaches.

On August 9 when the Deputy Commissioner of Mahendragarh, Mr. T. D. Jangal, supervised desilting operations at the spans of the Sahibi bridge he saw debris of houses, like wooden beams and steel boxes, hurled under the silt. As there is no Haryana hamlet along the Sahibi upstream of Dharuhera, these debris in all probability belonged to some Rajasthan village. The authorities in Rajasthan, however, do not admit that any hamlet in their territory was washed away by the Sahibi.

Mr. Jaipal Singh Yadav and other people of Dharuhera say they suddenly woke up on the night of August 3 on hearing the cries of women and children for help. Mr. Yadav, according to the Gurgaon SDM, Mr. Shankar Lal, had informed him the next day about it. The SDM passed on the message to the District Magistrate of Gurgaon when the latter reached Khalipur downstream of the Dharuhera bridge.

Sidhraulti is being developed as a "focal village" by the Haryana Rural Development Board. The flow of flood waters through the streets of Sidhraulti on the night of August 4 took everyone by surprise. By the time the villagers rushed out of their homes and reached the nearby national highway No. 8 the boundary wall of the newly built Panchayat Bhawan had collapsed and a classroom of Ram Lal Singh College of Education had caved in, according to a retired taxation official, Mr. Jom Chand Yadav. The only road connecting Sidhraulti with the national highway No. 8 was washed away at several places leaving about 300 villagers stranded between the national highway and the panchayat Bhawan.

BUND BREACHES

The authorities contend that Sidhraulti was affected by the sudden floods in the Indori Nadi and the change in its course towards Rewari. Indori is an old tributary of the Sahibi and originates in the Aravalli hills ranges upstream of Taoru Mandi. It is now learnt that a series of ring bunds, including the massive Rangolia embankment at Jaunsi village of Nah sub-division of Gurgaon, collapsed between August 1 and 4. The collapse of the Rangolia bund affected other ring bunds.

Drainage engineers did not concede the breaches in these bunds till three days ago when this correspondent was informed about the breaches by a putwan at Taoru. The Deputy Commissioner, Mr. Naseem Ahmed, claims that he learnt about the breaches in these bunds and had informed senior officials that very day. The Deputy Commissioner feels that the damage to Sidhraulti and Dharuhera villages would have much less had these bunds not collapsed. The drainage department says that the current of the water cascading down the hills was so fast that the bunds could not withstand the pressure.

Fortunately none of the 30 odd

bunds in Gurgaon sub-division developed cracks during last month's heavy rains. Mr. Shankar Lal says that he had warned bund guards in May-June last if a crack developed in any of these bunds they would be held personally responsible for it. Mr. Lal instructed the guards to open the weirs in the event of over-filling without awaiting clearance by senior officials.

Satellites to monitor creeping desert

NEW DELHI, September 11 (Samachar): Creeping of deserts in India and neighbouring countries will be monitored by satellites, it was proposed at the UN-desertification conference that ended in Nairobi on Friday.

The South-West Asia satellite monitoring system will cover Afghanistan, India, Iran and Pakistan (AIIIP). Fifty per cent of this AIIIP region is desert or desert margin, it is said.

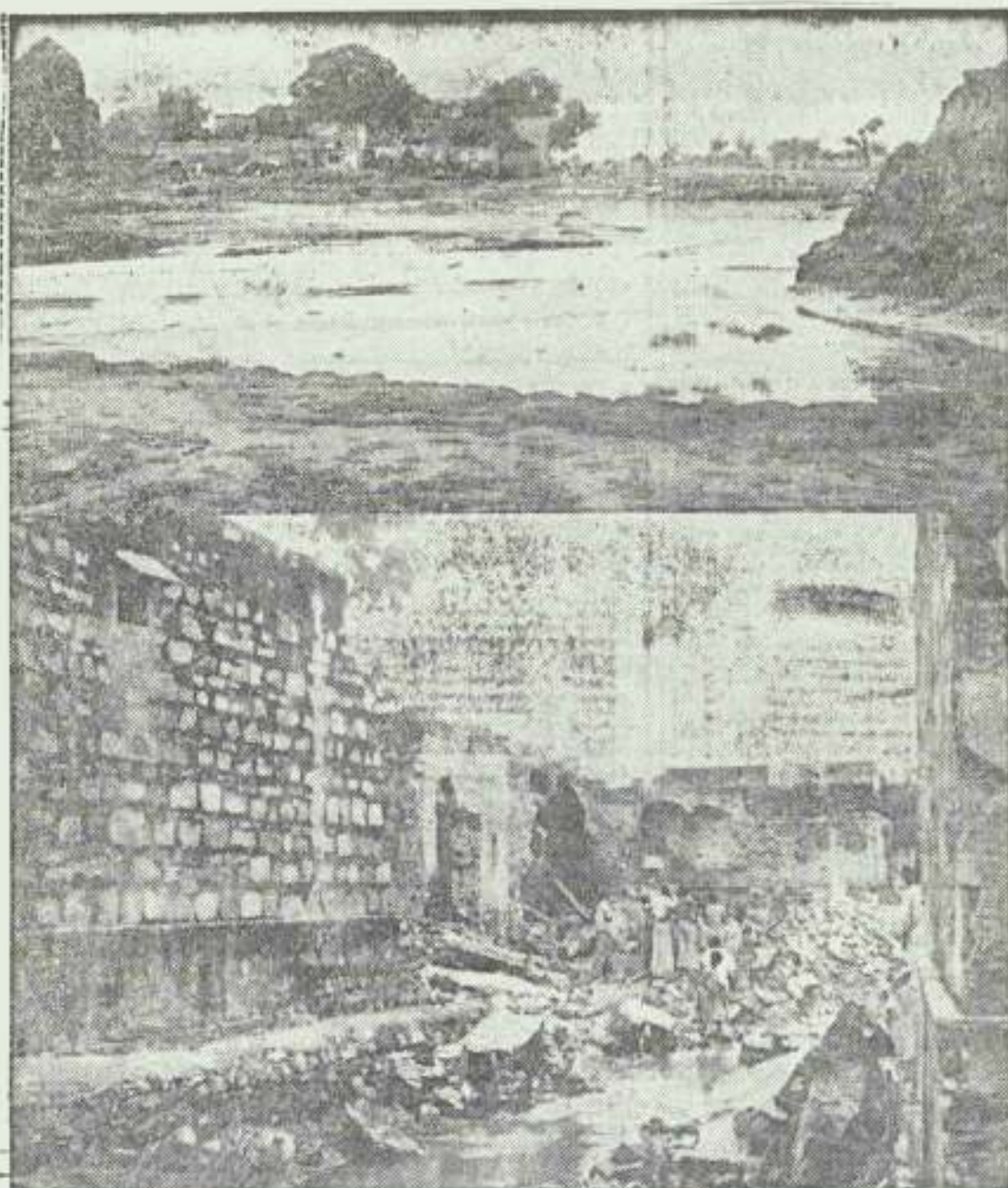
A similar satellite monitoring system has been proposed for South America where 60 per cent of Argentina and Chile, and 25 per cent of Peru is subject to desertification.

Meanwhile, India's signal contribution to the conference was presentation of a well-formulated proposal for establishing a machinery for generating additional resources for implementing an action plan to halt the march of man-made deserts.

The proposal adopted by the conference was to set up a consultative group comprising representatives from UN organisations already engaged in the task and other organisations, including major donors—traditional and new—multilateral financing agencies and from developing countries having substantial interest in combating desertification. The group would assist in the co-ordination of activities undertaken with resources mobilised by it.

India tried hard—though in vain—to see that voicing on this issue was avoided. Noting that sole major donor countries were lukewarm to the proposal the Indian delegate said any proposal adopted without the support of major donor nations would only be "paper victory." The consultative group even for a limited period of three years, that is up to 1980, to consider raising finances for the plans already drawn up would be helpful.

The Times of India (Delhi)
12 September 1977



Recent heavy rains have caused extensive damage in Rajasthan. Above, the breach in the Musit Bandh has flooded many villages at the Aravali foothills. Below, a double-storey building in ruins with flood water still flowing through Salal village near the Dhruhera tourist complex.

India to be 5th largest coal producer by 1985

NEW DELHI, September 11 (Samachar).

COAL output in the world is likely to exceed the annual level of about 4,000 million tonnes by 2000 A.D., doubling the present rate of production.

According to an appraisal of world coal resources undertaken for the World Energy Conference in Istanbul commencing from September 15, the world production level in 1985 would reach 3,596 million tonnes against 2,384 million tonnes in 1975.

The production and consumption trends in 10 major coal-producing nations reveal that by 1985, India would become the fifth largest coal-producing country with about 185 million tonnes of production.

China, which now occupies the third position, is likely to move to the first place in another eight years pro-

ducing 920 million tonnes per annum, closely followed by the Soviet Union with 851 million tonnes and 842 million tonnes by the United States.

The projected coal production in India by 2000 has been estimated at 327 million tonnes, with the consumption level of 313 million tonnes. By then, India's coal export is likely to reach 13 million tonnes.

The appraisal indicated that the percentage of coal in the world energy supply at present was 32.

If this percentage was to be maintained in 2000, the coal output in the world would have to be increased at an annual rate of 3.6 per cent.

Should a higher percentage, say about 40, be necessary, an annual growth rate in coal output of 4.8 per cent would be required.

"This growth rate can hardly be reached by most of the countries, due to the difficult conditions in their coal deposits," the appraisal said.

The Times of India (Delhi)
12 September 1977

Most countries make their planned future coal production figures dependent on their future expected requirements.

The assessment showed that the ratio of planned coal exports to total production would increase only in Australia, Canada and South Africa.

On a worldwide scale, the present measures to increase coal production would probably "not suffice to meet the future demand for world energy."

As a consequence, the world trade with coal, too, must be increased more than proportionately since the coal trade with overseas countries was only about 5 per cent of the overseas trade with mineral oil.

The assessment revealed that the majority of the economically recoverable world coal reserves was situated in the Northern Hemisphere like North America, the Soviet Union, China and in Europe.

CM: Titanium project needs IDBI aid

Our Special Correspondent

TRIVANDRUM, Sept 12

CHIEF Minister A K Antony on his return from Delhi said here today that the proposed multi-crore State sector titanium complex in Kerala deserved financial assistance from IDBI in the same measure as it helped private sector ventures, if not more.

Talking to newsmen at the airport, Mr Antony disclosed that IDBI officials with whom he had discussed the problem, pleaded helplessness in extending the loan assistance required on the ground that the project was visualised as State-owned.

A core sector project like the titanium complex for exploiting the abundant mineral wealth of Kerala coast for industrial use should necessarily be State-owned.

Paradoxically enough, being in State sector, seemed to disqualify the project for any assistance from the Industrial Development Bank of India. If rules stood in the way, these should be changed, the Chief Minister said.

Referring to the Plan talks he had with Central Ministers and Planning Commission officials, Mr Antony said he found the response positive and encouraging. The sixth Plan outlay as

proposed by the State at Rs 180 crores had been accepted without cut.

OTHER SCHEMES

More liberal assistance for various ongoing expansion schemes relating to the State's traditional industries like coir, cashew, handloom, khadi and fisheries was expected from the Centre for the current year.

The Chief Minister described as bright the prospect for World Bank participation in a couple of major agricultural and fisheries project. These included completion of the Rs 37-crore Vizhinjam fishing harbour and silent valley and Kallada irrigation schemes.

Mr Antony also hinted at the Soviet Union showing keen interest in helping the industrial development of Kerala in certain areas within the larger framework of economic co-operation between the two countries. Certain proposals had been discussed during his talks with Soviet embassy officials which were only exploratory in nature.

Answering questions on organisational problems of the Congress, Mr Antony said there were no differences or disputes that could be resolved through mutual talks. There was no proposal of any of the central Congress leaders visiting the State in the immediate future, he said.

Oil self-sufficiency 'a far cry'

Delhi Patriot 13 Sept 77 PF

MADRAS, Sept 12 (Samschar).

UNION MINISTER for Petroleum and Chemicals, H N Bahuguna has said that despite its best efforts and increased production the country cannot achieve self-sufficiency in oil in view of the ever-increasing demand.

While the developing nations were the hardest hit by the steep hike in oil prices, the oil reserves in the country could not be replenished. He, therefore, wanted the tapping of alternative sources of energy and avoidance of wastage in the use of oil.

Charcoal could be an important alternative source of energy and the Government had plans for an intensive programme of tree-planting to achieve this end, Mr Bahuguna said while speaking at the seventh anniversary of the Madras Refineries Employees' Union here yesterday.

COLLABORATION

Talking to newsmen at Raj Bhavan, Mr Bahuguna said that the Government would welcome foreign collaboration in the field of offshore and onshore oil exploration in new and unidentified areas, provided it was

consistent with national interest.

He, however, ruled out any foreign participation in the on-going schemes.

The Union Minister said there were several areas still remaining to be explored for oil like the Gulf, the west coast Rutch through the Gulf of Mannar along the Sanderbans and the delta of Cauvery, Godavari Krishna and other rivers in east coast.

The Union Minister said the Bombay High would be able to yield about 10 million tonnes of crude by 1980-81. The present anticipated output was about 2.5 million tonnes.

The Minister claimed that no Government had done better than the Janata Party Government within a short period of five months.

Mr Bahuguna was referring to the reported accusation of Mrs Gandhi that the Janata Party Government had not done anything since it had come to power at the centre.

He said that the first and foremost thing the new Government had done was to remove fear.

The dark nights the dark forces and the days of midnight knock had been forgotten now. The whole world now knows that there is no "percentage" to deal with

the present Government in India", he said.

Mr Bahuguna told newsmen in Tirupati on Saturday that the Government would soon take up exploration of offshore oil in South India in a big way.

He said the off-shore drilling at Narmapur in Andhra Pradesh would be inaugurated shortly.

He said he was happy over the performance of Bharat Heavy Electricals, Hyderabad, for supply of rigs for offshore drilling operations.

The Delhi Patriot (Delhi)
13 September 1977

Delhi Patriot 13 Sept 77

CSIR TECHNOLOGIES IGNORED P 8

SEVERAL technologies developed at the Council of Scientific and Industrial Research (CSIR) were rejected by the so-called user Ministries in favour of imported technologies, it was revealed at the conference of CSIR Directors, who met here recently to discuss the Government move to transfer some CSIR laboratories to the Ministries, reports Samachar.

The CSIR Directors belonging to biology, engineering, and fibre groups cited many such cases of unused technologies to counter the argument that the user Ministry will make better use of CSIR technologies, if the laboratories were transferred to the Ministries.

For instance, the pesticide "Endosulphan" developed at the National Chemical Laboratory was offered to the Ministry of Industry in 1974 but the Ministry of Chemicals was not inclined to use it, it is said.

The "Swaraj" tractor developed by a CSIR institution in 1973 was offered to the Ministry of Industries but was rejected. Instead, the Ministry allowed Hindustan Machine Tools to have foreign collaboration with the Czechoslovakian firm "Zeotur Tractor".

The CSIR Mining Institute in Dhanbad developed "hydraulic props" used to provide roof support in mines to prevent collapse. This technology was not used by the Ministry of Mining, which went in for collaboration with a West German firm.

MULTI-NATIONAL CALLED

Another indigenous technology for making "vinyl acetate monomer", a raw material in chemical industry, was offered to the Ministry of Petroleum in 1976. But the Ministry went in for a technology provided by a multinational firm, according to the

CSIR Directors.

They said the Ministry of Industry in 1974 rejected the CSIR technology for making batteries and instead extended collaboration with a foreign firm.

Another CSIR technology for making carbon-less paper was offered to the Ministry of Industry in 1976, but the Ministry gave permission for import of this technology from abroad.

Other CSIR technologies rejected by user Ministries in favour of import were stated to include vitamin B-6 manufacture and concrete sleepers for the railways.

The sleepers, satisfying all the specifications, were made by CSIR four years ago, but were made in collaboration with a West German firm.

MAINLY FOR WOMEN

Where a woman's place is still in the home

by Sumantra Banerjee

NEW DELHI
IMMEDIATELY after he became Prime Minister last March, Morarji Desai made a "faux pas" by saying that women are more tyrannical than men when in power. This provoked an angry demonstration of women social workers in front of his house the next day.

Possibly to make amends, and to show that a male Prime Minister is more concerned than his female predecessor about the social progress of Indian women, Desai has now reconstituted the National Committee on Women — a body that had remained defunct during Mrs Indira Gandhi's regime. There are also reports about the setting up of statutory autonomous commissions on women both at the central and state levels.

But the Government's sudden interest in developmental programmes for women is far from being a political gimmick to impress Indian feminists. The United Nations' World Plan of Action to raise the status of women during the International Women's Decade from 1975 to 1985 is perhaps nowhere more relevant than in India today.

Constituting a little less than half of India's total population of about 600 million, Indian women face almost all the disadvantages pointed out by the UN, ranging from social discrimination to economic exploitation. As a result, India's demographic trends reveal disturbing trends.

PROPORTION

The proportion of women in the population is declining (from 946 per 1,000 males in 1951 to 941 in 1961, to 930 in 1971).

Life expectancy of women (45.6 years) is lower than men's (47.1 years). Work participation rates also are coming down. The number of women workers which was 40 million in 1951 plummeted to 31 million in 1971 — the year in which the last national census was prepared.

The reasons for these disquieting features are various. The transition from a traditional to a modern economy in India has resulted in uneven rates of change in patterns of economic organisation, particularly in the rural sector. Women who enjoyed the status of high skilled workers only a few years back have degenerated to the insecure existence of unskilled manual labourers.

It has been found that for a majority of working

women the vocations of agricultural labour and mining and quarrying — both exceedingly arduous and exhausting for women — are the only means of livelihood. The indices of female participation in agricultural labour rose from 147.15 in 1961 to 163.87 in 1971.

The declining economic opportunities for women in the rural areas have forced many to migrate in recent years to the cities. Adult women are becoming an increasing proportion of India's urban population.

While in northern Indian cities there are proportionally fewer women, in southern India sex ratios are more even in cities of all sizes. There is naturally a rush for jobs among these migrant women,

female workers per 100 male workers in the age group 15 to 39 was only 16.70 in 1961 and fell further to 11.44 in 1971. The number in the age group 40 to 59 during the same period also fell from 17.84 to 10.98. There are possibly two reasons for the sharp decline. One, higher mortality among females, and two, processes of child bearing and child rearing which progressively remove women from work in these sectors. But as a result, valuable womanpower in the stage of acquiring skills is prematurely lost to the nation.

The problem of unemployment in the Indian cities and the prevailing social values conspire to keep women out of employment. There is a cultural resistance to the changing role of Indian women. A woman's role is restricted to domestic activities.

In these circumstances when there is competition with men for too small a number of jobs, women find it difficult to hold their own against men. Among the employers also there is an apathy and neglect to invest in training and attention to build up technical skill among women workers. This explains the extraordinary paucity of women in service trainees in any industrial sector in India.

But observers of urban demographic changes envisage growing pressure for jobs from urban women in India in the coming years. The pressures of inflation and taxation are already inducing middle class urban families to encourage more of their womenfolk to work. Reduction in maternal and infant mortality and in the family size if brought about by the Government's family planning is likely to increase the number of years when a woman is available on the labour market rather than engaged in child bearing.

It is because of this future prospect that the Government is now drawing up a plan for increasing opportunities for women's economic participation, as well as improvement in their health. The experts on the newly reorganised National Committee on Women will have to specify

sectors of employment suitable for women and identify those which inflict great harm on their physical health and wellbeing. There is a growing feeling that the employment of women in arduous jobs is responsible for the differentially higher mortality of females in India.

There is also a debate among the experts as to whether it would be more conducive to allow girls under 14 to go to schools rather than to work for the promotion of a small family norm. It is argued that employment at an early age may encourage in them a sense of independence and a desire to go back to work even after marriage which would be favourable to the development of a small family norm.

On the other hand, some people point out that the balance of advantage will possibly lie in ensuring school education for girls

at this age rather than permit them to work. Education will give them more of the necessary status and authority after marriage than a state of illiteracy to insist on going to work. It will also give them the means to acquire more skill and therefore higher wages.

The question of education therefore naturally assumes importance in the plan of action for raising the status of Indian women. Of the total count of 264 million females in India in 1971, 214 million were found to be rural. The rate of literacy among the 50 million urban families was 42 per cent while that among the 214 million rural families was only 12 per cent.

Areas of low rural female literacy constitute large and solid contiguous blocks of territory which are not sufficiently linked up by the communication system. These are also areas which are plagued with difficulties of importing school teachers, health workers and similar personnel.

The National Committee on Women will therefore have to fix priorities and draw up a time-bound programme to improve the situation. Special attention is being given to low-income working women in tribal and backward areas and urban slums; migrant women; destitute women; divorced and separated women; widows; exploited women and unmarried mothers; handicapped women; and women in conflict with law.

FIGURES

But figures reveal that the hiring of women in urban industries is very shortlived. The number of



Women at work in an anti-biotics plant in Rishikesh. But few Indian women get the opportunity to do challenging work.

'The problem of unemployment in the Indian cities and the prevailing social values conspire to keep women out of employment.'

List of Publications Received
During RAT Mission to India

28 August - 13 September 1977

A. UNEP

1. WMO Publication No. 463: Weather and Water. Geneva, 1977
2. Brochure "Crocodile Rehabilitation in Uttar Pradesh" issued by the Chief, Wildlife Warden, U.P. Lucknow. 1976
3. Report 1976-1977, Ministry of Industry, Government of India, New Delhi

B. DST

1. Energy. Second India Studies by Kirit Parikh
McMillan Co. of India. 1976
2. Water. Second India Studies. By H.C. Chaturvedi.
McMillan Co. of India. 1976
3. Country Report for Habitat 76 (UN Conference on Human Settlements)
4. Country Report for the UN Conference on Desertification 1977
5. UNCOD: Case Study on Desertification. Jami Development Block.
A Conf. 74/11
6. Present Status of Science and Technology in India. CSIR Report.
1976
7. Workshop on Vehicular Air Pollution Control
8. You and Your Environment. WED Information Brochure
9. WED Sample Poster: Better Living Needs a Clean Environment
10. Draft Status Report on Utilizations and Recycling of Waste
(Research, Development and Extension Requirements) - National
Committee on Science and Technology, August 1975)
11. Status of Environmental Legislation in India. Mimeo Pamphlet
by S. Venkatesh

C. WHO/SEARO

1. Selected Methods of Measuring Air Pollutants, UNEP/WHO.
WHO offset Publication No. 24. Geneva, 1976
2. Air Quality in Selected Urban Area 1973-74 UNEP/WHO.
WHO offset Publication No. 30. Geneva, 1976
3. A Monitoring Programme Design for Urban and Industrial Areas
UNEP/WHO/WMO. WHO offset Publication No. 33. Geneva, 1977

4. Legislation on Management and Control of Air Pollution in India. WHO Assignment Report SEA/EH/174
5. Water Pollution Control in India. WHO Assignment Report SEA/Env San/148, and 169
6. Prevention and Control of Waste Pollution in India. WHO Assignment Report SEA/EH/196
7. Prevention and Control of Water Pollution. Report on Seminar on the India Water Act of 1974, Bombay. SEA/EH/182
8. Solid Wastes Management in India. Report on Workshop Ahmedabad. SEA/Env San/167
9. Management of Solid Wastes in Developing Countries by F. Flintoff. WHO Reg. Pub. SEA Series No. 1

D. NBO

1. About NBO 1954-1974. Pamphlet
2. Towards a Human Settlement Policy in India 2001, September 1975, Town and Country Planning Organization. Pamphlet
3. Habitat India. Ministry of Works and Housing Newsletter Vol. 1 No. 1 (Dec. 1976), No. 3 (June 1977)
4. Prominent Facts on Housing in India, Leaflet
5. House for the Poor. NBO leaflet 1977
6. Catalogue of Building Research in India. Vol. VI, 1975. Pamphlet
7. NBO Display Centre. Brochure
8. NBO Scheme for cluster of demonstration Rural Houses along with Environmental Improvements in selected villages. Mimeo pamphlet
9. NBO Notes on Housing. Mimeo pamphlet
10. House for rural landless. NBO. 1976. Pamphlet
11. Director of Research and Development Organizations in Building and Housing in India; National Building Organization and UN Regional Housing Centre ESCAP, March 1977
12. A Note on "Appropriate Technology for Housing and Building Construction in Developing Countries" by Shri G.C. Mathur, Director, National Building Organization, New Delhi

E. IARI (SSA Division)

1. Install a Cow Dung Gas Plant. Information Booklet. Directorate of Extension, Ministry of Agriculture and Irrigation
2. Cow Dung Gas Plant for Energy and Manure by T.D. Biswas, "Fertilizer News" Vol. 19 No. 9. September 1974

F. CBPCWF

1. Annual Report 1976-1977
2. The Water (Prevention and Control of Pollution) Act 1974
3. Water Highlights. A leaflet
4. Water Pollution Prevention and Control Programme in India. Mimeo leaflet

G. NEERI (Nagpur)

1. Annual Report 1975
2. Rural Latrines, (Brochure)
3. Chloroscope, An Ideal Unit for Residual Chlorine Estimation (leaflet)
4. Defluoridation of Water by Nalgonda (leaflet)
5. Technical Paper: Economic Returns of Utilization of Domestic Waste Waters in Rural and Urban Area Fish Culture (From International Conference on Rural Development Technology: An Integrated approach. AIT Bangkok, June 1977)
6. Technical Paper: Economics of Wastewater Treatment in Small Paper Mills by P.V.R. Subrahmanyam and V. Hanumanulu, IPPTA Vol. XIV, No. 2, April - June 1976.
7. Technical Paper: Planning of Water Pollution Control Measures for an Integrated Kraft Paper and Paper Mill by V. Hanumanulu and P.V.R. Subrahmanyam, IPPTA Souvenir 1975.

H. CWPRS

1. CWPRS. An information brochure
2. Mimeographed catalogue of different types of equipment manufactured at CWPRS

I. NIO

1. NIO, CSIR. Information leaflet. 1976
2. NIO, Information Pamphlet
3. NIO Annual Report 1975
4. Sponsored Projects undertaken by NIO
5. Mahasagar. Bulletin of NIO Vol. 6 No. 2, June 1973
6. Mahasagar. Bulletin of NIO Vol. 9 Nos. 1 and 2. 1976
7. One Reprint from "J. Bombay Natural History Society" (Vol. 72, pp 580 - 584)
8. One Reprint from "Current Science" Vol. 41 No. 21, pp 766-767

9. Seven Reprints from "Indian Journal of Marine Sciences" (Vol. 2, pp 113-115; Vol. 3, pp 41-45; Vol. 2, pp 47-53; Vol. 2, pp 122-126; Vol. 5, pp 239-241; Vol. 4, pp 174-176; Vol. 4, pp 202-205; Vol. 4, pp 208-210)
10. Five Reprints from "Mahasagar" (Vol. 9, pp 51-56; Vol. 9, pp 67-69; Vol. 9, pp 57-62; Vol. 7, pp 91-94; Vol. 7, pp 41-51)
11. NIO Technical Report No. 1/77, August 1977
12. Indian National Report under IGOS 1975 and 1976
13. NIO Bibliography on Indian Mangroves
14. Reprint from NBS special publication 409 issued December 1974 on oil pollution along Indian coastline
15. Oil Pollution of Goa Beaches, India. Mimeo pamphlet
16. Reprint from "Journal of the University of Bombay" Vol. 38, pp 88-92
17. R.V. Garehani. Information booklet
18. Report on Flora, Fauna and Natural History of Pirotan Island in the Gulf of Kutch. Prepared for the WWF Indian National Appeal, July 1976
19. NIO Report on the "Marine Environmental Monitoring and Marine Living Resources Assessment" prepared for the Indian Ocean Region. Phase I: Survey of Institutional Capabilities. October 1976

J. ZAC

1. Zuari Information Booklet
2. Notes on Pollution Control Measures taken by Zuari Agro-Chemicals Ltd. Report submitted to DST

K. NEERI ZLC

1. Baseline Water Quality Studies of the Hooghly estuary. NEERI/CMDA 1976
2. Calcutta slums - The Problem and the Effort, CMDA 1975. Leaflet
3. Our Primate City, Challenges and Responses in the Calcutta Metropolis. CMDA. Leaflet
4. Water Supply During Emergencies by S.R. Kshirsagar. NEERI Bombay Zonal Laboratory. Reprint from Journal of the Indian Water Works Association, Vol. 9, pp 237 - 244

L. FORD FOUNDATION

1. Second India Studies, Economy by F.A. Mehta, the Ford Foundation, New Delhi, 1976
2. Second India Studies, Services by Harman Ezekiel and Madhoo Pavaskar, the Ford Foundation, New Delhi, 1976