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REPORT ON THE SEMINAR ON SANITATION PROBLEMS

OF RAPID URBANIZATION

LAHORE, 7-14 OCTOBER 1971

EMRO/72/688

The views expressed in this Report do not necessarily reflect the official policy of the World Health Organization.

This document has been prepared by the WHO Regional Office for the Eastern Mediterranean for Governments of Member States in the Region and for those who participated in the Seminar. A limited number of copies is available on request for persons officially or professionally concerned with the field of air pollution.

TABLE OF CONTENTS

	<u>Page</u>
PART I GENERAL	
A INTRODUCTION	1
B PURPOSE OF THE SEMINAR	4
C ORGANIZATION	5
D METHODS OF THE SEMINAR	7
E CONCLUSIONS AND RECOMMENDATIONS	7
PART II SUMMARY OF PRESENTATIONS	
A SUMMARY OF FIRST DAY PROCEEDINGS, THURSDAY 7 OCTOBER 1971	11
1. Urbanization and Related Health Problems	11
(a) Summary	11
(b) Discussion	12
B SUMMARY OF SECOND DAY PROCEEDINGS, FRIDAY 8 OCTOBER 1971	13
1. Environmental Health Programme of WHO as Related to Urban Development	13
C SUMMARY OF THIRD DAY PROCEEDINGS, SATURDAY 9 OCTOBER 1971	16
1. Planning of Metropolitan Areas and New Towns	16
(a) Summary	16
(b) Discussion	18
2. Planning and Design of Urban Water Supplies	19
(a) Summary	19
(b) Discussion	22

	<u>Page</u>
D SUMMARY OF FOURTH DAY PROCEEDINGS, MONDAY 11 OCTOBER 1971	23
1. Planning for Operation and Main- tenance of Community Water Supplies	23
(a) Summary	23
(b) Discussion	24
2. Solid Waste Collection and Disposal	25
(a) Summary	25
(b) Discussion	26
E SUMMARY OF FIFTH DAY PROCEEDINGS, TUESDAY 12 OCTOBER 1971	27
1. Design of Sanitary Sewers, Storm Sewers, Sewage Final Disposal	27
(a) Summary	27
(b) Discussion	29
2. Oxidation Ponds	30
(a) Summary	30
(b) Discussion	33
3. Organization and Administration of Environmental Health Department	34
(a) Summary	34
(b) Discussion	35
F SUMMARY OF SIXTH DAY PROCEEDINGS, WEDNESDAY 13 OCTOBER 1971	35
1. Legislation	35
(a) Summary	35
(b) Discussion	37
2. Financing Water and Sewerage Schemes	38
(a) Summary	38
(b) Discussion	40

	<u>Page</u>
3. Education, Training and Employment of Sanitary Engineers, Sanitarians and Other Auxiliary Staff	41
(a) Summary	41
(b) Discussion	42
G SEVENTH DAY PROCEEDINGS, THURSDAY 14 OCTOBER 1971	43
(a) Closing Session	43
PART III STATEMENTS BY PARTICIPANTS	
AFGHANISTAN	44
CYPRUS	45
EGYPT	47
ETHIOPIA	49
IRAN	52
IRAQ	55
JORDAN	59
LIBYA	60
PAKISTAN	63
QATAR	65
SUDAN	66
SYRIA	70
TUNISIA	72
YEMEN	75

ANNEX I	ENVIRONMENTAL HEALTH CRITERIA FOR URBAN PLANNING
ANNEX II	LIST OF PARTICIPANTS
ANNEX III	PROGRAMME
ANNEX IV	LIST OF BASIC DOCUMENTS
ANNEX V	LIST OF BACKGROUND MATERIAL

PART I

GENERAL

A INTRODUCTION

With few exceptions, the phenomenon of rapid urbanization is to be found in all nations the world over. Some of the characteristics of population migration from rural to urban areas and of population growth may vary from nation to nation and within a nation, but the fact remains that everywhere an ever-increasing portion of an increasing human population is becoming urbanized. While the world population is rising at a rapid rate, the urban population is growing at an alarming rate. (See chart No.1)

The process of urbanization is less than 100 years old. While some large cities were in existence by the mid-nineteenth century, no society could be described as predominantly urbanized before 1850. By 1900 only England could be regarded as an urbanized nation. Today, all industrial nations are urbanized to a high degree and the process of urbanization is proceeding quickly in the heretofore undeveloped nations.

Cities have existed for more than 5 500 years. History indicates that the world's first cities sprang up in Mesopotamia (now Iraq) in the valleys of the Tigris and Euphrates Rivers around 3 500 B.C. A few hundred years later, cities were built in the valley of the Nile River and around 2 500 B.C. the cities of Mohenjo - Daro and Harrappa, located on the banks of the Indus River, came into existence and flourished. The sites of these latter cities are located in West Pakistan - Harappa being located only a few hundred miles from Lahore. These early cities, and those that followed, were small and were surrounded by an overwhelming majority of rural residents. Moreover, they reverted easily to village or small-town status and, in some cases, disappeared from existence.

The industrial revolution of the latter half of the nineteenth century was a vital force in creating cities. The rapid development of industry and commerce brought about drastic fundamental changes in the social geography and organization of cities, created greater fluidity in class systems and led to the appearance of mass education and mass communications. These changes, coupled with an increasing agricultural productivity by a decreasing number of agricultural workers, stimulated movement of large numbers of persons from rural to urban areas and, in a few cases, permitted the more affluent to move to the less congested urban fringes and the suburbs.

Urban populations have been affected also by growing birth rates and by improved health care which is extending the average life expectancy. In many countries, particularly the developing countries, public health programmes have reduced markedly infant mortality rates and death rates due to infectious diseases. Urban population growth caused by these factors is significant in itself.

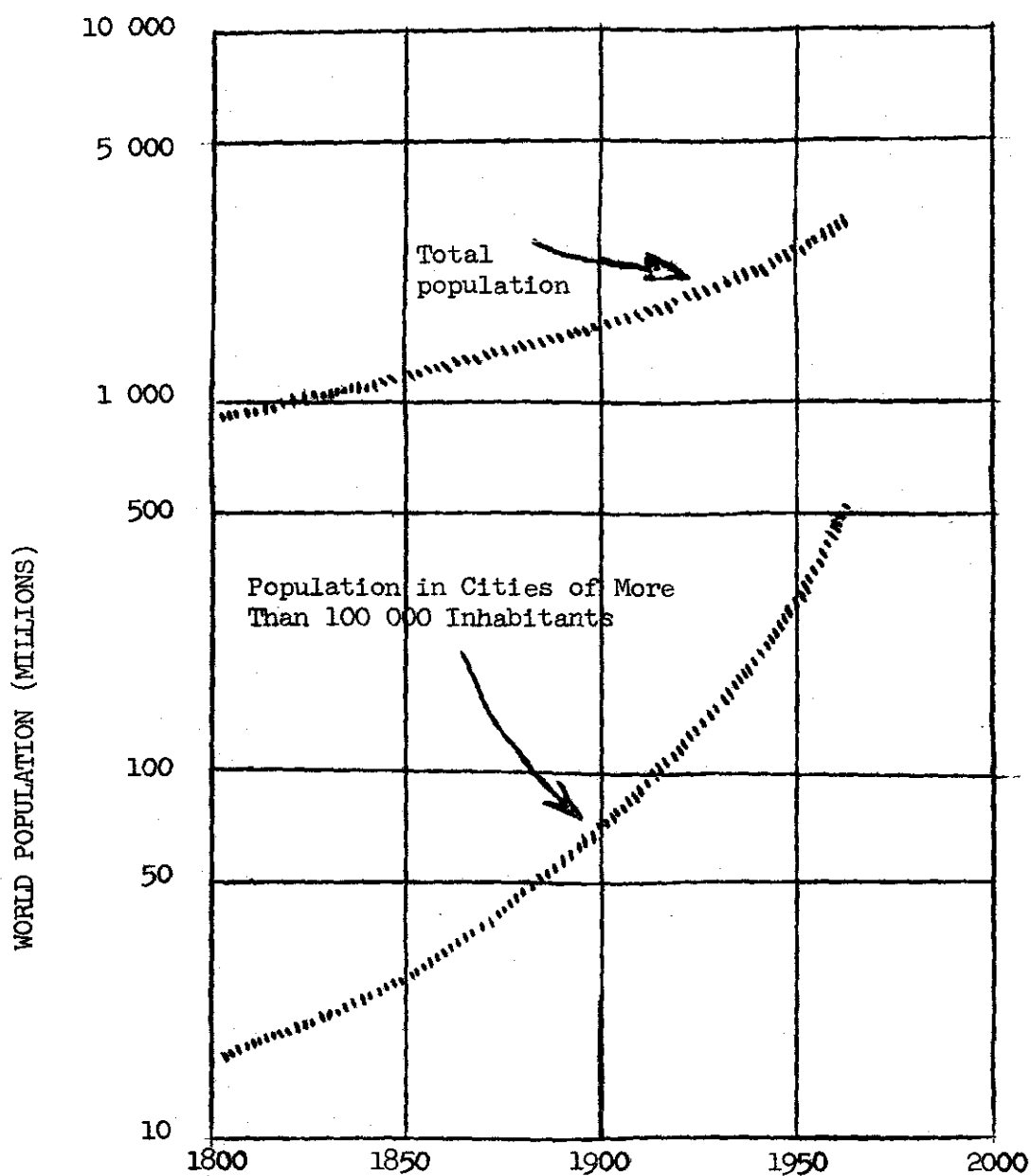


Chart No.1

The trends of the growth of the world population and of the population in cities with more than 100 000 inhabitants from 1800 to 1960.

(From Davis, K. - The urbanization of the human population.
Scientific American, 213:40-53, (Sept.) 1965)

There are other social, economic, political and culture forces that stimulate people to move from rural areas to the cities. Some people leave sparsely settled areas to seek a higher quality life. They seek more stable and dependable employment and more remunerative working conditions. Some are attracted by the higher standards of living and the amenities offered by an urbanized society. Others seek better housing, and improved educational opportunities; while still others are lured by the excitement generated by urban living conditions. However, often the sought-for goals are not achieved. In some countries, thousands of persons each year leave the rural areas seeking a better life in the cities, only to find themselves among social, economic and environmental conditions more detrimental to good physical and mental health and social well-being than those they previously endured.

Rapid urbanization largely takes place in two forms. In one situation, migrants from rural areas crowd into sub-standard housing facilities in the inner or older areas of cities. In the other, they move into shanties and make-shift dwellings in the fringe areas around urban centres, usually where local government controls are inadequate or lacking. Regardless of the form, the effect upon the recent migrant from the rural areas is the same. Often, he is forced to live at a mere subsistence level under almost intolerable environmental and social conditions.

The sanitation problems that arise from uncontrolled migration of rural residents into urban areas are numerous and complex. Frequently, a safe water supply is unavailable to the migrants living in the older areas of a city or in the urban-fringe. Means for the sanitary disposal of liquid and solid wastes may be lacking and the area may be infested with disease-carrying insects and rodents. Often, the air is fouled with pollutants from industry and transport and noise is deafening. Concomitant with these sanitation problems are other health problems such as malnutrition and mental disease.

Public health problems may be created or intensified by poverty, unemployment and a break-down in the social structure of the area leading to delinquency, crime, sociopathic behaviour, alcoholism, drug addiction, prostitution and venereal diseases. These conditions may interact one with the other. Hence, the solution to these problems of rapid urbanization is not simple.

It is difficult to delineate all of the environmental health problems that are involved in this trend toward rapid urbanization. Many urban areas do not have an adequate supply of potable and palatable water to meet present needs much less to provide for an expanding population and increasing industrialization. Water is needed not only for domestic purposes but it is needed in the manufacture of goods and for irrigation. Special note should be made that at present only 25 per cent of the population of the world residing in urban areas are provided with piped water under pressure into their homes. This is a serious situation which has

been recognized by the World Health Assembly which was convened in Geneva, Switzerland, in May 1971. The Assembly at this time has endorsed the programme for the seventies of the United Nations in which the targets are as follows:

Present Position: 25 per cent of urban dwellers supplied in house or courtyard; 26 per cent supplied from public standpipes.

Decade target : 40 per cent to be supplied in house or courtyard; 60 per cent to be supplied from public standpipes.

Another important sanitation problem of urbanization pertains to disposal of liquid wastes. Since many cities and towns have inadequate or non-existent wastewater collection and treatment facilities, serious problems of water pollution have resulted. The receiving waters into which these liquid wastes are discharged have often become so polluted that they can no longer sustain aquatic life. These discharges by man upset an ecological balance of nature. The present problems of liquid waste disposal is made more acute by rapid urbanization.

Improper disposal of solid wastes is another urban problem in most of the nations of the world. Many cities lack the facilities to collect, process and dispose of the used goods of urban life. Some of the commonly used methods of solid waste disposal result in water pollution, ground pollution or air pollution or a combination thereof.

In almost every country of the world there is an immediate need for the formulation and implementation of comprehensive programmes for the control and management of the environment. These programmes need to be formulated within the scope of national economic development plans and in accordance with local and national resources, customs and tradition. In developing these comprehensive programmes, it is necessary that consideration be given to the provision of adequate protection to the health of the urban residents. Without this protection, future generations appear to be doomed.

B PURPOSE OF THE SEMINAR

There were many purposes for convening this Seminar. Some of the more important being:

1. To analyze the problems of rapid urbanization that have or may have a direct effect on the health and well-being of urban residents, particularly in the nations of the Eastern Mediterranean Region of the World Health Organization;

2. to exchange information between the member countries of the WHO Eastern Mediterranean Region on specific problems of environmental sanitation related to the trend of rapid urbanization in this sector of the world;
3. to analyze proposed or in use solutions to some of these problems and to direct attention to the increasing need for preventive action;
4. to provide guidance for countries who need assistance in developing plans to cope with the sanitation problems of rapid urbanization;
5. to define the role of colleges, universities and other institutions of higher learning in developing the necessary manpower needed to cope with these problems; and
6. to encourage research institutions to study sanitation problems of rapid urbanization and to develop proposed solutions to these problems.

The Seminar was designed also to provide an opportunity for the participants to exchange, through dialogue, accounts of their experience in developing solutions to these problems and to propose constructive recommendations to national governments and WHO of suggested courses of action which may alleviate the health stress of rapid urbanization.

C ORGANIZATION

In 1969, the WHO Regional Committee proposed that a Seminar on Sanitation Problems of Rapid Urbanization be convened. An invitation from the Government of Pakistan was submitted to the Regional Office of the Eastern Mediterranean of WHO to hold the Seminar in Lahore. The planning and organization of the Seminar was conducted with the assistance of the Government of Pakistan and particularly of the West Pakistan University of Engineering and Technology. Many members of the Faculty of the University played important roles in planning, organizing and implementing the programme of activities.

The Seminar was held in Lahore, West Pakistan, from 7 to 14 October 1971. Participants came from Afghanistan, Cyprus, Egypt, Ethiopia, Iran, Iraq, Jordan, Libya, Pakistan, Qatar, Sudan, Syria, Tunisia and Yemen. In addition, there were observers from some of other UN Specialized Agencies. A list of participants, observers, consultants and staff is presented as Annex II.

The Seminar was opened by Rear Admiral A.N. Ansari, Director-General of Health of Pakistan, who welcomed the participants of the Seminar and called for leadership in the development of plans to cope with the problems of rapid urbanization and industrialization. He expressed hope that the developing nations would not repeat the errors of the more developed countries. Admiral Ansari asked that the necessary resources and technical knowledge be mobilized to assist the developing countries in formulating plans of action which would preserve and protect the environment and at the same time avail people of the benefits of industrialization and urban life.

An introductory speech was given by Mr Ahmad Hasan, the Vice-Chancellor of the West Pakistan University of Engineering and Technology in Lahore. He noted that it was the hope and conviction of all good men that the environment could be controlled adequately through proper sanitation so as to make urbanized areas a proper place in which to live. Mr Hasan acknowledged the health problems caused by ecological imbalances that have been created in the more developed countries of the world through urbanization and industrialization.

Dr A.H. Taba, WHO Director, EMR, gave a brief address in which he stressed the needs for the candour by the participants of such a Seminar in dealing with problems within the Eastern Mediterranean Region and in seeking possible solutions. He noted also that a number of member countries were proceeding to take steps for a thorough study of the major problems of sanitation in some of the rapidly urbanizing areas. Dr Taba called for the formulation of comprehensive programmes within each national development plan which would utilize all available resources effectively and efficiently.

The Seminar was opened officially by Lt. General M. Attiqur Rahman, Governor of the Punjab, West Pakistan, who made the inaugural address. He noted that one of the major problems facing the world in which we live is uncontrolled urbanization. Lt. General Attiqur Rahman acknowledged that the survival of mankind depends in part upon the recognition of the basic issues of environmental health and the development and implementation of programmes to reduce the potential hazards from environmental pollutants. He felt that future action would necessitate the co-ordination of all public policies relating to industrialization, agriculture, power, energy and development of transport and the use of natural resources.

After the opening ceremony, the following officers were elected:

Dr M. Islam Sheikh
Professor, Public Health Engineering
West Pakistan University of Engineering
and Technology, Lahore, Pakistan

Chairman

Dr R.A.A. Gomaa
Secretary General, Health Services
Supreme Council, Ministry of Public
Health, Cairo, Egypt

Vice-Chairman

Mr V. Babazade Khamnei
Deputy Director, General Environmental
Health Department, and Director,
Air Pollution Control and Occupational
Health Department
Ministry of Health
Teheran, Iran

Rapporteur

The Provisional Agenda was adopted by the participants and the Programme of Work was outlined by Mr L.J. Lovelace, WHO Regional Adviser on Environmental Health, who then introduced the WHO Consultant, Mr F.A. Jacocks, and WHO Temporary Advisers, Professor E.W. Mood and Mr R. Casanueva.

D METHODS OF THE SEMINAR

The methods of this Seminar involved the preparation and presentation of twelve papers on the scientific technological and administrative aspects of sanitation problems of rapid urbanization. The presentation of each paper was followed by comments from the participants. Some of the basic documents were sent to each participant in advance of the meeting in order to afford them an opportunity to read and study these papers prior to the convening of the Seminar. Outlines of other papers were also provided to the participants in advance of the sessions. A list of the documents which were made available to all participants prior to the meeting is found in Annex IV. A summary of each paper and of the discussions that followed constitute Part II of this report.

To supplement the material contained in the prepared papers and outlines, many additional publications were made available to the participants. A list of these documents appears as Annex V. A working library of other pertinent material was also available. To supplement the discussions several films dealing with subjects discussed were shown.

E CONCLUSIONS AND RECOMMENDATIONS

The main points that emerged from the papers presented and the ensuing discussions on the many technical and administrative aspects of the sanitation problems of rapid urbanization and industrialization, are embodied in the following recommendations which were agreed upon unanimously, as reported under Part II, at the closing session of the Seminar:

1. Due to the severity of sanitation problems created by rapid urbanization, Member Countries are urged to place the highest priority on programmes aimed at studying these problems and developing technical and economical solutions.
2. Member nations are urged to mobilize all available resources and to immediately undertake comprehensive programmes aimed at alleviating those conditions that pose a threat to man's health or survival.
3. Environmental health be given greater consideration in national development plans - which should be inclusive of all towns and cities with a view to solving the problems raised by rapid urbanization - and all agencies and ministries concerned with environmental health activities take an active part in the formulation of such environmental health programmes at the highest planning level.
4. Comprehensive studies by appropriate agencies in each member nation be made of the environmental pollution of air, water, land and soil in order to more succinctly identify the causes of pollution and to develop appropriate measures for environmental control.
5. Member Countries be encouraged to establish effective collaboration between non-official organizations in the Region devoted for development of environmental health.
6. Where appropriate, the establishment of Environmental Health Boards with representation from all agencies concerned with environmental health issues for the establishment of comprehensive environmental quality criteria, guidelines for preventive measures and methods of determining priorities and allocating resources based on national health needs.
7. Member nations give high priority to the development of community water supply systems particularly for urbanizing areas and that the quality of drinking water in such systems should at least conform to the minimum requirements, as found in the current edition of "International Standards for Drinking Water", published by WHO.
8. When planning for all environmental health and especially for community water supply and wastewater systems, special recognition be given to all relevant socio-economic factors.
9. The development by Member Countries codes of good practice which would be applicable to developing countries and would pertain to the operation and maintenance of public water supply systems, wastewater and solid waste collection and disposal systems.

10. As a means to reduce the initial cost and cost of operation an attempt should be made to standardize equipment in community water supply and wastewater systems.
11. In the planning of community water supplies, consideration be given also to the disposal of wastewater to avoid the creation of new or the intensification of the existing problems of sanitation.
12. Member nations should establish the necessary legislative controls prohibiting the discharge of wastewater into streams, water courses, and receiving bodies of water without treatment sufficient to maintain the quality of the streams and the receiving bodies of water at designated levels; and that such legislation be equitably enforced.
13. Consideration be given by WHO for the development of appropriate guidelines for the treatment of liquid wastes by industries before discharge into community sewers in order that the industrial wastes will not affect adversely the sewerage system or the sewage treatment process.
14. Housing and town planning should be acknowledged as an integral part of environmental health, and that Member States should enact minimum health standards of housing accommodation and formulate a national programme for housing improvement. These standards should be equitably enforced.
15. New research institutes of environmental health sciences and engineering be established in those Member Countries who have need of such research facilities, and that such facilities be staffed, equipped, and supported with adequate financing in order that studies of air, land, and water pollution may be conducted effectively and efficiently. WHO should have access to these projects and be able to distribute findings to Member States.
16. All appropriate research institutes be encouraged to study newer methods of design, construction and operation of community water supply and wastewater collection systems in an attempt to obtain greater economy of time and financial resources.
17. Member Countries continue and accelerate their efforts in training environmental health personnel at all levels taking full advantage of all available training facilities.
18. Training facilities be developed, staff and training programmes implemented for water supply and wastewater treatment plant operators.

19. Each Member Country, according to its needs, should be encouraged to establish laboratories and monitoring systems for the measurement of the quality of air and water. If funds are not available, assistance could be sought from international agencies.

20. WHO and other appropriate organizations should continue their endeavours to achieve uniformity in measurements and in collecting and reporting of data, especially on environmental pollution.

21. EMRO be encouraged to extend their existing programmes in the field of water pollution control to all countries of this Region, especially in the fields of planning and organization.

PART II

SUMMARY OF PRESENTATIONS

A SUMMARY OF FIRST DAY PROCEEDINGS, THURSDAY 7 OCTOBER 1971

1. Urbanization and Related Health Problems

by Mr F.A. Jacocks, WHO Consultant

(a) Summary

Man has made ill use of the earth. Exploding populations together with urban crowding, industrial expansion and uncontrolled use of technologic developments have threatened man's future existence on earth. Man is responsible chiefly for creating these problems and it is his duty to take such actions as will at least maintain the environment in its present condition. Even this, due to the anticipated population growth over the next twenty-five years, will produce conditions considerably worse than they are today.

Human life has been affected by the stress of urbanized, industrial environment and the methods that man has employed to degrade his environment. Some of present pollutants of the environment could have a marked effect on future generations. From current data, it is clear that environmental degradation is not a localized issue but is indeed world-wide in scope.

Comments also demonstrated that it is highly undesirable to attack these problems on a categorical basis, that is isolation of a problem and independent action of that problem. Most influences or actions affect other actions. The environment, as a whole, consists of interrelated, interacting and interdependent parts. An urban area is really a system of many sub-systems and while each sub-system may be studied independently and changes proposed, it is important to acknowledge the effect of change of a single sub-system upon the total system. Although we are considering here the effects of urbanization as they relate to the creation of sanitation problems, we must not lose sight of the economics, social, cultural and physical characteristics of the target area. We must recognize that there usually will be trade-offs since no urban area is so fortunate financially as to be able to correct all defects simultaneously. A further consideration is that to concentrate on correcting a single defect could possibly accelerate the degradation of the total environment.

It is recommended that consideration be given to the use of mathematical interrelationships in the total environment (social, cultural, economic, physical, as well as man himself). This is a method in determining the best possible environment for the well-being of man.

Concluding remarks indicated that many mistakes have been made in the past. Seminars such as this should serve to eliminating the repeating of these mistakes.

(b) Discussion

The cost of abating pollution in developing countries will be great, however, if action is initiated early the ultimate cost could be substantially less. This will be particularly true in those countries now undergoing rapid urbanization.

A pristine environment and highly industrial and urbanized societies are incompatible. In formulating solutions to specific problems of environmental pollution, consideration must be given to the cost-benefit ratios.

Obtaining sufficient funds to provide all the essential sanitation services for the improvement of the environment within the decaying cores of old cities is financially infeasible. Health education and motivation of the people may be a solution. It is necessary to convince people that pollution of the environment causes many problems some of which affect health detrimentally and are costly to correct, but that sanitation services and facilities are worth the cost.

In the Sudan considerable effort has been expended to improve conditions in rural areas in an endeavour to reduce the migration of people to urban areas. In Pakistan similar efforts have been made through the implementation of a policy of rural development which includes the provision of an adequate and safe supply of drinking water, effective drainage and improved rural health services with some financial assistance from UNICEF. This has partially stemmed the urban migration and some industries have decided to locate in rural areas thereby securing a better economic basis for these areas.

A question was raised as to the feasibility of reducing present pollution by engineering methods. There was a consensus that present degree of pollution can be reduced substantially, but it would not be possible to create a pristine environment. A more healthful environment can be created through the effective application of present technology without excessive costs and inconvenience of the people.

B SUMMARY OF SECOND DAY PROCEEDINGS, FRIDAY 8 OCTOBER 1971

1. Environmental Health Programme of WHO as Related to Urban Development

Presented by Mr L.J. Lovelace, WHO Regional Adviser, EMR

Considerable interest has been and is being displayed by the World Health Organization in promoting and stimulating nation-wide environmental health activities in Member Countries with emphasis on urban areas where sanitation problems tend to be more acute, notably in congested zones owing inter alia to rapid urbanization and industrialization and the consequent increasing flow of people towards cities.

More attention is given accordingly to such areas and efforts are being made to meet environmental health requirements which in this Region, relate mainly to water supplies, liquid and solid wastes disposal, air pollution control and the organization of sanitation services.

Water Supplies

In line with a number of recommendations by various World Health Assemblies, and as part of the UN Second Development Decade Programme, specific targets were set up by this Organization, as follows:

- 40 per cent of all urban populations to be supplied with safe water in house or courtyard (present position 25 per cent).
- The remaining 60 per cent of urban population to have access to safe water from standpipes.
- 20 per cent of rural population to be supplied with "acceptable" water.

In the Eastern Mediterranean Region, the number of persons residing in cities is 45 millions and it is expected that another 45 millions will be added by 1980. The proposed urban water supply programme for the whole world will require about US \$ 7.5 billion for implementation including about US \$ 800 millions for the countries included in the Eastern Mediterranean Region.

WHO is most willing to provide technical assistance in respect of this programme, especially in the formulation of master plans and feasibility studies which may serve as a basis for obtaining loans from lending agencies with a view to execution. These pre-investment studies are usually carried out within the Special Fund component of the UNDP programme. In this Region two important pre-investment projects are presently being implemented under UNDP/SF financing, with

WHO acting as executing agency: a project in Yemen for a water supply for Sana'a and Hodeida; another project in Afghanistan for the supply of water to Kabul. In addition, nation-wide plans are being carried out in Yemen, Pakistan and Ethiopia where a number of water supplies have been designed and constructed. It is also planned that extensive technical assistance will be given shortly to East Pakistan.

Mention should be made that this Organization is very much interested in research with a view to finding solutions to the special problems of developing countries. This relates to reducing costs of construction and operation of waterworks, to improving the efficiency of management and encouraging the provision of better water supplies to serve larger number of people at a price they can afford. To that effect WHO has requested the assistance of four universities in this Region, namely in Iran, Israel, Sudan and Egypt, to act as collaborating institutions to the WHO International Reference Centre for Community Water Supply at The Hague, Netherlands.

Wastes Disposal

The Governments of this Region are now becoming more concerned with the potentially vast array of endemic diseases which may be caused by the inadequate disposal of wastes. In fact, in the countries of this Region, sewage treatment plants are often limited in extent and capacity. Sometimes they are completely lacking, which creates problems of water pollution, and opportunities for the propagation of vectors of diseases. This constitutes an imminent threat to the healthful and economic development of a community.

It is encouraging, however, to note that many Member Countries now have taken steps to study these problems more carefully and are developing plans to solve them. For example, an important UNDP/Special Fund project is being implemented in Iran for sewerage and drainage facilities for Teheran. In Lebanon, a request has been officially submitted by that Government to UNDP for consideration, covering wastewater and solid waste disposal studies for the whole country.

In the field of solid wastes, interest has been displayed by some Governments, in particular Libya and Tunisia, where WHO assistance is being granted. This awareness is, in part, the result of the WHO-sponsored course on the collection and disposal of solid wastes held in 1968 in Damascus, Syria, for engineers from twelve EMR countries.

As regards research, the Public Health Institute of Teheran, Iran, has already been designated as a collaborating institution, along with many others in other regions, to assist the WHO International Reference Centre for Wastes Disposal which was set up in Duebendorf, near Zurich, Switzerland.

Environmental Pollution

The gradual development of the water-borne system for human wastes has at the same time brought about, in this Region, some problems of stream and coastal pollution due to municipal sewage effluents often not treated or subjected only to preliminary treatment. So far, WHO consultants have been provided to seven countries of the Eastern Mediterranean Region. They are rendering assistance in surveying and assessing the situations. Relevant recommendations have been made for stream and receiving water bodies standards. It is intended that these programmes will continue and that a seminar on water pollution control will be convened by EMRO next year to discuss the problems of this Region.

As regards air pollution problems, there are no acute situations in this Region, except perhaps in limited areas or in a few big cities. WHO consultants have been provided to four countries already, i.e., Kuwait, Lebanon, Cyprus and Iran, and assistance is being given to Iraq. An additional consultancy for Iran is being planned.

In 1969, the Regional Office for the Eastern Mediterranean convened in Teheran a Seminar on Air Pollution Control, with participation of representatives of eighteen countries, where some of these questions were discussed.

It is very likely that the interest of Member States in Environmental Pollution will increase as a result of present development trends, especially in metropolitan areas. It is anticipated that the help of the Organization will be sought more often in the coming years.

Sanitation Services

It is satisfying to note that sanitation services are now being given greater consideration, not only in health programmes, but in national development plans as well. Since the implementation of such programmes presupposes the existence of an infrastructure capable of conducting effective planning, it has been found advisable both by Member Countries and this Organization to promote the development and/or strengthening of environmental health services with a view to stimulating environmental health activities.

So far advisory services have been or are being given by WHO in this field to most of the countries of this Region. In addition, WHO has helped in the promotion and development of training courses and the granting of fellowships.

In line with this programme and owing to the need for French-speaking engineers in a number of regions, WHO has assisted the Government of Morocco to establish a Sanitary Engineering Centre in Rabat. One engineer has already completed post-graduate study and two more are now studying sanitary engineering in Morocco using WHO fellowships.

The training of sanitarians continues to be an important element of most field projects of environmental health and basic health services. In this Region, WHO-assisted sanitation courses are being given in ten countries. It is felt that this effort is justified and needs to be expanded.

Conclusion

EMRO has encouraged Member States to give high priority to environmental health programmes, in particular, those concerned with water supply and sanitation services. It is thought that stronger emphasis should now be given to other environmental health activities such as wastewater treatment, solid waste disposal, housing and urban planning.

Increased attention should also be given by health ministries for environmental health activities receiving a higher priority in national planning. Adequate appropriation of funds at national, regional and local levels should be made for basic sanitary engineering works which are critically needed in many places. It should be realized that 'in the long run, health is not as expensive as sickness'.

C. SUMMARY OF THIRD DAY PROCEEDINGS, SATURDAY 9 OCTOBER 1971

1. Planning of Metropolitan Areas and New Towns

by Professor E.W. Mood, WHO Temporary Adviser

(a) Summary

The solution of many sanitation problems of rapid urbanization requires the application of the process of metropolitan planning which should be comprehensive and should take into account the special circumstances, requirements and resources of the metropolitan area.

Planning is a process on an evolutionary continuum that may be defined as a "model of an intended future situation". It consists of a "programme of action" which delineates implementation measures. Comprehensive metropolitan or new town planning usually consists of the three basic elements as follows:

1. Economic Planning, which generally involves the utilization of available economic resources to achieve a desired productivity goal.
 2. Location Planning, which usually consists of the grouping of various land-use activities and of assigning those groups to specific areas or districts.
 3. Physical Planning, which designates the use or uses to which land should be placed. (Metropolitan planning tends to be primarily physical planning.)
- Planning should be conducted at all levels of Government, i.e. national, regional and local levels.

These are three basic phases of planning that should be followed sequentially as follows:

1. Determination of goals and general objectives.
2. Data collection and research.
3. Plan preparation and programming.

Every plan document should fulfill six fundamentals namely:

1. The plan should be comprehensive.
2. The plan should be long-range in character.
3. The plan should be general.
4. The plan should focus on physical development.
5. The plan should relate physical design proposals to community goals and social and economic policies.
6. The plan should be first a policy instrument, and second a technical instrument.

Environmental health planning should include consideration of the attainment of the following objectives:

- Objective 1 - Prevention and control of transmission of infectious agents.
- Objective 2 - Prevention and control of human exposure to chemicals that are or may be hazardous to human health.

- Objective 3 - Prevention and control of human exposure to physical forces and agents that are or may be hazardous to human health.
- Objective 4 - Prevention and control of those biological, chemical or physical conditions, forces and agents that cause or may cause anxiety.
- Objective 5 - Promotion or enhancement of physical well-being.
- Objective 6 - Promotion or enhancement of social well-being.

Environmental health issues that should be considered in metropolitan planning are as follows:

- (i) Water supply
- (ii) Sanitary waste disposal (wastewater and human excreta)
- (iii) Drainage of storm water
- (iv) Solid wastes and land pollution
- (v) Air pollution
- (vi) Ionizing radiation
- (vii) Housing and open spaces
- (viii) Public health establishments (hospitals, clinics, etc.)
- (ix) Vector control
- (x) Noise and vibration.

Environmental health criteria as defined by various WHO expert committees, scientific groups, seminars, etc. may be found in Annex I.

(b) Discussion

The methods involved in developing national goals and objectives were discussed. There was general agreement that in the developing countries national goals and objectives, and therefore national planning, should relate primarily to socio-economic goals just as is the practice in the more developed countries. It was generally agreed that definition of goals and objectives should normally precede collection of data in order that only pertinent material be gathered, however, it was acknowledged that in some of the developing countries there is insufficient facts on hand of natural resources, etc. as to provide a base for socio-economic planning. In those cases, an inventory of all natural resources, manpower, economic and social facts, should be made as quickly as practical to provide a basis for national goal setting and national socio-economic planning. These steps seem necessary if regional and local planning is to be able to cope with the concomitant sanitation problems of rapid urbanization.

It was noted that before any plans for change are implemented, it is desirable to get public reaction to the proposed changes. There have been numerous cases in both the more developed countries and in the developing countries where considerable funds have been expended for an environmental change that should improve the health of the people, but which were rejected by the public as the change did not fulfill a basic need or did not conform with a standing tradition.

The discussion confirmed the fact that planning at all levels of government was a continuing process and that agencies of government should be established to conduct this activity. When planning agencies are established, particularly at the regional and local levels of government there should be considerable public health engineering and sanitation input. This input is particularly important in dealing with problems of rapid urbanization. Traditionally, planners have concerned themselves primarily with land-use planning and have ignored many of the factors that are important in the creation of a more sanitary and more healthful environment.

There was a general consensus of opinion that public health workers, particularly sanitary engineers and health administrators, become more familiar with, and more involved, in the planning process. Similarly, planners should become more knowledgeable about public health issues of the area, particularly those concerning sanitation. Ways and means should be sought to initiate and sustain dialogue between planners and public health workers.

2. Planning and Design of Urban Water Supplies

by Mr R. Casanueva, WHO Temporary Adviser

(a) Summary

In the development of metropolitan areas there is one important and common factor directly responsible for the rapid advance or stagnation of such urban communities. This factor is the availability of sufficient water and the possibility of its use for domestic and industrial purposes.

The world is facing now a trend to concentrate the national population using as a nucleus the large urban areas. At present the urban population is around 1.2 billions and very likely will get to 1.7 billions within the next ten-year period and reach 2.5 to 3 billions at the end of the century.

Asia, Africa and Latin America are growing three to four times faster than Western Europe.

The increase of population requires new capital investment even if we want to remain with the present standard of living. Several economic studies show that an increase of 1 per cent of population requires 4 per cent of the national income to be used as demographic investment. When the population increases 3 per cent per year there is a need of 12 per cent of the national income increase to be used as demographic investment.

The delay in solving the water problems in urban communities is due to a great extent to the lack of basic information of city Master Plans and to the scarcity of technical personnel for planning, design, construction and operation of water systems.

It is of paramount importance to have a good and efficient organization at national and local levels to operate and maintain water services. Extension of water systems to new areas should not be at the expense of existing services. It is important to know the real population increase of an urban community in order to predict the water demand. Some areas will increase at a great rate due to the industrial development plan while others will remain with the same population or possibly decrease due to national migration.

The study of several cases in Latin America lead us to the conclusion that an investment of 0.5 per cent of the Total National Product (T.N.P.) will be sufficient to cover the goals of Punta del Este (70 per cent of urban population served with water and services in a ten-year programme). When the use of water for agricultural purposes is predominant, it is important to start early multipurposes water projects, to define priorities and the use of available water in each water basin.

In designing urban water supply systems special attention should be given to:

1. Demographic aspects
2. Public health aspects
3. Financial and Economic conditions
4. Technical aspects.

Demographic aspects

- Population to be served for the next fifteen to fifty years.

Public Health Aspects

- Technical and bacteriological quality of water.
- Water production to satisfy actual and future demand.
- Piped water within premises.
- Permanent service under pressure.

Financial and Economic Conditions

Self supporting services are becoming more popular all over the world. In some cases each service facility will be self supporting while in others the adequate support may be based on a regional or national water programme.

A survey made in 1962 for seventy-five countries in the world revealed that one third of the urban population had piped water, one third of the urban population had access to piped water and the other third had no access to piped water.

External financial assistance for the period 1958-1969 in the world for urban water supply programmes is as follows:

International agencies	220 million dollars
Regional agencies	407 million dollars
Bilateral agencies	<u>268 million dollars</u>
Total	<u>895 million dollars</u>

The financial effort by the countries involved is accepted to be 900 million dollars for the same period of time. WHO has estimated as feasible the following targets for the developing countries in the second UN Development Decade (1971-1980).

<u>Urban population served</u>	<u>now</u>	<u>by 1980</u>
Courtyard service	25%	40%
Public standpipe	26%	60%
No service	49%	0%
Rural population served	10%	20%

Total Funds Required

Urban	US \$ 7 500 000 000
Rural	US \$ 1 600 000 000
External funds (expected)	US \$ 2 300 000 000
Nation funds	US \$ 6 800 000 000

This means that the external component necessary by 1980 is three times that spent in the 1958-1969 period and the national efforts required are more than seven times the amount for the 1958-1969 period.

Technical Aspects

- Planning and development of water programmes.
- Design of water systems.
- Construction systems.
- Operational and maintenance.

(b) Discussion

There was considerable interest among the participants about methods to disinfect municipal water supplies, particularly methods that are applicable in situations of rapid urbanization. The application of chlorine, either in its elemental form as chlorine gas or as a liquid solution of sodium or calcium hypochlorite, is the most satisfactory and least expensive method of disinfection available today. Chlorine should be applied at a rate sufficient to provide a continuous free available chlorine residual of at least 0.1 ppm, 30 minutes after application. It is important that this residual level be that of free available residual chlorine rather than total residual chlorine. Combined available residual chlorine, which is the difference between total residual chlorine and free available residual chlorine, is an inefficient bactericide. In many conditions of rapid urbanization, disinfection is the only practical method of water treatment. Therefore, it is imperative that the minimum recommended level of free available chlorine residual be maintained at all times.

There was some discussion about the acceptability of water which is high in hardness as a source of community water supply in a rapidly **growing** community. It was indicated that excessive hardness does not have any adverse public health effects, i.e., it is not harmful to health. However, it has economic significance. Often it is more economical for the water user to pay a slightly higher price for water that has been softened during the purification process rather than to pay an increased amount of money for soap and other detergent or cleansing agents.

Many of the participants know of situations where persons, who had migrated from rural areas to urban areas do not utilize urban water supplies of potable water correctly. It is difficult to convert some people to use potable water properly and to discontinue use of polluted sources of water, such as ditches along the highways, as places to bathe or as sources of drinking water. There seems to be an increased need for health education in the proper utilization of potable water. If persons migrating from rural to urban areas are properly educated in the hygienic use of water, this knowledge should produce long lasting effects with many benefits.

There was considerable discussion concerning the financing of programmes to enlarge and modify urban waterworks that supply urban areas in which the number of residents are increasing at greater than normal rates. It was stated that since a community water supply could be made a revenue producing activity more emphasis should be placed on developing financial schemes that are self-sustaining and self-amortizing.

D SUMMARY OF FOURTH DAY PROCEEDINGS, MONDAY 11 OCTOBER 1971

1. Planning for Operation and Maintenance of Community Water Supplies
by Mr John V. Dibble, WHO Sanitary Engineer

(a) Summary

In the developing countries, conditions found in slum areas of rapidly growing cities are often quite shocking in the degree of insanitary conditions which have developed before the authorities have begun to start work on any sanitation measures. People living in new slum areas are basically from the more spacious rural areas where to a large extent nature takes care of waste disposal. It is only when country customs are practised in towns and cities that trouble occurs.

Planning agencies should take into consideration sociological conditions existing in new urban communities when planning for the adoption of policies for maintenance and operation of community facilities. It is desirable to formulate policy for financing operation and maintenance. In some prosperous areas, self financing may be possible, in others government subsidies will be necessary. Usually, the more rapid and unplanned the development, the greater the degree of subsidization required.

The department implementing government policy by constructing the facility should continue to consider in detail sociological as well as the physical aspects of planning. Before any construction is initiated, it may be necessary to motivate people to accept and utilize properly the new facility otherwise they may continue to use old traditional methods.

Planning should include extensive investigations into methods of reducing operating costs and the use of a cheaper power for operating pumps. In many countries, cheap electric power or use of natural gas should be considered.

Standardization of plant and equipment is desirable for economic reasons, not only on initial costs but also on maintenance and replacement costs. Standardization also allows speedy replacement of defective or inoperative parts or units.

Planning for operation of community water supplies should be a continuing process during the construction phase. It is necessary to ensure that all training of staff in routine operation procedures and all local legislation is completed well before the date the facility is to become operational.

Motivation should be continued at this stage and the actual inaugural ceremony should be an important point in local history to create a sense of possession amongst those who will benefit from the water supply facility.

Routine inspection maintenance presents no problem if carried out according to prearranged schedules. Every worker engaged in operation and maintenance of a community water facility should be given a complete list of duties he is to perform.

The operating authority of a community water supply facility should have by-laws for the prevention of contamination, waste and misuse of water and also for the assessment and collection of revenue.

Training of water plant operators should not only include education in the mechanical aspects of their particular task, but also should include training in the more specific aspects of the preventive health measures in which they are engaged.

(b) Discussion

Rapid urbanization is causing many water supplies and treatment facilities to become inadequate at a much earlier date than initially anticipated. In a few cases it has been necessary to plan further additions immediately upon completion of enlargement programmes which were designed to meet the anticipated needs for a ten-year period.

There was a consensus that people moving into urban areas from rural areas should be properly educated and motivated to use potable sources of water for domestic purposes and to discontinue the use of non-potable sources, such as water from irrigation canals, for drinking.

In some areas there are many misconceptions in the minds of people who have recently migrated to urban areas from rural areas concerning piped potable water. There are instances where people who have recently migrated to urban areas and have refused to use piped water as they believe that it would affect adversely their sexuality. In some instances, there are former rural residents

who believe that water from pipes will cause baldness. Public health officials must consider ways to cope with these misconceptions and to conceive methods of health education and motivation that will encourage the proper use of potable water.

A practical means of providing an efficient water distribution system in an area of rapid urban growth is through the use of poly-vinyl-chloride (P.V.C.) pipe. In general, P.V.C. piping should have a low initial cost and a low maintenance cost. It can be installed by relatively unskilled labourers with minimum supervision. These pipes have considerable durability, in fact, in areas where the ground is either excessively acid or alkaline, P.V.C. pipe is preferred to metallic pipe. There is a particular health aspect, however, that must be observed when considering the use of P.V.C. pipe. P.V.C. pipes for distribution of potable water should be made only from virgin ingredients and should not be made from recycled plastic stock unless proper sterilization is accomplished. Furthermore, it should be free from toxic substances. There are numerous producers of P.V.C. pipe that meet various national standards for use in the transmission and distribution of potable water.

2. Solid Waste Collection and Disposal

by Mr F.A. Jacocks, WHO Consultant

(a) Summary

Solid waste collection and disposal is a universal need. This is very important to the individual but it is of paramount importance to people when they are located in close proximity to each other. Solid waste collection and disposal is necessary not only from the health, but also from an aesthetic standpoint.

The type of collection and disposal method to be used is dependent upon the types of waste involved. Residential collection is performed often on a twice-a-week basis, whereas some large commercial or industrial producers of waste must have daily collection. It may be feasible to stockpile certain wastes, those that do not create a health hazard. In very rare cases a monthly collection may suffice.

Regardless of the type of service needed, it is essential that there be a fixed responsibility for solid waste collection and disposal. The fixing of responsibility is necessary for routine collections, but not all wastes are generated on a fixed base. Some wastes, such as agricultural wastes, vary greatly on a seasonal basis. The attachment of responsibility here assures that variations in the system (collection and disposal) may be assured to meet the need.

It was stated that proper planning must be accomplished to produce the most efficient operation. Poor planning can and will add greatly to the cost. Planning entails a multi-factor approach: (1) local conditions; (2) financing; (3) policies dealing with number of collection, location of pick-up; (4) routes of collection; (5) type of equipment that is to be used; (6) responsible agency and if this agency is a public body, how it is to be administered and its structure; (7) numbers and salaries of personnel; (8) type of equipment to be used; and (9) the establishment of a records system so that planning can be a continuous operation.

There are many choices as to the best way to organize and operate a solid waste collection and disposal system. Every precaution should be taken to put the best plan in effect so that the needs of the people may be met using the greatest efficiency possible.

(b) Discussion

There are many ways to collect, handle and dispose of solid wastes from urban areas. The method of choice will vary from community to community depending upon local conditions, needs and resources. Ideally, solid waste collection and disposal systems in rapidly urbanizing areas should be flexible to meet changing situations and inexpensive to install and operate. The method should be of such character as to be readily acceptable by the public.

Tipping or dumping on open land with or without burning is not an acceptable method of refuse disposal, even as a temporary emergency measure. Incineration is used in many of the cities in the more developed areas of the world for the disposal of solid waste. It is a costly means of disposal, as it requires skilled operation and is not sufficiently flexible to meet changing situations, except in special circumstances. It is not a method that may be recommended generally in rapidly urbanizing situations.

The disposal of solid wastes by the sanitary landfill method is quick and inexpensive. It may be performed with a minimum of initial capital outlay and it does not require skilled operation or supervision. However, if the sanitary landfill method is to be used for the disposal of solid wastes, particular care should be taken in selecting sites to be used for the landfill operations. These lands once filled must remain as open land or land with very low land load for many, many years to come. For all intents and purposes, these lands must remain as open spaces. Particular care should be exercised in the selection of landfill sites so as

not to contaminate ground water. The leachate from a sanitary landfill contains high concentrations of many pollutants. The sanitary landfill method for the disposal of solid wastes is recommended in rapidly urbanizing situations, but its use requires considerable planning in order that proper decisions may be made.

Composting is one of the newer methods for disposing of municipal solid wastes. It is a relatively inexpensive method, but not as inexpensive as sanitary landfill. While it does not require a high capital investment, it is more expensive to initiate than a sanitary landfill. Composting should have much merit in the developing countries. The end product from composting is stable and can be used as a soil conditioner, improving the character of the soil for cultivation. Since composting requires some degree of sorting of refuse, it permits maximum utilization of the recycling component. Composting is a method of solid waste disposal that is acceptable to a rapidly urbanizing area.

Other older methods such as burial at sea are not recommended for rapidly urbanizing situations, nor are some of the newer methods that are currently under development in some of the more developed countries.

E SUMMARY OF FIFTH DAY PROCEEDINGS, TUESDAY 12 OCTOBER 1971

1. Design of Sanitary Sewers, Storm Sewers, Sewage Final Disposal
by Mr R. Casanueva, WHO Temporary Adviser

(a) Summary

Sanitary sewers are recognized as important urban community facilities by all health authorities all over the world.

Sewers can be designed as separate or combined systems depending on the total cost for carrying sewage and storm water plus final treatment, if that is necessary. Generally speaking, separate sewers are found to be more practical, particularly when final treatment is required, which is becoming more necessary due to the rapid increase of urban population.

When designing sewer systems, a design period should be established of thirty to fifty years for the system itself and ten to fifteen years for mechanical equipment used. Shorter periods of design are acceptable where the construction of supplementary future sewers is easy and does not require modification of the original works.

The principal sources of sewage flow composition are the following:

1. House sanitary sewage flow
2. Industrial liquid wastes
3. Ground water infiltration
4. Storm water infiltration.

Each source is studied in detail and its relative importance is established.

A comprehensive programme of technical details in the design of sewers follows including acceptable standards for minimum and maximum size of house connexions.

Storm sewers are designed on pluviometric statistics using the relation curve "intensity - duration time" of rainfall in the area to be drained.

Domestic sewerage suspended and dissolved solids, is less than 0.1 per cent of the total weight of the sewerage. The rest is water. The composition of this 0.1 per cent is important in order to establish the acceptable sewage treatment procedure.

Treatment procedures can be classified in:

1. Pre-treatment
2. Primary treatment
3. Secondary and tertiary treatment
4. Other advance treatment.

A summary revision of these four procedures is included in the working paper giving special attention to lagoons and stabilization ponds.

Attention was drawn during the seminar to interim measures that could be established when it is not possible to construct the sewer systems and treatment facilities according to the proper manner established in a sewer Master Plan, taking into consideration the fact that old urban communities were in general not the result of a sound feasibility study involving what was best for the society, but rather decisions were made by individual groups thinking more in what was better for their particular interest. In other cases, the predominant reason to settle in urban communities was a defense strategy against invasion. Today the people are incorporated in the decision making bodies. They expect the technicians to advise on 'why' and 'how' to proceed and they will decide 'what' to do and 'when'.

The best procedure to follow for rapid developing urban communities is to prepare Metropolitan Master Plans including water and sewerage schemes as well as public utilities. These Master Plans constitute the basic for implementing specific projects. In many cases the national government or city authorities may not have funds to cover the construction cost. Temporary measures for excreta and sewerage disposal have to include great support from individual and community health education activities. In spite of the enormous progress in city development, achieved during the last fifty years, a large number of people have changed very little their standard of living, their level of education and economical and social status, in particular with regard to defecation. This practice is conducive to infestation and is responsible for keeping high indices of pollution. House sewer connections and plumbing are important to be installed immediately after the public sewers are available. Several schemes were given as good examples to help the house owners to achieve this goal by providing technical and financial aid.

Community participation was emphasized as an important aspect in the construction of community sewer projects, in particular for fringed areas of urban communities. Participation can account for 20 to 30 per cent of the construction cost, through supplying free labour or money. The 'conservancy method' of excreta disposal should be discontinued as soon as possible.

Simple interim measures for excreta disposal was explained and which could be developed by stages in communities with or without water systems available.

(b) Discussion

In rapidly urbanizing areas, as in towns and cities with a stabilized growth pattern, the installation of separate storm and sanitary sewers systems is preferred over a combined drainage system. Health goals and objectives are attained more efficiently and with less expenditure of funds when separate sewers systems are installed.

To prevent the creation of nuisance conditions and to maintain the efficiency of sewage flow, it is desirable to maintain self-cleansing velocities in the sewer lines at all times. Self-cleansing velocities should be considered in the design of sewers.

Water quality standards of receiving streams and bodies of water should be determined and the discharge of wastes that would impair these standards should be prohibited.

The effluent from sewage treatment plants may be used for irrigation under certain circumstances. The effluent should be disinfected with chlorine to kill pathogenic micro-organisms that are still present in the sewage after treatment.

Generally, it is undesirable to permit excessive infiltration of ground water into the sewer system.

An adequate distance, depending upon local soil conditions, location of ground water level etc., should be maintained between latrine pits and wells. Dwellings may be served by a well and a septic tank with a sub-surface drainage system located on the same plot of land provided that an adequate distance is maintained between the two systems.

2. Oxidation Ponds

by Dr M. Islam Sheikh, Professor,
Public Health Engineering
West Pakistan University of Engineering and Technology, Lahore

(a) Summary

The future of Asia is closely linked with the natural resources - protein and water. These are in short supply in many parts of Asia.

If social and political chaos are to be avoided during the coming decades, new techniques of resource conservation must be developed and applied. Reuse of human waste material is one approach that may be taken. Water-borne sewage treated to the point whereby the treated liquid effluent may be reused as drinking, irrigation or industrial water supply would be an effective way to assist in the urban water shortage. A combination of this process with one which would reduce the human wastage of nitrogen and return it to the soil to produce an edible protein would surely be desirable.

The cost of construction as well as operation of the conventional methods of wastewater treatment is expensive, requires skilled supervision and imported materials and equipment. It is because of the prohibitive cost that not much work has been undertaken in the developing countries to construct sewage treatment plants. The choice of method or methods of safe disposal of sewage must be determined by economic consideration within the frame-work of sanitary needs.

The oxidation pond method of wastewater treatment seems to be adequate for the developing countries for the reasons mentioned above. Oxidation ponds utilize natural processes under controlled conditions for the stabilization of organic wastes. They may be classified as aerobic, anaerobic or facultative according to the conditions of stabilization. Many factors are involved in the waste stabilization mechanism. Decomposition of the settled organic matter produces inert residue and soluble nutrients. In aerobic ponds there is surface aeration and photosynthesis activity by the algae producing oxygen. Oxygen is taken up by the bacteria and other micro-organisms which liberate CO₂, which in turn is utilized by algae. Oxidation ponds may be compared with other conventional treatment methods in many aspects. For oxidation ponds the land requirements are greater than that required for an activated sludge or biological filter processes. Oxidation ponds have proved to be much cheaper than other processes. Operating and capital cost of oxidation ponds for a population of 1 000 000 persons could be reduced to one half the cost of the conventional methods. For lesser populations the difference could still be larger.

Due to the climatic conditions in tropical countries, oxidation ponds have proved to be ideal for successful operation provided they are designed properly.

The effluent from an oxidation pond is highly nitrified and of better quality than that from a humus tank.

It can be concluded that oxidation pond method is suitable, cheap and reliable for the wastewater treatment for any size of community. The design of oxidation ponds depends upon many factors. Light is one of them. Seasonal changes in daily solar radiations determine the seasonal rates of photosynthesis and the depth of penetration determines how much of the volume will participate in oxygen production. Increased temperature may produce higher biological activity but this favours blue green algal growth which could create objectionable odours in the ponds.

Wind provides the surface aeration, which is advantageous. The pond layout should be so planned that the direction of wind is never along the line of flow, as it produces short-circuiting of the flow.

Another factor is that of evaporation which determines the level of water maintained in an oxidation pond. In some areas the rate of evaporation may be as high as 20 per cent. It is recommended that tests be made under the local conditions. Percolating tests

for the soil encountered should also be performed to check the possible danger of polluting any nearby water supplies. A loading of 100 to 150 lbs of BOD per acre per day has been suggested for countries having similar climates as in Pakistan. The depth of the pond may vary from two to six feet, however, due to high penetration of sun light deeper ponds may be considered.

If possible, the pond site should be located on the leeward side of habitations so as to avoid any objectionable odours that might emanate from the pond. The pond bottom should be free of vegetation and the inlet of the pond should be near the centre of the unit to distribute the material uniformly over the area. Due to the varying climatological conditions at different places, it is necessary to study the performance of pilot ponds under local conditions for the evaluation of their applicability.

Engineering University, Lahore, has taken steps for the evaluation of design criteria applicable to local climate. Two years ago, the Public Health Engineering Division of the University operated oxidation ponds on a laboratory scale and demonstrated the treatability of locally produced wastes by this method. The work has recently been extended to full scale units treating domestic sewage which is mixed with a small quantity of industrial wastewater. It is hoped that with the help of this research the most favourable loading rates, an acceptable design and operating control procedures for West Pakistan will be established. The experimental ponds cover an area of one acre each and there will be four in number each with a four feet depth. They can be operated in parallel as well as in series. Sampling can be done at five different locations to evaluate the distribution of the biochemical activity. Two of these have already been built, the other two will be constructed in a second phase.

A developed form of oxidation ponds is the aerated ponds. Through artificial aeration, it is possible to construct oxidation ponds ten to twelve feet deep with loadings three to four times higher than those used in conventional ponds. The cost, however, recommends the design of the ponds without artificial aeration when land is available.

Another developed form is that of high rate oxidation ponds. These ponds serve a useful purpose other than wastewater treatment. They provide conditions for maximum yield of algae which is rich in protein. After due processing, this protein-rich algae can be used for animal or even human consumption. One day retention period permits high rate of algal reproduction. It is of interest that algae has been used as a source of protein for centuries,

especially in far east countries. The normal growth period for algae is one day, in continuous mass algal culture. On an areal basis algae is 127 times more productive than soybean and 1 460 times more productive than rice. It is seen that algae are similar to soybean in its protein quality and could compete with soybean for chicken feed markets. Due to these reasons, research work is proposed to be conducted at the Engineering University's Research Pilot Plant.

(b) Discussion

It was reiterated during the discussions that the use of oxidation ponds is possibly the best method of handling liquid wastes for developing countries. Other methods were discussed but it was brought out that this was the cheapest to construct, requires less maintenance than other methods, and that it produced good results.

This is an admirable method to use in developing countries, since its expansion, due to rapid urbanization, can be easily accomplished. The major and only obstacle to using oxidation ponds is securing the necessary quantity of land at a location which will be suitable and moderate in cost.

It was pointed out in the discussion that there are factors that should be considered when proposing the use of oxidation ponds. Some industrial wastes are difficult to handle, and consensus indicated that special care should be exercised to assure that wastes were not put into the pond that would be detrimental. Care should be exercised to assure that pond use would not contaminate the surrounding ground water thereby making the ground water unfit for human consumption. Several methods were discussed, the use of an impervious material such as brick and the use of plastic membranes. At this point it was agreed that progress reports would be issued to the delegates as the present research progressed and that they would also be supplied with a copy of the final report. This was felt to be highly desirable, since it was apparent that many aspects of pond usage needed research to determine the desirable operating procedures for countries in the Eastern Mediterranean Region.

Discussion brought out the fact that ponds improperly designed or managed could be the source of mosquito breeding. Several aspects of design and management were discussed. These included the critical depth that would prohibit the aquatic growth from occurring, to the use of larvicides and top feeding fish.

Interest was evident in the use of this methodology since it was considered especially important for rapid urbanizing areas and the group desired that they be kept abreast with the research findings.

3. Organization and Administration of Environmental Health Department

by Mr F.A. Jacocks, WHO Consultant

(a) Summary

Health Departments should be organized so that the total spectrum of preventive health can be covered. This consists of both the medical and environmental health aspects.

Environmental Health must be staffed by doctors, engineers, sanitarians, laboratory technicians and other ancillary personnel so that all problems in this field can be dealt with. Size of area, number of programmes, and the severity of the problem will be the determinate in the type of organizational unit required and staff requirements.

Health Departments are of many forms. They are based upon a legal document which states the rights, duties and procedures that must be followed. In some ~~cases~~ health departments may perform primary advisory and consultative type functions, while in other instances they will be organized on a strictly service or inspectional line. The area of responsibility based upon the authorizing law is the governing factor in all cases.

This area of responsibility should be clearly defined so that decisions can be made on the best type of organizational unit and the scope of work. Decisions dealing with these two items are largely dependent upon the size of the area to be served, the programmes to be initiated and their severity and the possible level of funding that can be made available. A listing of possible programme areas was given and the usual level of the authorizing authority, as found in the United States. The level of authority for enactment of the basic laws is very important since some programmes are very local in nature, such as those dealing with inspections of restaurants within a given city, whereas other programmes, such as those dealing with air pollution, must have a wider base for control. Air pollution affecting a given point could be quite distant from this point.

Although the list of possible activities was comprehensive it was stated that a given environmental health department might not immediately initiate programmes in all of these areas, since all actions are dependent upon the authority contained in the authorization document. Most laws which give authority are very broad in scope, however, economics and needs will play a

part in programmes actually initiated. There are instances where programme responsibilities are shared by different administrations. An example would be that if the operation and maintenance of a water system is the responsibility of a public works department, the health department still has a responsibility to assure that the finished product (drinking water) meets the health standards for quality and quantity. This could be needed because of the diversity of all problems. Uniformity of standards and enforcement procedures is also highly desirable. This is especially true when you are dealing with private industry on a broad area. To do otherwise might conceivably render an unfair advantage to a specific industrial plant or to a specific group.

There are many functions that health departments should perform, but careful consideration must be given first to meeting the needs of the people to the greatest extent possible. Care should be exercised to perform the functions as competently and effectively as possible. It is by far better to perform a few functions efficiently than attempt to do many tasks and find that they are ineffective for any reasons. The public respects a task well done, but has little patience with poor performance.

(b) Discussion

Public health agencies at the local governments level usually are charged with the responsibility of conducting programmes in environmental sanitation. In a few instances, a special agency has been created outside the official health agency, but this is rare.

Sanitation problems of rapid urbanization usually are of such scope and of such magnitude as to need the full resources of a well organized and full-staffed public health agency.

One of the more pressing problems of many rapidly urbanizing areas is the provision of a potable water supply. The resources of a laboratory are desirable to augment the work of the environmental health division.

F SUMMARY OF SIXTH DAY PROCEEDINGS, WEDNESDAY 13 OCTOBER 1971

1. Legislation

by Professor E.W. Mood, WHO Temporary Adviser

(a) Summary

The purposes of legislation are: (1) to establish a guide of acceptability; (2) to establish a legal basis for judgement;

and (3) to provide punitive measures for persons who fail to comply. In a rapidly urbanizing area, laws concerning environmental pollution are needed to fulfill the initial purpose.

Most legislation concerning the control of the environment should be administration and administrative sanctions - not criminal - criminal sanctions should be used only in cases of non-compliance.

Usually sanitary and public health codes are part of the administrative law of the governmental unit and the authority to enact such legislation stems from the police power of that governmental unit. Police power is the sovereign right of government to enact the necessary legislation to preserve and protect the public health, safety and welfare.

All urban areas, including that portion which may be beyond the corporate limits of the central city, should be governed by appropriate zoning, building and housing codes. The need for such legislation is particularly critical in areas affected by rapid urbanization.

A zoning code controls the use to which land may be placed and stipulates the conditions that must be met before applied to that use. It is an implementing device of the land-use plan of the master plan for the municipality.

A building code deals primarily with the structural characteristics of all buildings and usually stipulates conditions to be met to provide for structural stability, fire protection and safety.

A housing code concerns the conditions under which a structure may be used as a place of human abode and usually stipulates the requirements of maintenance, of occupancy, and of installed facilities and provided services.

While it is desirable that zoning, building and housing codes be of the performance type, it is not practicable for most urban areas to enact legislation of this type. Therefore, most codes covering the above subjects are of the specification type.

Zoning, building and housing codes should be reviewed regularly and revised as necessary or desirable. This is particularly true for rapidly urbanizing areas.

WHO is embarking on a programme of the development of criteria, promulgation of recommended codes of good practice, and formulation of operating guidelines that should be of considerable aid to the developing countries in securing solutions to sanitation problems in areas of rapid urbanization.

(b) Discussion

Development of national laws is of primary importance since this would be the appropriate method of controlling all national and natural resources. Laws, when developed, should begin with a statement of purpose so that it is clearly understood by all what is intended. Laws must be interpreted and the use of preambles or statement of intent gives a basis for appropriate interpretation.

There is need for national laws in the environmental health field and consensus was that these laws should be based upon realism. Realism is essential because lack of recognition of the customs of the people could create an impossible enforcement situation.

Laws should be very clearly written not only as to purpose but should also include administrative procedures and penalty assessments, if any.

The feeling of the Seminar was that great care should be exercised to have national laws concerning environmental health, and that when the laws become operational that enforcement be initiated promptly. Care should be exercised to see that the law is clear in establishing not only the rights of the people, but the rights and duties of the enforcing agency also. Clarity in the enabling act is essential so that the rights of all parties can be fully maintained.

Coordination of efforts was also stressed with the example given that although building codes including plumbing codes are usually enforced by organizations other than health departments, deal with the physical and safety aspects of construction, but when the construction project is a home there is need for coordination by the health department to assure that the humanistic factors are considered. This is a good example because the Health Department will be involved with the house when it is occupied by people, through the housing code, to see that the facilities, occupancy and maintenance of the structure are maintained in an appropriate manner.

Consensus also was that the protection of the people's health should be a part of the Constitution of the Nation and specific authority and duties should be stated. The creation of a national organization for health is highly desirable and the Ministry of Health should be a part of the cabinet, or executive, part of the national government.

2. Financing Water and Sewerage Schemes

by Mr R. Casanueva, WHO Temporary Adviser

(a) Summary

An outline was presented to the participants covering the most outstanding features on the subject, namely:

1. Background information
2. Goals to be achieved
3. Cost composition for capital investment and operational budget
4. Financing of urban and sewerage systems
5. Financing rural water supply programmes.

The information needed in order to establish the proper financing of water and sewerage schemes is the assurance that there is enough water available and that the existing natural conditions of the area make it possible to design such systems within the economic capability of the community to be served. If there are limited water and sewer services already existing in the country, an inventory should be made in order to size the necessary improvement to meet present conditions and those anticipated within the design period.

The goal suggested by WHO to be achieved in a ten-year programme is 40 per cent of the urban population served with piped water in the house in addition to 60 per cent served by public standpipes and 20 per cent of rural population served with acceptable water. It is important to emphasize the need of forecasting the future population to be served, the density of such population by city zones, the tentative future industrial water consumption and the respective sewage flow. The life expectancy of a water system varies from thirty to forty years for the system itself and twelve to fifteen years for the mobile equipment. For sewers the life expectancy is thirty to fifty years, for equipment ten to fifteen years. Unit cost for different construction activities is necessary for water and sewage programmes in order to prepare the tentative total cost of the projects. Long range programmes are considered to be those that

cover a twenty to thirty years period and are included in the national development plans. More elaborate plans are needed for the medium range programmes which usually cover a four to six years period. The life time of these programmes should be arranged to coincide with the administrative period of the government. The short range programme including operating budget is formed by the annual water and sewerage projects including the budget breakdown by provinces and metropolitan areas.

When preparing the Capital Investment Budget for water and sewerage it is important to consider the following items: pre-investment cost, construction and supervision cost, improvement and enlargement of existing facilities and cost of financing. The cost of operation and maintenance is evaluated on a yearly basis.

All the three programmes mentioned should be prepared showing a yearly time table and the medium and long range programme should be corrected on the basis of actual experiences of the annual programme and operating capital budget.

There are several sources of funds to finance such programmes; the most important is the national source including grants and/or loans from the Federal or Central Government and from the Provincial or State level. Other national sources are the commercial or government banks. Before requesting any loan for water and sewers programmes a thorough investigation should be made of the above mentioned possibilities. It is expected that National Authorities will give first priority to financing this social investment, which is essential for the economic development of the country, and that their participation will be two to three times better than it has been up to now, worldwide.

External lending agencies can be classified in multilateral and bilateral agencies. Examples of the first are the World Bank, the Inter-American Development Bank, African Development Bank, East Asia Development Bank, etc. Bilateral lending agencies are the Export/Import Bank, AID in USA and several agencies in Europe from France, Holland, Switzerland, etc.

Self-supporting water programmes are of particular importance for developing countries because they focus the financial problem in the project itself without any other agency being responsible for their economical commitments. These projects depend on water revenues coming from water rates and/or land taxes for the premises to be served. Water rates structure

should be arranged in such a way that the low income people will not use more than eight to twenty days salary to pay for the water consumption of his family in a year's period. Meters should be established for 100 per cent of the water service and high rates should be applied for consumers that use water far beyond their sanitary and health needs, when there is scarcity of available water. Sewerage schemes are usually financed in Latin American countries through land taxes. Recently a movement has begun to establish sewer rates in the same water bill following the experience gained in some countries where they established flat sewer charge of about 20 per cent of the water bill. Special rates could be established for large industries charging them on a volume usage and the chemical characteristics of their effluent.

Community participation in the actual capital cost for expanded water and sewerage programmes can be obtained through community organization in the fringe areas of urban communities and more likely in the rural areas where the people are normally organized in communal entities.

Financing of water systems and excreta disposal in rural areas can be done by establishing a rotating fund with rates designed to recover the total cost within a period of four to six years.

(b) Discussion

Participants were interested to know the proper method of converting the common line budgetary system used by many government agencies into a programme budget, which is now required by modern administration methods. It was recognized that the conversion is not an easy task because in a programme budget there is the need to introduce the 'unit cost' procedure which implies an identification of parameters. There is a tendency in water works programmes to use cost per million gallons rather than the unit cost "per person". This latter parameter has more meaning from the public health point of view. The transfer of the first to the latter is not easy since different family composition directly affects the total number of consumers.

The cost benefit ratio was discussed in connection with water programmes and it was recognized that serious and numerous attempts have been made to get a practical answer, but the problems remain that securing a cost-benefit ratio when you are dealing with health is difficult. A restricted answer to this problem is given by evaluating the cost of sickness including medical care, medicines and loss of production. This cost benefit ratio is not an answer that satisfies economists and national planners.

It was also necessary to clarify that amortization is an important factor of the financing cost of water projects and it should be included in the water rate structure.

Another matter discussed was the use of the same bill to pay water and sewerage charges. This was generally accepted since both bills must be paid and their sharing one bill would make little difference.

In order to have a water and/or sewage system accepted by the community it is necessary, in many cases for the Eastern Mediterranean countries, to precede a water project with a health education programme designed to educate the people and create a demand for water services.

Although it is desirable to construct water and sewerage systems simultaneously, it was recognized that national priorities and lack of funds might make such an operation difficult.

3. Education, Training and Employment of Sanitary Engineers, Sanitarians and other Auxiliary Staff

by Professor E.W. Mood, WHO Temporary Adviser

(a) Summary

While the need for trained environmental health workers is generally great in most areas of the world, the need in rapidly urbanizing areas tends to be considerably more acute. In some cases, the needs may be made less critical through the more efficient use of presently available trained manpower resources, i.e., the assignment of engineers to engineering tasks, of technicians to technical activities, of administration to administrative duties, etc.

In rapidly urbanizing areas, there are two broad categories of personnel that need training, namely present staff who may need retraining or advanced training in selected or specialized subjects, and potential staff who need to be fully trained to meet the demanding conditions of the new situation.

Particular care must be taken to ensure that the training endeavour will produce all of the skills necessary to have an efficient environmental or public team. Usually sanitation problems of rapid urbanization are of such character and of such magnitude as to require the skills and resources of an effective environmental or public health team.

Existing staff usually need training in only selected areas, while potential staff will need training in all of the basic subjects of a particular profession or skill plus some advanced training. In a pressing situation of rapid urbanization it may not be possible to provide all new staff members with a complete and balanced advanced training programme.

Training should be accomplished within the same country where the person is or may be employed, except that general professional training may be accomplished within the same regional area.

To the extent possible, all existing training facilities and resources should be utilized, schools, colleges and universities should be encouraged to gear their programmes of instruction to meet the training needs.

It is the basic responsibility of each country to use its training facilities to its best advantage to train the health workers that are needed to cope with the problems of rapid urbanization. If such an effort does not or cannot produce the needed manpower, the cooperation of and the assistance from international agencies should be sought.

(b) Discussion

Considerable interest was displayed in discussing this topic. There was a unanimity of opinion that there is a real shortage of trained personnel in the field of environmental health. Also that there was a real need to retrain health people to prepare them to cope with the complexities of urban life. Serious shortages in personnel requirements were expressed and to add, the difficulty in securing additional people that could be trained.

Coordination between activities was stressed and the use of multidisciplines could be employed to help overcome the reported shortage. World conditions have changed so that it is required that health people utilize people who have been trained to render supportive services. Health engineers trained in the construction of safe and sanitary water supplies could greatly benefit from persons trained in the social services field in securing implementation of their use. Possibly the best approach to the problem is to use many people trained in many professions each performing the tasks for which he is best suited. It was suggested that the use of females in the enforcement activities might be a method of securing additional employees since this has not been a common practice in the past.

There was agreement that training activities should be on a practical field basis with the theoretical components taught only to those who would be involved with high level leadership's roles. The practical field type training, hopefully in an environment similar to the ultimate working setting, can produce persons to do specific jobs. These courses should be of a short duration, teaching the rudiments of sanitation. As a person progresses, the trainee can be given additional training so that his capabilities are broadened and he can operate in a wider sphere.

Discussion also revealed that there were funds that could be used to train, but that the government of the country must make the proper request to the international agencies stipulating the type of training required.

The need of keeping the trainees, after they finish their training, in service, performing the type of work in which they have received specific skill and knowledge, in order to have the best result out of their training, was also emphasized.

SEVENTH DAY PROCEEDINGS, THURSDAY 14 OCTOBER 1971

(a) Closing Session

The Chairman convened the session with a request for consideration of the recommendations as proposed by individual delegates. Each recommendation was carefully considered by the Assembly. After changes and modifications, the Assembly unanimously adopted the recommendations as found in this document.

In response to the Chairman's request for any other matters that should be considered by the Assembly, a suggestion was offered that consideration be given to the formation of a Regional Public Health Engineering Society. Discussion resulted in a consensus that such action would be desirable. The Chairman, then, in response for such action, appointed a Steering Committee to give further consideration to this proposal.

There being no further business, the Chairman expressed the appreciation of the delegates and observers to the many persons and institutions responsible for the success of this Seminar, especially WHO Eastern Mediterranean Regional Office for their support in making the Seminar possible.

Mr Lovelace, WHO EMRO Representative, responded with appropriate remarks.

The Chairman then declared the Seminar officially closed.

PART III

STATEMENTS BY PARTICIPANTS

AFGHANISTAN

Afghanistan is an agrarian society where 85 per cent of the population still live in rural areas, but we are following the same trends as most of the countries in Asia, Africa and Latin America in the pattern of socio-economic development.

In order to conduct urbanization on sound lines, a Central Housing and Town Planning Department has been established with Headquarters in Kabul. The Department has so far drawn up master plans for many metropolitan areas and towns in the country. The Department also chooses and surveys sites for new towns being built beside the old ones. The master plan of the city of Kabul, which has been prepared with the help of Soviet experts, envisages complete urbanization of the city in a span of twenty-five years. The micro-district built east of the city along the Kabul-Jalalabad highway could be considered a first step in this direction. This micro-district possesses all the modern services, namely: sewerage, electricity, drinking water, central heating, schools, playgrounds, market places, a cinema and an indoor recreational centre.

Municipalities in Afghanistan are responsible for the supply of drinking water, solid wastes disposal and establishment of sewerage systems. Most of the municipal organizations in Afghanistan have succeeded in providing safe drinking water to their citizens, some are in the process of construction of their water supply networks.

In order to better cope with the problems of waste disposal, water supply, etc., the Government has created a new department, called the Bureau of Environmental Health in the Ministry of Public Health, being responsible for the control of environmental health activities throughout the country. It has also taken over the responsibility for the design and construction of rural waterworks, latrines and composting programmes. These programmes which are closely connected are being carried out through the Health Centres and Sub-Health Centres which are gradually being established. It is worthwhile to mention that the Central Housing and City Planning Department, besides having launched new housing projects in Kabul and other cities, has also undertaken slum clearance, especially in Kabul, which will assist the Bureau of Environmental Health in the implementation of its plans.

The new housing projects in Kabul and other cities, have the purpose of moving out the urban population from their decrepit and unhealthy houses in the older parts of the cities to new well-planned surroundings, where most, if not all, of the conditions for leading a healthy urban life are available. In the second place, the purpose

of the townships have accepted the responsibility of easing the rush on the towns and relieving congestion. In the long run the Central Authority for Housing and Town Planning plans to demolish all the substandard buildings and dwellings in towns throughout Afghanistan, and replacing them with habitations possessing the qualities that we have already mentioned (remodelling). The plans for the towns will incorporate dwellings for both high and low income groups and these will be built in accordance with municipal specifications.

A project of pre-investment study to improve and enlarge the water system of Kabul and to build a more efficient waste disposal system was undertaken with technical and financial assistance of WHO and UNDP. United Nations Development Programme together with WHO have assisted the Central Authority for Housing and Town Planning in providing a comprehensive plan for safe drinking water, sewage and waste disposal. This is being studied at the present time and it is hoped that with its implementation other cities in Afghanistan will also have a vivid example of how to cope with water supply and waste disposal on more modern and scientific lines.

Treatment and disposal of industrial water has also received the attention of the authorities concerned. But some difficulty is being experienced. Government authorities and management of industrial enterprises are having difficulty in finding qualified personnel and funds for laboratory as well as equipment required for an industrial waste control programme.

Therefore, it is evident that early Government action is required for determining the extent of the problems and for planning and implementing efficient measures in the evaluation of the environmental health programme, on which the Environmental Health Bureau has rightly embarked.

CYPRUS

Cyprus is one of the largest islands in the Mediterranean with an area of 3,572 square miles. The island is divided in six districts, each one has its own capital. Each town is governed by a Municipal Corporation and the suburbs around the towns are under Improvement Boards.

The distribution of population in Cyprus is as follows:

Towns and suburbs	247 100
Villages	<u>385 900</u>
Total	<u>633 000</u> =====

Water Supply

Cyprus is a semi-arid country and has an abundant supply of water. All available water in Cyprus comes from rainfall. The annual mean rainfall is 20 to 21 inches, with a maximum of 27 inches and a minimum of 9.7 inches per year. Most of the rainfall occurs during the winter months and there is great variation in rainfall density according to the meteorological conditions, for instance: Troodos has an annual average of 40 inches per year and Morphou area has an average of only 11 inches.

Water for domestic use is generally obtained from springs and from boreholes. All communities have their own water supply system, either on an individual or regional basis.

Some areas are experiencing water shortages now and with an expected increase in demand the development of new sources is essential.

Air Pollution

At the present time Cyprus does not have any major air pollution problems, but the trend for urbanization and industrialization may create such a problem. The Government is considering the designation of special zones for industrial development. These zones will be provided with an adequate supply of water, a sewerage system, electricity, etc. In designating these zones, special consideration is given to the control of air pollution. One of these industrial zones, an area of about 60 acres, has been established outside Nicosia on the main road to Famagusta.

There is some air pollution which stems from the burning of fuel creating smoke and sulphur dioxide. These pollutants are not prevalent enough at the present time to constitute a public health hazard.

Liquid and solid waste

No city in Cyprus has a water-borne sewerage system. The present practice is the disposal of sewage by septic tanks and absorption pits. This existing method is no longer suitable, because of a lack of permeable soil and the increasing density of the population. In certain areas of some towns, raw sewage flows on the ground, polluting streams and causing nuisances.

In general, refuse is not being disposed of in a sanitary manner. Much of the material is collected by the local authorities and dumped in ravines, buried in trenches and scattered on the ground uncovered.

Some of the material is burned. It has been recommended that in addition to planning for a sanitary means of disposal of liquid wastes, plans be developed for the proper disposal of solid wastes.

Old Automobiles

There are many old automobiles in Cyprus, which are no longer in service and are left for final disposal in scattered areas. This practice causes public nuisances and are unsightly. An area has recently been designated near Nicosia, where old cars may be taken for salvage or final disposal.

The improvement of environmental pollution in Cyprus is depending upon the availability of qualified manpower to perform necessary tasks.

EGYPT

The sanitary situation in Egypt and the main problems created from rapid urbanization can be summarized in the following six categories:

1. Water Supply Problems

The urban environment is divided into two levels, big cities which include Cairo, Alexandria and canal cities, and medium size cities, which constitute 120 communities in all the country.

Filtered and chlorinated water is available for 90 per cent of the total urban population at a rate of 200 to 250 litres/capita/day in big cities and 120 litres/capita/day in other smaller cities.

The main problems in cities include:

- (a) Some parts deprived of water facilities are 'slum areas'.
- (b) Other parts are not served by water piping inside houses, but water stands are available for free consumption.
- (c) The need of increasing the water production to increase the water consumption rate per capita.

Plans for the future are aimed at increasing and improving the water quality.

2. Sewage Problems

Approximately 40 per cent of the total urban population is served by public sewerage systems and treatment plants, the rest have unsatisfactory means of sewage disposal.

The sewage treatment plants in Cairo and Alexandria are overloaded due to the heavy increase in population and in industrial plants; this situation has led to the disposal of raw or partially treated sewage in open drains and lakes. As a result, the dissolved oxygen in some of them is depleted to such an extent that fish life is no longer possible.

Another problem related to the proper disposal of sewage is the low capacity of pumping stations to cope with the actual discharge flow. In Alexandria, a certain percentage of raw sewage is discharged into the Mediterranean Sea at some distance from the shore, leading to a certain degree of nuisance to the bathing beaches, although no health hazard has been encountered according to the numerous studies done on that subject.

3. Solid Waste Disposal

Refuse collection and disposal are practised in all cities and towns as well as big villages. The deficient methods of manual street cleaning, the lack of efficient cartage and deficient disposal systems cause considerable problems. Tipping is badly carried out due to poor transport and to lack of suitable space. Efficient incineration would require heavy capital expenditure. The transformation of solid wastes into compost is practised on a small scale and expansion would require a high level of investment for suitable plants.

4. Problems of Urban Dwellings

- (a) Shortage of housing units due to the great increase of urban population, due to the migration from rural areas.
- (b) High density per dwelling unit.
- (c) Old buildings, which need to be replaced by new and safe ones.
- (d) Lack of public utilities in the vicinity of many dwelling units.

5. Situation of Air Pollution Control

Air pollution begins to constitute a real health hazard to the urban communities. Smoke and poisonous gases emitted from industries, internal combustion engines and various other kinds of vehicles, are increasing day by day. A Standard Committee of all concerned agencies has been established at high level. Several activities of this committee are being implemented, but most of them are in the beginning stage.

6. Present Solution to eliminate Rapid Urbanization Problems

- (a) More interest from the national authorities to elevate living standards in rural areas and construct small industries using agricultural product as raw material in order to eliminate migration.
- (b) Extension of electricity to the villages.
- (c) Increasing the irrigated agricultural area.
- (d) Planning for domestic water and sewage facilities as financially feasible.
- (e) Public health education programmes have aroused the interest of urban communities on public cleansing, refuse collection and disposal, as well as the use of insecticides to control flies and mosquitoes.
- (f) The construction of new dwellings and the existence of attractive financial schemes to encourage individual investments for housing projects.
- (g) The enforcement of existing by-laws regarding pollution control and the production of new regulations, specifically for water quality control.

ETHIOPIA

General

Most of the urban centres, having 9.4 per cent of the country's population, grew around inaccessible high land centres for reasons of security, mild temperature and better environment. The fact that rural community development can hardly be achieved for many years to come and because of the widely scattered settlement of the rural areas, exodus will occur to the urban and at the present time exceeds 4 per cent increase per year.

Despite the fact that master plans for 41 towns have been drawn and the Five-Year National Development Plan covering city planning and public utilities infrastructure programmes, including water supply, sewerage systems and environmental sanitation, the unsuitable location of the old towns makes urban development schemes very difficult and expensive. The basic sanitation problems will continue to threaten the health, physical well-being and survival of the urban population unless drastic measures are taken.

Water Supply

Only 3 per cent of the total population of the country, which is a little over 24 million inhabitants, have access to safe piped water although not in adequate quantity. Among the 250 urban centres, about 50 of them have piped water systems of intermittent flow which are occasionally checked by bacteriological analysis. Because of shortage of water and inadequate distribution systems, where water is available, the low income group has no access to piped water and obtain their water from grossly polluted streams and shallow wells. The problem of unsafe water has been substantiated by high infant morbidity and mortality rates.

Wastewater Disposal

Domestic and industrial water wastes coming from urban areas are disposed of in septic tanks, cesspools, or soaking pits. Dry latrines are used by the low income group. The discharge of liquid wastes in storm sewers and nearby streams is not uncommon in many big towns. Municipal sewage trucks are employed to empty septic tanks and the waste is dumped in an open area outside the cities. Open areas in the cities are fouled with human excrement creating pollution of ground water, streams and soil. High rates of infection due to helminths is evidenced. The capital city, Addis Ababa, however, will have a sewage treatment plant in about 3 years. The sewerage scheme covers only 10 per cent of the city. The high density and low income groups are not in the plan, although these are the groups with the greatest exposure to health hazards.

Solid Waste Disposal

All towns have irregular and partial solid wastes collection services by municipalities using vehicles, wheel barrows and animals. It is not uncommon to see garbage and rubbish piled up on street curbs, in the backyard of living quarters, in narrow paths and open places. Collected refuse is usually tipped or dumped and burnt in the open at the outskirts of the towns. The uncontrolled urbanization has led to an encroachment of houses into the dumping area.

for a number of towns including the capital city. A national sewage plan will be finalized in the next three years. Water supplies for smaller communities are being constructed by the Government with the cooperation of international agencies and existing water supplies are being improved. Surveillance activities of water supplies will be intensified using the modified WHO drinking water quality standards. In regard to liquid waste disposal, the municipalities are urged to: construct additional public latrines, enforce laws for factories and institutions to have their own treatment plants and houseowners to provide latrines for their premises. Sanitary landfills have been suggested by the Ministry of Public Health for all municipalities in disposing of their solid wastes.

Low cost house construction in Addis Ababa is being financed through local banks and foreign loans. Hopefully this will extend to other municipalities as well. Roads have been constructed in the capital to provide sewage and refuse collection service. Water standpipes, sewage treatment plants and refuse incineration are under study for institutions and factories located in the capital city.

Imported and exported foodstuffs and beverages are routinely inspected at ports of entries by Public Health Sanitarians. All other health activities in the towns are left to the municipalities concerned. The Ministry of Public Health is now reviewing its public health laws, including environmental health, for subsequent enactment or amendment as the need arises. The establishment of a National Environmental Health Policy Committee is envisaged.

IRAN

Location

Iran is a part of the Iranian plateau which consists of Iran, Afghanistan and West Pakistan. It is situated in the northern temperate zone, between 44° and 63° longitude and 25° and 40° latitude. It has an area of 628 000 square miles and has a population of 30 millions.

Climate

The country is rimmed by mountains on all sides and is consequently shut off from surface climatic factors that affect neighbouring areas.

The highest point in Iran is the volcanic cone of Damavand, a little northeast of Teheran, with an elevation of 18 375 feet. The lowest point lies along the Caspian Sea at about 85 feet below sea

level. There are great differences in climatic conditions, which range from cold polar climates over the high grounds to hot-tropical conditions of lower altitudes.

Environmental Pollution

Owing to population growth, urbanization and industrialization of the country, the problems of environmental pollution are increasing almost everywhere in extent and complexity.

Mechanization of agriculture, industrialization of the country and ease of earning money have increased the migration of people toward the cities. For example the population of Teheran is 3 millions and the growth rate is 5.5 per cent per year. Also, it is predicted that the population of Teheran will be 5.5 millions in 1990.

There is risk of polluting streams, coastal waters, underground water sources, as municipal and industrial sewage are not treated.

Air pollution is another problem which will increase due to population growth and industrialization of the country.

Water

Fortunately progress has been made by the Iranian Government in solving potable water shortages and unsafe water problems, created by rapid urbanization in urban areas. The latest report from the National Development Plan Commission shows that during the first three years of the Five-Year Plan, a high percentage of the urban population be supplied with potable water.

Five-Year Plan	No. of Towns	Population	Capital Cost \$
1	6	874 910	31 700 000
2	103	6 464 886	330 000 000
3	196	5 028 234	317 300 000
Total	305	12 368 030	679 000 000

It is planned to spend 215 million dollars in the Fourth Five-Year Plan to construct water supply and sewage collection and treatment plants.

At the same time, approximately 2 million people in rural areas are served by piped water. The rate of capital investment per capita in rural areas varies between 6 to 9 dollars.

Another aspect of the public health problems is the possibility of schistosomiasis being introduced in new irrigated areas in the southern part of the country (Khozistan Ostan).

The Government of Iran is aware of this problem and will take strong steps to eradicate schistosomiasis before the construction of the fourteen dams in the Khozistan Ostan is completed.

Sewage Disposal

Generally speaking, each property is provided with a means of sewage disposal by constructing a cesspool or digging a dry well into which the sewage is discharged and absorbed by percolation into the porous strata. This is a very inefficient and unhealthy method.

The latest report from the National Development Plan shows that during the last three Five-Year Plans, only six sewage collection and treatment plants were constructed, that they serve 960 693 people and that the capital cost was \$ 12 130 000.

Using cesspools and dry wells as sewage disposal, there is great risk of breaking the safe water cycle by contaminating the water sources.

Air Pollution

There are many evidences of air pollution in the rapid urbanization areas of the country, but the most significant one is the pollution created by the exhaust of fuel burning equipments and internal combustion engines. For example there are 240 000 motor vehicles in Teheran (police and army motor vehicles not included) and the concentration of carbon monoxide, which is monitored continuously by the Ministry of Health, varies between zero to 150 p.p.m.

Also there are other sources such as industries, workshops, refineries, brick kilns, cement factories etc. which increase the air pollution of every important city.

Housing

The 5.5 per cent growth rate per year in Teheran population, and at a lower rate in the other main cities of the country, brings up housing problems such as:

1. High population density per square mile.
2. High concentration per dwelling (families living in one room).
3. Lack of appropriate green areas.

Refuse Collection and Disposal is not effective and is not adequate from a sanitary standpoint.

Noise is increasing day by day and constitutes a nuisance.

City Planning

A High Commission of Town Planning has been established under the Ministry of Housing and Development to solve the above mentioned problems in the future, and also to plan towns and communities throughout the country. The Commission hired town consultant engineers to prepare a Twenty-five-Year General Development Plan for each town of the country. There are representatives of all responsible ministries and organizations on this Commission. Every aspect of town development is carefully studied by consultant engineers and the government representatives. There is great hope that all sanitation problems will be solved in this way. Each municipality is required by the Government to execute the Twenty-five-Year General Development Plan.

Acts and Regulations

The following acts and regulations are enforced:

Health laws, food cosmetics and health act 1966. These include water pollution control and the control of drinking water and their regulations. There is an approved Air Pollution Control Act.

Also there is under preparation:

The regulations for radioactive protection for industries, medicine, natural and unnatural radioactive fall-out.

IRAQ

Iraq covers an area of 116 600 square miles. The population of the country is 9.2 millions, 49 per cent of them living in urban areas, the others live in rural areas and a very few in the desert.

The Iraqis are 80 per cent Arabs, 15 per cent Kurdish and 5 per cent other.

Social Conditions

The general division of the Iraqi population is based on economical factors:

1. Urban population
2. Country population
3. Nomadic population.

This classification results among others from the following processes:

- (a) Stabilization of nomadic elements changing into country peasant population. This process is presently still taking place.
- (b) Relocation of rural population into towns.
- (c) Assimilation of these elements by the urban society. The present population of Baghdad, the capital, is also the result of such process. The last great migration from the rural area to the city of Baghdad, due to economic reasons, was started in 1929 and reached its maximum between the years 1952 and 1962. Presently some decline in the migration movement is noticeable, but the process is not completed. The final distribution of population cannot be determined at this time.

Existing Situation

Rapid urbanization can be seen in Iraq in a number of cities. The city of Baghdad has one of the most acute situations, since it is the largest centre of public administration, higher education, learning, culture, trade, finance services and industry, and it accounts for 18 per cent of the country's population.

The population of the city increased from 500 thousands in 1947 (first census) to 1.5 millions in 1965 (last census). This is an increase of about 8 per cent annually which is composed of natural increase and migration.

As a result of the rapid increase of the population, during the last three decades, problems have been created in the development of large slum areas around the cities. These are occupied primarily by new inhabitants. These slums are lacking in all social and municipal services.

The former trend of the population increase showed a high increase in migration to the cities. Now there appears to be some decline in migration. This is due to several actions taken by the government according to a wide national planning process. The main factors are:

- (a) The issuing of the law of agrarian reform, this law has changed the agricultural relations by combating the feudal system, giving the land to peasants. This action has decreased the migration of rural population towards the cities.
- (b) Improving the social and health conditions of rural areas by furnishing them with water supply and necessary medical care.
- (c) The distribution of new industries geographically through the country to encourage the growth and consolidation of the small cities.

Housing

To overcome the problem caused by the formation of slums as a result of the migration, the Government started national projects for housing to provide new houses for low income people, also distributing government lands freely to the new inhabitants and giving them assistance in building their own houses.

Water Supply

All cities of the country are now provided with a drinking water supply. New units and extensions are being added to increase the capacity of existing plants to supply the increase in population.

In the rural areas there are about 1 500 villages still lacking sanitary water supply. Based on a recent government survey funds have been allocated to provide all these villages with drinking water within five years. The estimated cost of this project is 200 million dollars.

Sewage

Present sewerage and sewage treatment covers one half of the city of Baghdad, the other half is now under construction. Another six main cities of the country are to be provided with sewerage and sewage treatment plants during the Five-Year Plan 1970-1974.

The other parts of the country are still using the method of ordinary septic tanks and cesspools.

Town Planning

A new master plan for the city of Baghdad has been prepared by a Polish firm (PolSERVICE), taking into account the further needs and elaborating new zoning for the city. New master plans for another twenty-six important cities are also complete.

Solid Wastes and Garbage Disposal

The usual method for solid wastes and garbage disposal is by sanitary landfill in all the important cities of the country. A new incinerator is being built for the city of Baghdad and is nearly complete.

The situation of solid wastes and garbage disposal is quite satisfactory in Iraq.

Environmental Health Sanitation

The Ministry of Health takes the responsibility of controlling the environment of the country by a number of laws and ordinances operating through city health departments. These departments are staffed by public health doctors, sanitary engineers and sanitarians. The control of sanitary conditions of the environment has not reached a satisfactory condition due to the shortage of staff, especially sanitary engineers and occupational health doctors.

Training of Staff

Fellowships are granted to doctors, engineers and other health personnel to go abroad. They are sponsored by the government and supported by WHO and other agencies.

A school for the training of sanitarians is available in Baghdad, two others are needed and should be opened in the coming future.

Nurses, midwives and other auxiliary personnel are given training courses in all the provinces each year. Students are chosen locally to serve in local areas.

The Ministry of Health is experiencing difficulty in motivating the people to serve in the field of public health, especially sanitary engineers and doctors.

JORDAN

Jordan covers an area of about 35 000 square miles. The population is about 2 millions. Amman, the capital, has a population of about 600 000. Jordan is a country with few natural resources.

Water Supplies

The development of adequate water supplies for domestic purposes and for agriculture is one of the major problems of Jordan. With the exception of the Jordan, there are few perennial rivers: most streams are seasonal, and the flow is often scanty and unreliable. Springs and cisterns provide the principal sources of water supply but shallow or deep wells are found in some localities. The water supply for 'Amman' is pumped from several springs and stored in about eight reservoirs located on hills above different sections in the city. Distribution is by gravity, the flow is irregular and roofs storage tanks are usually necessary. The supply is chlorinated, and chemical and bacteriologic examinations are made at different intervals in the public health laboratory in Amman. New sources of underground water have been found to meet the need of the people.

Wastewater Disposal

Cesspools and septic tanks are used for domestic sewage disposal. In rural areas, latrines or cesspools are generally used and in some cases this has caused soil pollution. Increased rapid urbanization in Amman and other big cities has caused a rapid rise in water pollution and of the environment thus creating public health hazards. To meet the need for wastewater disposal a new sewerage system with a modern treatment plant was constructed in Amman.

Solid Waste Disposal

It is collected from houses and streets and stored in sacks. It is, then transported by vehicles to a dumping place near the city and burned. This method is insanitary and creates serious problems of air pollution in addition to harbouring rats, flies, mosquitos and other disease-carrying vectors. The Municipality is now considering incineration as a method of disposing of the solid wastes.

Housing

The number of people in Amman itself had increased twenty times within the last forty years. About one third of the actual population of Amman are refugees coming from abroad. This has resulted in the creation of a new health problem due to lack of adequate housing. Now, new units of houses are being built by the government and sold to the people for their use.

Air Pollution

The major source of air pollution is motor vehicles, which emit pollutants such as carbon monoxide, nitrogen oxides and particulate matter. The industrial and domestic combustion of fuel which produces smoke dust and sulphur oxides are also polluting the air. To bring the air pollution under control, corrective measures pertaining to vehicles are necessary.

Manpower Employed in Environmental Health

There are about fifteen public health doctors, twelve public health engineers and 150 sanitarians.

Situation of Environmental Health Training

The Ministry of Health is responsible for the training of not less than fifty persons per year in the field of environmental sanitation.

Food Sanitation

Inspections on restaurants, shops or industries, where foods are processed or sold, are made by the Ministry of Health. In Amman, the capital, such establishments are licensed and inspected by the Municipality. Meats are subjected to Municipal Ordinance and the Public Health Law. Meat and carcasses are examined by the veterinarian and the inspectors of the Municipality in the slaughter-houses. Samples are collected daily, or at intervals, and sent to the Municipality Laboratory in Amman for chemical examination and food adulteration.

LIBYA

General

The Libyan Arab Republic is situated between two different natural environments, the Mediterranean sea to the north and the extensive Sahara Desert to the south. The northern belt, of some fifteen kilometres, is influenced by the sea having maritime climate of warm-arid Mediterranean type. All major cities, Tripoli (300 000 inhabitants), Benghazi (over 100 000 inhabitants), Derna and Misurata (over 20 000 inhabitants each), are located in this belt. Prevailing wind direction is north (north-east and north-west). Southern very hot wind called "ghibli" blows mainly in the spring carrying a lot of sand and dust. These sand-storms affect the life of people and impose particular requirements on planning.

Water Supplies

The main and almost single source of water is from the ground. Hydrological studies, that have been carried out, give relatively satisfactory data for planning. At present, general comprehensive studies are being made which will give still more accurate data. Generally speaking, quantity of water will not be a problem in the near future although the water table continues to decline. Quality is deteriorating however, owing to a greater withdrawal than recharge (mineralized water intrusion) and for some cities possibilities of installing demineralization plants are being considered. The water supplies of the cities and towns are being extended following the requirements of the lay-out and master plans. The ultimate goal of urban water supply is to meet these WHO recommendations:

1. Piped water to be available in all the premises in sufficient quantity and adequate pressure.
2. Quality of water not to be of lower standard than that set by WHO for drinkable water.
3. Water supply schemes to be administered independently on sound management practice and revenues established.
4. The design capacity of a scheme is based on a future population and an assumed ultimate per capita rate. For urban areas of low and medium density the water consumption ranges from 50 to 250 litres/capita/day. For higher density the water consumption is 300 to 600 litres/capita/day.

It is worth mentioning that in the new water plans, roof tanks will be abolished and stress placed on the overall design of the scheme to ensure required pressure and quantities on premises day and night. This was suggested by the WHO Representative and their abolition should cut the rate of water-borne diseases, since the roof tanks are the main point, where contamination of the water can take place.

Sewerage

Separate sewerage systems for the larger cities and towns have been adopted. Each system includes a treatment plant capable of treating a sewage flow three to six times the dry weather flow. In most cities the systems are in operation or are about to be completed; however, the networks cover only the central parts of the cities and plans for the suburbs are now being studied. Through the use of these treatment plants the contamination of the underground water

sources (intakes), which are in or close to the towns, will be avoided and thereby minimize the spread of water-borne diseases. On the other hand, collection of sewage and its treatment are designed to stop pollution of the sea, as untreated sewage is now freely discharged at the shoreline. Effluents from the treatment plants are to be used for irrigation.

Solid Wastes

Garbage collection and disposal can be considered satisfactory. The municipalities concerned are increasing their staff and facilities based upon the requirements of rapidly growing cities. At present collected garbage is incinerated at Tripoli, but for some other cities plans are being made to bury the garbage in 30 cm layers with adequate cover, in safe places.

Air Pollution

At present and in the near future this problem does not appear to be a serious one. Lack of heavy industry, existence of large open areas and almost permanent breeze from the sea make this problem nearly non-existent. Some pollution does exist due to the rapid increase in the number of cars.

The only serious air pollution is the occasional blow of southern wind (ghibli) carrying sand and dust. However, these days are few and effects will be minimized by increasing the green belts around cities, to keep the sand firm, and by proper design of houses. Links between ghibli and respiratory tract diseases seem to exist, however there are no statistical figures to support such a relationship.

Housing

There is a national plan to provide a house for every family which is almost completed. Some time ago the design of houses was improved particularly as regards the environmental health aspects and the location, distribution, planning and execution of corresponding public utilities.

General Note

All the aspects of public health connected with environmental factors are integrated in the overall National Development Plan. Assistance in this field has been given by the World Health Organization.

PAKISTAN

Introduction

The State of Pakistan, which consists of two wings - East Pakistan and West Pakistan - separated by 1 000 miles of Indian territory, came into being in the year 1947. The areas falling under the jurisdiction of the new State of Pakistan were mostly underdeveloped and were lacking in basic amenities of water supply, sewerage, drainage, etc. A great upheaval took place just after the partition due to the migration of refugees from one State to another. The country was confronted with an enormity of complex problems of national importance and as such nothing significant could be done in providing community services on large scale, except the development of Satellite Towns in a few cities, till the Second Development Plan 1960-1965.

Extent and Trend of Urbanization

There has been rapid urbanization due to influx of refugees from India and accelerated population growth within the country. Development projects around cities attracted rural population migration to urban areas to find better prospects of living. Due to this, some of the towns have expanded from five to ten miles. For example, the Lyallpur Town in West Pakistan which was only an agricultural market has grown to one of the largest industrial cities of Pakistan and its population has arisen from 70 000 persons to more than 750 000 persons since 1947. Similarly Khulna in East Pakistan during the same period of twenty-four years has grown from a small town of 30 000 persons to a population of 330 000 persons. The general increase in population is (Figures in million):

	1951			1961			1970 (Estimated)		
	EP*	WP**	Total	EP	WP	Total	EP	WP	Total
Rural	40.22	27.76	67.98	48.20	33.23	81.43	67.9	42.9	110.8
Urban	1.85	6.02	7.87	2.64	9.65	12.29	4.5	17.0	21.5
Total	42.07	33.78	75.85	50.84	42.88	93.72	72.4	59.9	132.3

Water Supplies

Since 1947, many improvements in the existing systems have been made and many new towns have been served with piped water supply.

*East Pakistan

** West Pakistan

	Number of Cities	Number served in 1947	Number served up to 1970
East Pakistan	78	8	22
West Pakistan	88	45	55

In spite of all the efforts, hardly 38 per cent of the urban population is served with a piped water supply.

Sewerage

Very little attention has been paid to improving the sewerage systems of cities except two in East Pakistan and fifteen in West Pakistan. A lot of work is required to be done. No treatment has been provided. Raw sewage is mostly used for irrigation. Only about 20 per cent of the urban population are connected to a sewerage system.

Garbage Disposal

Very primitive methods of garbage collection and disposal is the practice in many cities. Schemes are under preparation for proper disposal in a few towns.

Housing

Although the government has been developing housing colonies in many cities, the slum areas continue to increase. People do not want to go to distant housing colonies.

Air Pollution

This problem is on the increase due to industrialization, but nothing has been done so far to control the situation. Stream pollution is also increasing.

Environmental Health Training

There is no training for sanitarians, the M.Sc. in Public Health Engineering Course is available to College graduates. Sanitary Inspector Courses are available within the country, but they have no engineering subjects and are of low standard.

Manpower

Public Health Engineering Departments exist in both wings for planning, designing and execution of sanitary works. Specialists for trade waste disposal are needed.

QATAR

Qatar is an Arab State on the western shore of the Arabian Gulf. Its population exceeds 130 000. The capital Doha is a rapidly growing city, and 80 per cent of the population live in and around it.

The country is desert-like and its climate is distinguished by a great difference of day and season temperatures, high humidity and minimal amounts of rainfall in winter months.

Water Supply

Qatar has no rivers, and domestic water is obtained from two sources:

1. From distillation plants with total distillate capacity of seven million gallons per day.
2. From well-fields yielding three million gallons per day.

The water is chlorinated before distribution and regular check samples are taken for chemical and bacteriological examination.

Refuse and Sewage Disposal

There are two methods of treating refuse:

1. Tipping
2. Incineration

A fleet of cesspool emptiers attend to cesspool cleaning. They empty their contents on natural rifts outside the town. There is a sewage collection and treatment system designed in two stages. The first stage has already been completed.

Housing

Qatar is dependant for all its labour force on immigrants from neighbouring countries. No provision whatsoever has been made to accommodate this large number of people. The condition under which they live is appalling and highly unsatisfactory. Otherwise, the condition of housing is moderate.

Air Pollution

No problem of air pollution exists at present. Houses are widely spaced, except in limited areas of the town, and there is no threat of industrial waste pollution. Motor vehicles with their exhaust fumes are increasing each year, thereby posing an air pollution threat to the capital Doha.

Manpower

Most of the environmental health work is entrusted to a group of unqualified staff. The government has appointed some foreign health inspectors, from Jordan and Pakistan, to supervise them.

Training

WHO provides certain facilities for training. A Health Training Institute, started in 1969, will provide the Public Health Department and Qatar Municipality with trained health personnel through graduation in 1972. In-service training of the present staff is arranged for periodically.

Future Needs

1. Qualified staff. This will be partially satisfied by graduates of the Health Training Institute.
2. Better maintenance of municipal fleet of trucks. This has already been budgeted for.
3. Town planning in some congested areas should be reorganized.
4. Cooperation by the population. This will be accomplished through qualified staff from the Health Education Centre.

SUDAN

The Sudan is a large country of about one million square miles and with about 15 million inhabitants.

Its climate is temperate although in June the temperature may reach 115°F. There are wide climatical variations; the southern part of the country has a rainy season for about nine months of the year; the far north has little rain and a hard winter; the east, which lies on the Red Sea hills, has a rainy winter, and the western and central parts have the same characteristics.

There are also differences in habits and traditions and modes of living in the various regions of the country, although more prevalent in the rural areas.

Administration

The Republican Democratic Sudan is divided into nine provinces and each province is headed by a commissioner.

Environmental sanitation work in the country is financed by the Ministry of Local Government and its different councils, whereas the curative and social medicine and the training of all public health personnel are undertaken by the Ministry of Health.

The rapid increase in town population is an alarming problem and is found everywhere. This population increase has created many problems, including water supply, sanitation, employment frustration with low standard of living and migration from rural to urban areas.

Water Supply Sources

1. The Nile that runs south-north across the country provides a sufficient supply of water in its basin for both drinking and agricultural use.

2. The western part of the country, mainly two provinces with about a three million population, rely on their water from rains. Water is stored in dug out excavations, wells, or trunks of trees in certain areas.

In the capital of the provinces, water is normally treated in water works and distributed to houses. In rural areas public standpipes are established for a clean water supply. There are other groups of people who have no supply. They collect their water from distant areas and in the majority of cases use only four gallons per day when they are required to collect it.

The Government is now undertaking a serious plan to provide a water supply project for these areas and funds are being raised to support such an expensive scheme. The people are very anxious to have a wholesome supply.

Waste Matter Disposal

1. Human waste disposal methods:

- (a) Night soil bucket system in many big cities.
- (b) Pit latrines in areas of low density in both rural and urban areas.

- (c) Sewers system on a small scale in main towns.
- (d) Aqua latrines services in some towns.
- (e) A large proportion of people in rural and agricultural areas have no disposal system thus endangering the local water supplies.

Wastewater

Where a water-carried system is installed we have no problem in getting rid of the wastewater. In some areas wastewater is disposed in deep wells and cesspools. A big proportion of wastewater is allowed to run on the surface thereby creating a problem of mosquito breeding.

Solid Waste Collection

House to house collection is only made in first and second class residential areas in a city. The people here pay for this service. In other areas the refuse is taken to public refuse bins.

Removal of all refuse is done by mechanical refuse transport and finally incinerated. In certain areas the residue is used in the reclamation of land.

Another problem is the shortage of transport, which is a matter of finance, since the rapid increase of towns is creating a greater demand for increased budgets for all purposes.

Housing

Difference in habits and modes of living is bound to make some variation in the type of houses and requirement. Law provides that a minimum area of a house should not be less than 200 square meters. A house in a first class area can go up to 1 000 square meters. Materials of construction and building land coverage are also governed by law. Light and ventilation are not problems.

Recently a Ministry of Housing has been formed to undertake planning responsibilities. It is presently occupied with supplying houses for the different levels of income. The project involves materials and cost of construction.

We have been faced with a very rapid increase of population in the Khartoum Province. Population in 1965 was about one quarter of a million and it is now approaching one million inhabitants.

Air Pollution

As a developing country this problem is not acute. We hope that we shall benefit from the experience of other people before this problem becomes serious.

Manpower

The categories of manpower engaged in environmental sanitation are:

- (a) Qualified Health Officer.
- (b) Sanitary Overseer or Sanitary Aid.
- (c) Assistant Sanitary Overseer or Sanitary Aid.
- (d) Workers.

According to our last evaluation of services made in the Ministry of Health it was found that our figures are below that required. Measures are now being taken by the Ministry of Local Government to adjust these requirements as far as possible. For example, our ratio of qualified public health officers to the population is one per 75 000.

Training

We have a School of Hygiene which graduates qualified sanitarians with a Diploma of Public Health Inspectors from the Royal Society of Health, London. We graduate about twenty each year, and candidates from other countries are always welcome. The course takes three years and entrance requirements are that the candidates must have completed their secondary education.

Requirements to qualify as sanitary overseers are, they must have at least two years practical training with councils before being given the six-month course in the School of Hygiene. Short courses for other categories are also conducted in the school and locally in the different provinces.

The curriculum of the School of Hygiene and all training centres is now being revised.

Other Activities

Minimum Standard of Service

- (a) In order to attempt to make a fair distribution of services and minimize channels of migration, minimum standard of services are now discussed. These include:

- 1) Water supply
- 2) Waste matter disposal
- 3) Food preparation places
- 4) Housing accommodation.

(b) The distribution of factories and industries throughout the country is also being considered seriously to minimize migration.

(c) Full use is made of voluntary organizations, such as youth, women and cadets, in all fields of health, education, and even in the practical process of cleanliness.

(d) Refugees from other countries are accommodated in certain areas and assisted through supplying food, medical facilities, and land to cultivate. Efforts are made, however, not to overload the existing services of the area.

(e) Fellowships of different specialities are being granted by WHO and we feel they are of great benefit to us.

SYRIA

Syria has about six million people and an area of 187 000 square kilometres. The average rate of population increase is 3.3 per cent annually. Immigration to urban area has raised this rate up to 5 per cent annually in some cities. This has resulted in sanitation problems due to rapid urbanization.

More than two million people are living in cities of over 50 000 inhabitants, while the rest are living in villages and towns and small communities.

The Ministry of Municipalities and Rural Affairs is now responsible for water supply systems (source, treatment, if necessary, and networks), solid waste disposal, wastewater disposal, city planning and housing.

The Ministry of Public Health is concerned with the environmental health aspects of such projects. Sixty-six per cent of the population of Syria live in urban areas, which may include villages, while the rest live in rural areas.

(a) Water Supply

About 58 per cent of the urban population are now served with piped water in their houses. It is hoped that this figure will reach 68 per cent by the end of 1975. Seven per cent will still obtain their water from public fountains, and 25 to 35 per cent have no reliable source of drinking water.

Water consumption in rural areas varies from 30 to 75 litres/capita/day. Present planning provides for design figures of not less than 75 litres/capita/day in the year 2 000 in all communities of less than 5 000 inhabitants. In villages and cities which are larger the water consumption is from 100 to 250 litres/capita/day.

About one million people are supplied by treated surface water, while the rest are drinking water from underground sources which does not require treatment.

Water supply standards have been fixed by law. Most of these standards are identical to WHO standards. Routine chemical and bacteriological examinations are performed daily in big towns and it is hoped that this can be extended to all communities, even in rural areas, by the end of 1975.

The maintenance and operation of rural water supply projects is not easily achieved and there is a need to train technical personnel for this purpose.

(b) Wastewater Disposal

Most of the municipalities which have water supply have sewers too, while in rural areas there are no sewers and not even latrines. All the sewage is discharged into rivers and streams which are periodically dry. The combined system (storm and sanitary sewers) has been adopted throughout the country. There exists no sewage treatment plants at the present time. During the Fifth Five-Year Plan (1970-1971) the design and construction of sewage treatment plants for Damascus, Homs and Hama will be accomplished.

(c) Solid Waste Disposal

Solid waste collection is practised in all municipalities. Donkies as well as wagons drawn by tractors are used in small and big cities, while trucks or lorries are used in well-planned city zones. Difficulties are experienced in the collection of solid wastes in slums where narrow streets do not allow the entrance of vehicles.

Most of the solid waste is dumped, part of it is burned, in the open while other parts are utilized as raw fertilizers in agriculture. A composting plant is now operating in Hama and a new treatment plant in Aleppo is under construction. Part of Damascus city garbage is composted.

(d) Housing

The migration of rural population to urban areas creates a great housing problem. There is not sufficient national staff for city planning, so assistance is provided by United Nations experts in an attempt to solve this problem.

(e) Air Pollution

In the city of Homs where there is a refinery, air pollution is a problem, also in Damascus where air pollution is created by motor cars, and in winter by petroleum stoves. Nothing has been done to alleviate this problem, so far.

(f) Water Pollution Control

The orient (ASSI) river, which is now the source of water supply for Homs and Hama, is highly polluted by the effluents from the petroleum refinery and from many different factories. Sewage of Homs and Hama is also discharged in this river. Corrective action has been initiated. A department has been organized, which will impose water pollution standards for both the effluents and the river water. All factories are now obliged to treat their wastes, in accordance with these standards, before discharging them in the river. The Baroda River, where Damascus discharges its sewage, has the same problem of pollution, which is now under study. It is hoped that the Baroda River can apply the same corrective measures initiated for the orient river.

(g) Environmental Health Training

There exists an institute for the training of both medical and environmental health personnel. It is hoped that this will be extended to train operators for water supply and sewage treatment plants.

TUNISIA

Tunisia has about four million inhabitants with 40 per cent living in rural areas. The population growth (2.3 per cent per year) and the industrialization have resulted in a rural exodus, which characterizes developing countries. These two factors have created a growth of the towns and the extension of urbanized areas with slum conditions around the cities.

1. Water Supply

Tunisia has seasonal streams except for the 'Medjerdah' River, which supplies Tunis in part. Springs and deep wells provide the principal sources of water supply together with some agricultural reservoirs. A national society called 'SONEDE', financed in part by the World Bank, was established in 1968 and has an industrial and commercial outlook. SONEDE has the responsibility for water distribution systems to new developments and satisfying the need for clean water. Quality control is the responsibility of the Public Health Department (PHD), which has five regional bacteriological laboratories and a reference laboratory in Tunis, namely the 'INSTITUT PASTEUR'. Every inhabitant in the urban areas (more than 5 000 inhabitants) can be provided with water and the connection costs can be paid under easy terms. This water supply is almost continuous, with rare exceptions in summer, is adequate and safe (less than 10 per cent of the bacteriological examinations were positive in 1970) and the pressure is in the average minimum, which requires each building having more than three stores to have a storage tank. These water supplies do not, however, meet the chemical or, in some cases, the physical standards suggested by WHO. Disinfection is made by chlorination (liquid hypochlorite) usually at the pumping stations, or in the reservoirs, in a manner to leave at least 0.1 to 0.3 ppm residual of free available chlorine. This figure can be raised at the request of the Public Health Department, which controls this residual chlorine. In the rural areas water is supplied by dug wells. The Public Health Department has begun a programme to improve these wells to make them sanitary and to equip them with hand pumps with the assistance of UNICEF and CARE MEDICO. Besides, mobile crews (one for each "governorate" or province) make bi-monthly disinfection of public wells.

2. Wastewater Disposal

This is a municipal responsibility. Major cities, having more than 10 000 inhabitants, are provided with adequate sewerage systems and each house can be connected to the system with some financial facilities included in the payment of taxes. The actual sewage treatment plants (five in number) are unfortunately nearly out of operation, due to the lack of operators. For example 'chargnia' sewerage treatment plant in Tunis, is treating only one third of the total flow it receives, the remainder (two thirds) goes to the Lake of Tunis which is highly polluted. Some areas and some industrial sites also are polluted thereby creating problems of odours, flies and mosquitos. In the rural areas, the most common system of wastewater disposal is the cesspool. The Public Health Department is doing its best to control the use of sewage effluents for irrigation and to carry out health campaigns. With the help of the World Bank and SIDA, it is believed that in a few years, all the tourist areas and their cities will be provided with complete sewerage systems and adequate treatment facilities using the effluent for irrigation, when appropriate.

3. Solid Wastes

This is also a municipal responsibility. Collection is somewhat adequate, but the treatment does not exist anywhere. In the last few years, however, the Public Health Department has had a great success, in the wake of the 1970's flooding and epidemics, in convincing the municipalities (not all of them, but the most important and even in rural areas) to employ incineration, landfill or composting. By 1971 several small municipalities have shown interest in the last method and it is believed that some municipal authorities are now convinced that they should entrust this work of collection and treatment of solid wastes to private agencies for the benefit of sanitation and fly control.

4. Housing

As mentioned above, the housing difficulties exist in Tunisia and the rural exodus together with the tourist boom create slum conditions around all major cities. In the past, in Tunisia urbanism was not aided by any long-term national plan. Today it has become necessary that each town should have, very soon, its planning programme involving the control of its expansion within a plan for the organization and development of the whole country, in order to stop the depopulation of rural areas. The Ministry of Public Works and Housing now has the situation under control. They plan housing projects with the help of all authorities concerned. Issue building permits for housing or industries; control clandestine construction with assistance from the municipalities and give loans for the improvement of housing.

5. Air Pollution Control

Tunisia does not yet have any problem with the exception of industrial areas, where air pollution is beginning. It is not expected that there will be any in the near future provided that recreational gardens, green belts and public parks continue to be developed or extended around cities and unless there is a substantial increase in the number of motor vehicles.

6. Environmental Health Manpower and Training

All environmental health activities are, at the regional levels, in the hands of public health doctors.

One national sanitary engineer and one WHO engineer adviser are assisting the Public Health Department, which controls the sanitation of the thirteen regional sections of the country. The Public Health Department has about 400 sanitarians, trained in Tunisia with the help of WHO. In the next few years the Public Health Department

will be able to start the training of a higher category of sanitarians capable of performing supervisory functions, about ten sanitary engineers will graduate from Rabat University (Morocco).

Tunisia still has a great deal of work to do in environmental sanitation. Many programmes are under study with the assistance of WHO and help will be required from UNICEF, World Bank and UNDP.

YEMEN

Yemen is a small country. The population is not exactly known, as no census has ever been made, but it is estimated to be about five million and seems not to have varied very much over the years.

The rainy season coincides with the summer time and the population depends on rain for water, both for irrigation and drinking purposes.

Urbanization in Yemen is not a problem today, because large areas are available, but it will become a serious problem, particularly due to immigration, if appropriate city planning criteria are not established in the near future.

Health

In Yemen there are about thirteen hospitals containing 1 000 beds.

Health Centres:	three centres in large cities with WHO technical assistance.
Sanitarian Schools:	none (closed two years ago).
Nursing Schools:	three schools with WHO technical assistance.
Manpower:	planned to be built up in the near future.

(a) Doctors:	2 specialists 12 general practitioners 70 physicians 50 foreigners
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(b) Preventive Medicine:	1 doctor and about 100 sanitarians.
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Most of their work is concentrated on vaccination and supervision of the public places.

No sanitary engineers are working in public health activities.

Health Problems:

- In children: Malnutrition, gastro-enteritis and bad handling by mothers.
- In adults: Parasitic infestation and nutritional deficiency diseases. Kat chewing and schistosomiasis are the present problems.

Water

The most pressing problem in Yemen is lack of water. We depend on rainfall. Four years have passed without rain in about half of the country. As a result, most of the land produced no agricultural products this year. We may have a famine within a few months exactly as happened last year. In the capital Sana'a every house has its own well and most of the city dwellers have had to deepen their water wells every few months to reach water. Others buy water daily paying nearly 20 per cent of their salary. In rural areas it is even worse. Now WHO, acting as UNDP Special Fund Executing Agency, is going to build a water supply for Sana'a and Hodeida. It is hoped that they will find sufficient water resources for their project. It is proposed to plan for sewerage systems and proper sewage final disposal as soon as public water is available.

Sewerage Systems

Sewerage systems are not yet established in Yemen. Every house digs a hole in the ground about twenty metres deep for excreta disposal. This is a bad practice, because of potential groundwater contamination, since there are a great number of wells in the city. Other houses use underground or street level latrines and the faecal matter is collected by private people, who dry it out for use as fuel in the turkish baths.

Waste

Solid waste disposal is not a serious problem, because the quantities of domestic waste are relatively small. It is put into a container, consolidated into barrels in the streets, and then public cars transfer the wastes outside the city. The average quantity of solid waste is about 1 kg/capita/week.

Air Pollution

Such problems are not found in Yemen as the process of urbanization is still rather slow. There are only a few hundred motor cars and not more than one or two factories in the big cities, and there are no railways. Therefore, there still exists pure air to breathe.

Housing

In spite of the fact that each family lives alone in a big house, yet the houses are crowded. Families perform all their functions in one or two rooms. Ventilation is not adequate.

Government

The Government of Yemen is developing a project for the national use of manpower and will establish a Manpower Institute with the technical assistance of WHO and financial help of UNDP. The Government will have the responsibility of providing the building.

ANNEX I

ENVIRONMENTAL HEALTH CRITERIA FOR URBAN PLANNING

1. Criteria for Urban Water Supply

- a) Urban water supplies should be continuous, adequate and safe, and should have sufficient pressure.
- b) Urban water supplies should meet at least the standards specified in the current edition of the International Standards for Drinking Water recommended by WHO.
- c) Adequate supplies of potable and palatable water should be provided for the domestic use of every inhabitant of the urban area.
- d) Sufficient water with adequate pressure should be made available for fire services.

2. Criteria for Wastewater Systems

- a) Sewerage systems, sewage treatment facilities and adequate storm water drainage should be provided in urban areas.
- b) Sewage treatment facilities should be adequate to permit subsequent uses of receiving bodies of water.
- c) Adequate drainage of storm water should be provided in urban areas as to prevent localized flooding.

3. Criteria for Urban Area Water Resources

- a) Water supply, sewerage and drainage should be considered as a unit or as a system and their coordinated planning as an integral part of the metropolitan plan.
- b) Water supply, sewerage, sewage treatment and, where possible, drainage should be considered as a public utility and financed on a self-liquidating basis.

4. Criteria for Solid Wastes Management

- a) The storage, collection, transport and disposal of solid wastes should be considered as units of a system, each interrelated to the other.
- b) The storage, collection and transport of solid wastes, particularly garbage, should be done in the most sanitary and efficient way possible to assure proper control of infectious diseases.

- c) The collection and transport of solid wastes should not cause traffic congestion or create a nuisance situation.

5. Criteria Concerning Land Pollution

- a) Seepage into, or discharge on the earth surface of chemicals, including oil should not pollute the soil or the groundwater table.
- b) Excavation for sand and gravel and spoil banks from mining operations should not create breeding areas for insect and rodents, nor nuisance conditions, and should not interfere unduly or seriously limit future land use of the site.
- c) Discharge of radioactive materials on the earth surface or burial of these materials in the earth's surface should not create potential hazards to present and future generations of humans, plants or animals.
- d) Land conservation practices should be developed in cooperation with soil conservation groups and these practices should be made an integral part of the urban plan for solid waste disposal.

6. Criteria for Air Pollution Control

- a) The siting of new towns should be undertaken only after a thorough study of local topography and meteorology.
- b) New industries using materials or processes likely to produce air contaminants should be so located as to minimize the effects of air pollution in the population.
- c) Satellite (dormitory) towns should be restricted in use of pollution-producing fuels.
- d) Provision should be made for the development and maintenance of green belts and open spaces to facilitate the dilution and dispersion of unavoidable air pollution.
- e) Greater use should be made of hydroelectric and nuclear energy and of natural gas for industrial processes and domestic purposes as a means of reducing the pollution resulting from the use of conventional fossil fuels.
- f) Greater use should be made of central plants for the provision of both heat and hot water for entire districts.
- g) As motor transport is a major source of pollution, traffic should be planned as to reduce the level of pollution from motor powered vehicles in residential areas.

7. Criteria for the Use of Ionizing Radiation

- a) If nuclear reactors are to be used for the generation of electric energy of an urban area, the location of such reactors should be planned so that radiation hazards to the population experienced through the accidental release of radioactive wastes into the air, water and ground will be at an absolute minimum.
- b) Nuclear reactors not used for power production and facilities for the processing of radioactive substances should be located in remote areas with low population densities.

8. Criteria for Housing and Open Space

- a) Residential areas should be protected against all sources of pollution - air, water and soil.
- b) Conditions in residential areas should not interfere with the provision of sunshine and natural ventilation.
- c) Protection should be afforded against noise.
- d) Roads and streets in residential areas should be designed to minimize accidental injury to the residents of the areas.
- e) Residential areas should be designed as to eliminate undesirable segregation of individuals, families and groups of families.
- f) Residential areas should be planned with ample provision of open spaces for recreation and relaxation and as to be easily accessible.
- g) Open spaces should be provided for passive activities.
- h) In residential areas, or in areas easily accessible from residential areas, provision should be made for schools, crèches, hospitals and health care facilities.

9. Criteria for Public Health Establishments

- a) Establishments intended to meet the routine medicine needs of a population should be located as to serve residential areas.

10. Criteria for Vector Control

- a) Provision should be made to eliminate and to prevent the creation of breeding areas and harbourages of biological vectors of human disease or to provide effective barriers and control measures to prevent the transmission of infectious agents to humans.

11. Criteria for Noise and Vibration

- a) Noisy industrial establishments, airports, landing fields for helicopters, railway stations and junctions and superhighways should be located outside the city limits.
- b) Planning should make provision for the surfacing of highways and urban streets with materials that will prevent or reduce noise from vehicles travelling on the highways and streets.
- c) Green belts or open spaces should be planted with trees and shrubbery particularly if the green belt or open spaces are between a residential area and a source of noise, since vegetation has some sound absorbing capacity.

12. General Criteria

- a) Wastes should not be transferred from one part of the environment to another without adequate study of the effect of the waste on the environment as a whole.

ANNEX II

LIST OF PARTICIPANTS

EASTERN MEDITERRANEAN REGION

AFGHANISTAN

Mr Shah Aqa
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IRAQ	Dr A.R.H. Khayat Director, Sanitary Engineering Ministry of Health <u>Baghdad</u>
JORDAN	Dr T. Abdul-Razak Amman Municipality <u>Amman</u>
LIBYA	Mr R.A. Akrami Head, Water Supply Department Ministry of Housing and Public Utilities <u>Tripoli</u>
PAKISTAN	Mr M.F. Qureshi Director Public Health Engineering Department <u>Lahore</u> Mr I.A. Beg Chief Engineer Lahore Municipal Corporation <u>Lahore</u> Dr Abdul Qadeer Khan Medical Officer I/c G.H.Q. Hospital, Loralai <u>Baluchistan</u> Mr M.H. Rahimtoola Chief Engineer Karachi Development Authority <u>Karachi</u> Dr A.A. Shah Deputy Director Health Services North West Frontier Province <u>Peshawar</u>

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OBSERVERS FROM HOST COUNTRY

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Dr Ghulam Mohammad
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REPRESENTATIVES FROM OTHER UN BODIES

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Mr W.J. Waylett
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Agency for International Development
Lahore

WHO SECRETARIAT

Dr. A.H. Taba	Director	WHO Regional Office for the Eastern Mediter- ranean, Alexandria
Mr L.J. Lovelace	Adviser on Environ- mental Health	WHO Regional Office for the Eastern Mediter- ranean, Alexandria
Mr F.A. Jacocks	Consultant	Special Assistant to the Director, Bureau of Community, Environ- mental Management, Department of Health, Education and Welfare, Public Health Service Rockville, Maryland, USA

Professor E.W. Mood	Temporary Adviser	Associate Professor of Public Health and Chief of Environmental Health Section, Department of Epidemiology and Public Health, School of Medicine, Yale University, New Haven, USA
Mr R. Casanueva	Temporary Adviser	Consultant Engineer in Environmental Health, Santiago, Chile
Mr J.V. Dibble	Sanitary Engineer	Community Water Supply and Sanitation, Lahore
Miss C. Cartoudis	Conference Officer	WHO Regional Office for the Eastern Mediterranean, Alexandria
Mrs G. Pappas	Secretary	WHO Regional Office for the Eastern Mediterranean, Alexandria.

ANNEX III

PROGRAMME

1. THURSDAY, 7 OCTOBER 1971 - VENUE: INTERCONTINENTAL HOTEL, LAHORE
 - 8.30 a.m. - 9.30 a.m. - Registration of Participants.
 - 9.30 a.m. - 10.30 a.m. - Opening Session
 - Welcome address by Rear Admiral A.N. Ansari, Director-General of Health, Pakistan.
 - Short speech by Mr A. Hasan, Vice-Chancellor of the University of Engineering and Technology, Lahore.
 - Address by Dr A.H. Taba, Director, WHO, Eastern Mediterranean Region.
 - Inaugural address by Lt. General M. Attiqur Rahman, Governor of the Punjab, West Pakistan.
 - 10.30 a.m. - 10.45 a.m. - Recess
 - 11.00 a.m. - 2.00 p.m. - Elections of Officers: a Chairman, a Vice-Chairman and a Rapporteur.
 - Adoption of the Agenda.
 - Programme of Work by Mr L.J. Lovelace.
 - Urbanization and related environmental health problems by Mr F.A. Jacocks Doct/4.
 - Health problems arising from water pollution and defective waste disposal.
 - Socio-economic aspects of slums.
 - Sanitation control as preventive measure.
2. FRIDAY, 8 OCTOBER 1971
 - 8.30 a.m. - 9.00 a.m. - Steering Committee
 - 9.00 a.m. - 11.45 a.m. - Environmental Health Programme of WHO as Related to Urban Development presented by Mr. L.J. Lovelace Doct./5.
 - Sanitation Problems of Rapid Urbanization in EMR (statements by participants).
 - 1.00 p.m. - 4.00 p.m. - Field visit to Paper Mill in Lahore.

3. SATURDAY, 9 OCTOBER 1971

- 8.30 a.m. - 9.00 a.m. - Steering Committee
- 9.00 a.m.* - 2.00 p.m. - Statement by Participants (Continued).
- Planning of Metropolitan Areas and New Towns by Professor E.W. Mood Doct./6.
- Planning and Design of Urban Water Supplies by Mr R. Casanueva Doct./7.

4. SUNDAY, 10 OCTOBER 1971

- 7.00 a.m. - 7.30 p.m. - Field visit to Mangla Dam (90 miles from Lahore).

5. MONDAY, 11 OCTOBER 1971

- 8.30 a.m. - 9.00 a.m. - Steering Committee
- 9.00 a.m.* - 2.00 p.m. - Planning for Operation and Maintenance of Community Water Supplies by Mr J.V. Dibble Doct./8.
- Waste Collection and Disposal by Mr F.A. Jacocks Doct./9.

6. TUESDAY, 12 OCTOBER 1971

- 8.30 a.m. - 9.00 a.m. - Steering Committee
- 9.00 a.m.* - 2.00 p.m. - Planning and Design of Sanitary and Storm Sewers - Sewage Final Disposal by Mr R. Casanueva Doct./10.
- Oxidation Ponds by Dr M. Islam Sheikh Doct./11.
- Organization and Administration of Environmental Health Services by Mr F.A. Jacocks Doct./12.

* 10.30 a.m. - 10.45 a.m. - RECESS

7. WEDNESDAY, 13 OCTOBER 1971

- 8.30 a.m. - 9.00 a.m. - Steering Committee
- 9.00 a.m.* - 2.00 p.m. - Legislation
by Professor E.W. Mood Doct./13.
- Financing Water and Sewerage Schemes
by Mr R. Casanueva Doct./14.
- Education, Training and Employment
of Sanitary Engineers, Sanitarians
and other Auxiliary Staff by
Professor E.W. Mood Doct./15.

8. THURSDAY, 14 OCTOBER 1971

- 10.00 a.m. - 10.30 a.m. - Films.
- 10.30 a.m. - 11.30 a.m. - Summary of conclusions and recommendations.
- Adoption of recommendations.
- Closing Session.

* 10.30 a.m. - 10.45 a.m. - RECESS

ANNEX IV

LIST OF BASIC DOCUMENTS

PROVISIONAL AGENDA	EM/SEM.SAN.PROB.URB./1 - Rev.2
PROVISIONAL PROGRAMME	EM/SEM.SAN.PROB.URB./2 - Rev.1
PROVISIONAL LIST OF PARTICIPANTS	EM/SEM.SAN.PROB.URB./3
URBANIZATION AND RELATED ENVIRONMENTAL HEALTH PROBLEMS by Mr F.A. Jacocks, WHO Consultant	EM/SEM.SAN.PROB.URB./4
ENVIRONMENTAL HEALTH PROGRAMME OF WHO AS RELATED TO URBAN DEVELOPMENT	EM/SEM.SAN.PROB.URB./5
PLANNING OF METROPOLITAN AREAS AND NEW TOWNS by Professor E.W. Mood, WHO Temporary Adviser	EM/SEM.SAN.PROB.URB./6
PLANNING AND DESIGN OF URBAN WATER SUPPLIES by Mr R. Casanueva, WHO Temporary Adviser	EM/SEM.SAN.PROB.URB./7
PLANNING FOR OPERATION AND MAINTENANCE OF COMMUNITY WATER SUPPLIES by Mr J.V. Dibble, WHO Sanitary Engineer	EM/SEM.SAN.PROB.URB./8
WASTE COLLECTION AND DISPOSAL by Mr F.A. Jacocks, WHO Consultant	EM/SEM.SAN.PROB.URB./9
DESIGN OF SANITARY AND STORM SEWERS SEWAGE FINAL DISPOSAL by Mr R. Casanueva, WHO Temporary Adviser	EM/SEM.SAN.PROB.URB./10
OXIDATION PONDS by Dr M. Islam Sheikh, Professor of Civil Engineering, University of Engineering and Technology, Lahore, West Pakistan	EM/SEM.SAN.PROB.URB./11

ORGANIZATION AND ADMINISTRATION
OF ENVIRONMENTAL HEALTH SERVICES
by Mr F.A. Jacocks,
WHO Consultant

EM/SEM.SAN.PROB.URB./12

LEGISLATION
by Professor E.W. Mood,
WHO Temporary Adviser

EM/SEM.SAN.PROB.URB./13

FINANCING WATER AND SEWERAGE SCHEMES
by Mr R. Casanueva,
WHO Temporary Adviser

EM/SEM.SAN.PROB.URB./14

EDUCATION, TRAINING AND EMPLOYMENT
OF SANITARY ENGINEERS, SANITARIANS
AND OTHER AUXILIARY STAFF
by Professor E.W. Mood,
WHO Temporary Adviser

EM/SEM.SAN.PROB.URB./15

ANNEX V

LIST OF BACKGROUND MATERIAL

URBAN HEALTH SERVICES (Expert Committee on Public Health Administration - 5th Report)	TRS NO. 250
ENVIRONMENTAL CHANGE AND RESULTING IMPACTS ON HEALTH (Report of a WHO Expert Committee, Geneva, 1964)	TRS NO. 292
ENVIRONMENTAL HEALTH ASPECTS OF METROPOLITAN PLANNING AND DEVELOPMENT (Report of a WHO Expert Committee, Geneva, 1964)	TRS NO. 297
TREATMENT AND DISPOSAL OF WASTES (Report of a WHO Scientific Group, Geneva, 1966)	TRS NO. 367
THE EDUCATION OF ENGINEERS IN ENVIRONMENTAL HEALTH (Report of a WHO Expert Committee, Geneva, 1967)	TRS NO. 376
RESEARCH INTO ENVIRONMENTAL POLLUTION (Report of Five WHO Scientific Groups, 1968)	TRS NO. 406
WATER POLLUTION CONTROL IN DEVELOPING COUNTRIES (Report of a WHO Expert Committee, Geneva, 1967)	TRS NO. 404
URBAN AIR POLLUTION WITH PARTICULAR REFERENCE TO MOTOR VEHICLES (Report of a WHO Expert Committee, Geneva, 1968)	TRS NO. 410
COMMUNITY WATER SUPPLY (Report of a WHO Expert Committee, Geneva, 1968)	TRS NO. 420

NATIONAL ENVIRONMENTAL HEALTH PROGRAMMES:
THEIR PLANNING, ORGANIZATION AND ADMINIS-
TRATION
(Report of a WHO Expert Committee, Geneva,
1969)

TRS NO. 439

URBAN WATER SUPPLY CONDITIONS AND NEEDS IN
SEVENTY-FIVE DEVELOPING COUNTRIES
Dieterich, B.H. and Henderson, J.M. (1963)

PUBL.HLTH.PAP.
NO. 23

HOUSING PROGRAMMES: THE ROLE OF PUBLIC
HEALTH AGENCIES
Andrzejewski, A. et al (1964)

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NUISANCE

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PROBLEMS IN COMMUNITY WASTES MANAGEMENT
Ellis, H.M. et al (1969)

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Goromosov, M.S. (1968)

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NO. 33

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December 1967

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(UN Publication)

SALES NO. 67. IV.5
(ST/SOA/65)

THE CENTRAL PUBLIC HEALTH ENGINEERING RE-
SEARCH INSTITUTE, NAGPUR, INDIA
(UNDP/WHO Report, Geneva, 1968)

POLICIES FOR SOLID WASTE MANAGEMENT

US PHS Publication
No. 2018

REPORT ON THE SEMINAR ON AIR POLLUTION
Teheran, 21-29 April 1969

EM/ES/144
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IRCWD NEWS
by the WHO International Reference Centre
for Wastes Disposal, March 1971

No.1

WHO EMRO

EM/ES/191
Annex V
page iii

SECOND ANNUAL REPORT 1970
by WHO International Reference Centre for
Community Water Supply

THE CHALLENGE TO PUBLIC HEALTH OF URBANIZATION
(Report on the Technical Discussions at the
Twentieth World Health Assembly, 17 May 1967)

A20/Techn.
Disc./6