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EXPERT COMMITTEE ON ENVIRONMENTAL SANITATION

Second Report

	Page
1. Introduction	4
2. Categories of personnel	8
3. Education and training	13
4. Establishment of training centres	17
5. Utilization of personnel	18
6. Recapitulation of main recommendations	20

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EXPERT COMMITTEE ON ENVIRONMENTAL SANITATION

Second Session

Geneva, 15-20 October 1951

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EXPERT COMMITTEE ON ENVIRONMENTAL SANITATION

Second Report ¹

The Expert Committee on Environmental Sanitation held its second session in Geneva from 15 to 20 October 1951.

Dr. Brock Chisholm, Director-General of the World Health Organization, opened the session and welcomed the members of the committee. He outlined the structure of the Organization, in particular as it concerns the expert committees. The importance of the latter lay in their study of general problems and of the solutions to be applied in differing circumstances. He laid particular emphasis on the fact that the reports of expert committees, after having been authorized for publication by the Executive Board, were sent without any change, but with the Board's comments, to governments for their information. It was, therefore, important that the wording of such reports should be carefully studied and that the conclusions reached by the committee should be such as to be applicable to all countries, whatever their stage of development.

The Director-General asked the committee to devote its attention, during the present session, to the specific problem of the education, training, and utilization of personnel for environmental sanitation. He brought to the notice of the committee the fact that the need for environmental sanitation had found increasing acceptance in all countries since the first session of the committee, held two years ago. He emphasized the desirability of the committee's recognition of differences in conditions prevailing in various

¹ The Executive Board, at its ninth session, adopted the following resolution :

The Executive Board

1. NOTES the report of the Expert Committee on Environmental Sanitation on its second session ;
2. THANKS the members of the committee for their work ;
3. AUTHORIZES publication of the report, and
4. REQUESTS the Director-General to base future programme proposals in this field on the general recommendations of this report, bearing in mind the advantages of activities in the nature of self-help, education and stimulation of local interest in favour of general improvement of environmental conditions.

(Resolution EB9.R47, *Off. Rec. World Hlth Org.* 40, 16)

countries in the world and of framing recommendations acceptable under such conditions on a worldwide basis.

Professor Abel Wolman was unanimously elected Chairman and Professor K. Subrahmanyam, Rapporteur for the session.

1. Introduction

1.1 General

1.1.1 The committee noted the resolution on the improvement of environmental hygiene and sanitation adopted by the Fourth World Health Assembly :

“ The Fourth World Health Assembly,

Recognizing the supreme importance of providing, as an essential part of the public-health programme, for the improvement of environmental hygiene and sanitation, including the development on sound lines of urban and rural planning and of housing schemes,

1. RECOMMENDS to all Member States that appropriate provision should be made to train, and to employ in their health administrations, adequate numbers of public-health engineers, town-planners, architects and other allied personnel ;

2. REQUESTS the Executive Board and the Director-General to give to Member States all possible help in creating the necessary training facilities.”²

1.1.2 By the term “ environmental sanitation ”³ the committee means the control of all those factors in man's physical environment which exercise or may exercise a deleterious effect on his physical, mental, or social well-being.⁴ In particular it refers to the control of :

(a) methods for the disposal of excreta, sewage, and community wastes to ensure that they are adequate and safe ;

(b) water-supplies, to ensure that they are pure and wholesome ;

(c) housing, to ensure that it is of a character likely to

(i) provide as few opportunities as possible for the direct transmission of disease, especially respiratory infections, and

(ii) encourage healthful habits in the occupants ;

² Resolution WHA4.19, *Off. Rec. World Hlth Org.* 35, 24

³ In general, the definition given is based on that used in the report on the first session of the Expert Committee on Environmental Sanitation (*World Hlth Org. techn. Rep. Ser.* 1950, 10, 5).

⁴ In the Preamble to the Constitution of the World Health Organization “ health ” is defined as “ a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity ” (World Health Organization (1952) *Handbook of basic documents*, 4th ed., Geneva, p. 3).

(d) milk and other food-supplies, to ensure that they are safe (the question of their nutritive quality being excluded from consideration) ;

(e) personal and public habits of cleanliness, especially in relation to disease ;

(f) arthropod, rodent, mollusc, or other alternative hosts associated with human disease ;

(g) atmospheric conditions, to ensure that the external atmosphere is free from deleterious elements and that the internal conditions of workshops, houses, etc., are suitable for the occupations undertaken in them ;

(h) factories, workshops, dwellings, streets, and the general environment, to ensure freedom from risk to health whether mechanical, chemical, or biological, and to provide the best working and living conditions.

1.1.3 The main difficulties in the preparation of a report on the subject of the utilization and training of sanitation personnel which will be of general application and validity in all countries lie in the wide variety and complexity of the systems at present in use. The conditions in which such personnel work vary from rural areas in the most underdeveloped regions of the world, through rural and urban districts of many degrees of advancement, to the most highly-developed industrial areas of modern cities.

Similarly, the systems of local and central government through which control of the environment is normally exercised have developed in many different ways according to local needs and according to the political, economic, and social outlook of each nation.

The committee considers that its function is to offer guidance to individual nations based on a broad appreciation of the problems commonly met with in different parts of the world. It is hoped that the pooling of information and experience which has been acquired by different nations will be of real benefit to those countries which are seeking to organize or to re-organize their environmental sanitation services. Detailed application of the principles laid down in this report must depend upon and be adapted to local conditions and requirements.

1.1.4 The assumption, perhaps too widely made, that underdeveloped regions are not prepared for the services of the best-trained specialists in environmental sanitation can readily be contested. Countries of minimum resources are most in need of the highest expert service available, both for diagnosis of need and for planning of solutions. The relegation of these functions to less-adequately prepared persons results from a great misunderstanding of the complexity of the problems in environmental sanitation encountered in areas of low economic level. These problems require for their solution the impact of high intelligence, training, and experience,

even when the number of persons possessing such qualifications is necessarily a minimum. It is unsound practice literally to send a boy to do a man's job.

1.1.5 The terminology used to denote the various groups of sanitation workers shows considerable variation from one country to another. Titles such as "health officer", "health inspector", "sanitary inspector", and "sanitarian" are open to numerous interpretations. The committee does not consider it practicable at this time to propose a uniform system of nomenclature for general adoption. For the purposes of this report, however, it is essential that some classification of the types and duties of personnel should be made and section 2 (page 8) sets out the meanings which the committee has placed upon these terms. Recommendations in other parts of the report should be read in the light of these interpretations.

1.2 *Organization of environmental sanitation services*

A survey of the sanitation services of a number of nations reveals wide variations in administrative practice, which can no doubt be accounted for by the historical development of these services. Health problems have presented themselves in varying degrees of urgency at different times in different countries, and this fact, combined with the rapid advances in knowledge of communicable diseases which have taken place and are taking place, is sufficient to explain the apparently haphazard and unrelated developments in public-health organizations.

1.2.1 Some countries, for instance, have tended towards a vertical organization of health services. Such is the case in the Netherlands, where governmental institutes have been formed, each of which is responsible for a well-defined aspect of environmental sanitation. These include the Government Institute for Water-Supply, the Inspection of Labour, the Government Institute for Sewage Purification, and the Veterinary Public Health Service. The personnel employed in these services naturally tend to be specialists in their own subjects.

Other countries have developed a different approach and have built up their health organizations on broadly based ministries in which technical staff are expected to be conversant with many aspects of the ministries' work. This may be described as a horizontal structure as opposed to the vertical organization mentioned above. It is exemplified by the State health departments in the USA which concern themselves with all aspects of sanitation within their areas. Those employed in these departments are engaged on many different phases of design, inspection, advice, and control, and their training is therefore of a character designed to suit these particular requirements.

Sanitation activities have been developed outside the health departments in still other countries, including a number in South America.

1.2.2 Another classification of health organizations is possible according to the degree of centralization. In the United Kingdom, local authorities are charged by Acts of Parliament with the duties of providing for the sanitation of their areas, and the central government departments act generally in an advisory and co-ordinating capacity. The French system involves a higher degree of central control, operating through government representatives at the level of the Département with the advice of the departmental board of health (Conseil départemental d'Hygiène).

The majority of nations are found to base their organizations on various combinations of these systems but tend towards either centralized or decentralized types of health services. In the former group it is highly desirable that local government and community organizations should take an active interest in and share the responsibility for sanitation activities. In the latter group, while sanitation activity is to a large extent primarily dependent on local authority, it must inevitably depend on the central organization for such services as the development of standards, research studies, and consultation.

In underdeveloped or emergent countries where local government has not yet progressed sufficiently to take over responsibilities for sanitation and where sufficient trained personnel are not yet available, centralization is often the most desirable pattern at the beginning of activity.

1.2.3 There are also differences between nations as to the relative positions in the sanitation services of medical officers, engineers, and sanitarians. The statutory responsibility for health, including matters of sanitation, is in most countries laid upon the medical officer of health. In the USA, all three groups are generally integrated in the State health department, which contains a division or bureau of sanitary engineering (including both engineers and sanitarians) working alongside other divisions, with a medical officer at the head. In the United Kingdom, engineers concerned with sanitation works are generally employed in municipal engineering departments or with consulting engineers. Both of these groups operate separately from, but in close collaboration with, the public-health departments of the responsible local authorities, with their medical officers of health and their sanitary inspectors.

These two examples may be taken as extremes and numerous deviations are found in different parts of the world. It is not considered necessary to detail the various national organizations in this report: the purpose of this section is merely to indicate the wide variety of conditions prevailing and the different ways in which countries have attacked their problems.

It must not be forgotten that in many areas of the world governmental organization has not yet become sufficiently firmly established or widespread to enable it to support distinct services for environmental control. The development of such services must, therefore, be related to the development of other aspects of government. Nevertheless, the committee wishes to stress that in such areas the most rapid improvement in health conditions will generally occur through early concentration on environmental sanitation, in conjunction with a maternal and child health programme.

1.3 *Spheres of activity*

While acknowledging the wide variety of practice in the various countries of the world, the committee considers that the duties of personnel employed in environmental sanitation may be divided into three broad functions, as follows :

(a) Design, construction, operation, and maintenance of works intended to effect major changes in the environment in the interests of health. Such activities include the supply of water, the disposal of wastes, town-planning and housing, industrial hygiene, insect and rodent control, and the mechanical processing and distribution of food and milk. These services are mainly the responsibility of professional engineers and architects, trained for work in environmental sanitation, with the co-operation of specialists in other sciences such as chemists, bacteriologists, entomologists, and medical doctors.

(b) Inspection, reporting, prevention, and adjustment of faults in existing environmental conditions, and advising on and ensuring compliance with the law, which are the functions of sanitarians of various degrees of training according to circumstances.

(c) Activities in the nature of self-help, education, and stimulation of local interest in favour of general improvement of environmental conditions.

The committee considers that activities as outlined in (c) are essential to the success of the work of categories (a) and (b) in those areas where sanitary works of any kind are new or unfamiliar. It has been observed in numerous cases that provision of even the best sanitary facilities is a waste of effort if the population is unable to appreciate their value or has not learned how to use them.

2. **Categories of Personnel**

The committee noted the various documents which had been submitted for its guidance, including, in particular, reports on the technical discussions held at the Fourth World Health Assembly, background information

transmitted by countries for the technical discussions, and reports submitted by many members of the Expert Advisory Panel on Environmental Sanitation and other experts and by several national health-authorities and associations.

The general view of the committee, after studying relevant documents, was that it should lay particular emphasis on the description of the various categories involved directly in the practice of sanitation and on the ways in which other members of the health team should direct their own activities toward effecting improvements in the environment. This decision was taken in full realization of the complexity of the problem described in section 1 of the report. It was felt that the task of developing a programme of environmental sanitation based upon the control of the four component parts of the physical environment — air, soil, water, and fire — is independent of the stage of development of a country, applying equally well to the most highly developed as to the least developed.

The committee has already pointed out the common fallacy that environmental services in underdeveloped countries can be planned and executed by persons having little or no skill. There must be a development of sanitary engineering, in collaboration with other professional disciplines required for the study and planning of an environmental sanitation programme, to find simple and economical sanitary methods for field application. Without such an approach, wasteful and ineffective methods may be employed which actually will cause irreparable damage. The less developed a country, the more complex is the task of solving its environmental problems.

2.1 Sanitary engineers

Sanitary engineers, also known as public-health engineers, are assumed to have a broad and thorough understanding of the whole range of environmental conditions that affect human well-being, to be well qualified by aptitude, training, and experience to serve as true professionals at the various levels of responsibility relating to the environment in public-health and associated organizations, and, in the upper echelons, to be able to take their place alongside their counterparts in other professions in assuming responsible administrative duties and other public-health functions. In addition, they should possess the skills required to prepare the design and to supervise the construction and operation of sanitary works.

2.2 Plant operators

Plant operators are assumed to have the requisite skills to operate specific sanitary works. Plants representing considerable investments are often operated by university-trained men who are aware of their duties.

In the case of operators of small plants, who are frequently poorly prepared, more-advanced training will often be required. In the latter case, well-developed countries have a reserve pool of skilled workers for recruitment purposes, but in less well-developed countries special efforts must be made to find and to develop such personnel.

2.3 *Other specialists*

Specialists in a number of other fields of applied science play an important part in the study and management of the environment for the benefit of mankind. Their special skills are assumed to be on a level with those of other members of their own professional groups. Each has a sound contribution to make in his own speciality to the work of the health team. Examples of such specialists are statisticians, chemists, biologists, veterinarians, entomologists, and physicists.

2.4 *Medical officers of health*

The committee has not felt that it comes within its province to deal with the qualifications, experience, or training of medical officers of health. That task rests more appropriately with the Expert Committee on Professional and Technical Education of Medical and Auxiliary Personnel, which has, indeed, had the subject under review.⁵ Nevertheless, the committee would like to mention here that it recognizes the medical officer of health as occupying a key position in the team charged with solving the problems of environmental sanitation. In fact, in most countries the statutory responsibility for the direction of health programmes, including that of environmental sanitation, is laid on him. For this reason, and because of the necessity for teamwork, the committee feels that the medical officer of health — a health officer, as he is described in some countries — should be specially equipped by training and experience to assume that role.

2.5 *Personnel engaged in personal health services*

These include general practitioners of medicine, nurses, medical social-workers, midwives, etc. While rendering services they have innumerable opportunities to stress the importance of environmental sanitation.

The medical profession and its auxiliaries have made and are making some contribution to the common effort in environmental sanitation. Nevertheless, by reason of the quality of their training and, in many countries, the reasonable staffing in these professions their interest might well

⁵ *World Hlth Org. techn. Rep. Ser.* 1950, 22

be further stimulated and their effort intensified. That, of course, will depend on providing their members with adequate and efficient instruction in sanitation.

2.6 *Public-health nurses and health visitors*

The committee recognized the special contribution which public-health nurses and health visitors can make to the improvement of environmental sanitation. Because of their close contact with individuals and families, they have an unusual opportunity for encouraging and helping sound sanitary practice in the home.

The public-health nurse should have a sound knowledge of the living conditions of those whom she visits, and be prepared to give practical advice on how they can help themselves to better their environment and so to manage their lives as to make the best of those conditions.

2.7 *Industrial hygiene personnel*

Industrial hygiene personnel are considered by the committee to be specialists in certain phases of environmental sanitation. They comprise industrial medical officers, and other industrial hygienists who are usually engineers, chemists, or applied physiologists.

Inspectors of factories in many countries carry most of the statutory responsibility for the administration of factory laws and regulations, which include provisions for environmental sanitation within the factory and, in some cases, for the disposal of factory wastes. There are various categories of inspectors, such as medical inspectors and engineering inspectors; these have statutory duties of inspection.

Besides these there are labour and social-welfare officers and safety engineers who have a great deal to do with the day-to-day maintenance of environmental conditions in factories which will avoid risks to the health or safety of workers.

2.8 *Sanitarians*

The personnel included within the category of sanitarians have, for purposes of convenience and simplicity, been grouped into three classes, under the titles "health inspector", "health assistant", and "health aid". These titles do not necessarily correspond to personnel in any one country having the same or similar titles. In general, these titles do not include medical personnel (discussed in sections 2.4 and 2.5, page 10).

2.8.1 *Health inspector.* This grade has been described as the backbone of the sanitation service. Certainly this officer has a very important part to play in the wide field of environmental sanitation. His educational

background should be the equivalent of some 12 years of education from the beginning, and should be sufficient to permit him to matriculate at a university, for his duties involve inspections, dealing with complaints, contact with the public, and the promotion of programmes of sanitary importance. For these important duties, and particularly in view of his close contact with the public, he has to be chosen not only for his ability, but for his personality and integrity.

In many countries the health inspector is a well-established public officer whose contributions to the sanitary improvement of these countries have been invaluable and have been spread over a century of effort. It is felt in many quarters that some prospect of advancement should be offered to this highly trained type of person. Consideration may have to be given to the creation of higher posts in this group for the most capable who may graduate in sanitary science or hygiene at university level.

2.8.2 *Health assistant.* The health assistant is a lower grade of sanitarian who works under the direction of a senior person — in this case a health inspector. The educational standard required of him should be the equivalent of at least seven to eight years of education from the beginning, or in some countries equivalent to that of the highest class in the elementary school. This officer should have some knowledge also of the construction of wells, latrines, and privies, and of how to assist in insect and rodent control.

2.8.3 *Health aid.* This grade of sanitarian functions as an orderly or sanitary guard performing, under suitable direction, general sanitary duties in rural areas. Such a person should, of course, be given instruction adapted to the job he has to do. His requirements in this direction are elementary and can be met by a rudimentary knowledge of the housing and sanitary conditions of the people he serves. The standard of education demanded is also elementary, comprising reasonable competence in reading, writing, and simple arithmetic.

2.9 *Voluntary leaders for the mobilization of self-help*

2.9.1 In underdeveloped areas of the world where public and personal health services are almost non-existent, an attempt should be made to mobilize the interest and resources of the local people in each village by voluntary self-help. Mere diagnosis of the faults in their environment and occasional advice do not necessarily produce results.

Local leaders should be sought who are interested in the welfare of the community as a whole, as their advice is readily acceptable. Village schoolmasters and young men with enthusiasm who work or own property in the village are particularly suitable people to lead self-help movements.

The success of self-help depends upon the initiative originating from the village in question, after it is made aware of the available technical facilities which the villagers can utilize to improve their health circumstances if they organize themselves. Much depends on the availability of some government official to educate, not only village leaders, but also the villagers themselves as to how their specific health conditions may be bettered provided they organize themselves to utilize the technical services at the regional and subcentral levels. It is much preferable for the approach to the village to be integrated with the activities of other welfare agencies such as agriculture, education, co-operatives, etc. In fact, it may be stated that a sanitation programme unco-ordinated with a programme for general economic and social improvement will have little chance of permanent success in an underdeveloped area.

2.9.2 In more-developed areas of the world a similar effort to mobilize voluntary self-help should be made. In these areas, while more assistance from health services and existing organizations can be expected, the need and importance of such a programme is equally great. Particular attention should be paid to the education of the public in the subject of sanitation; in this connexion the committee endorses the recommendations made in section 3.8 of the report on its first session.⁶

3. Education and Training

3.1 *Sanitary engineers*

The committee concurs with the general principle set forth in section 5.4 of the report on the first session of the Expert Committee on Professional and Technical Education of Medical and Auxiliary Personnel:⁷

“Public-health engineers should possess basic education and training in engineering followed by at least an academic year’s specialized education and training. The latter should include the sciences of bacteriology, chemistry, and human physiology as related to problems of public-health-engineering interest. Also, the principles and practices of engineering analysis, design, and operation as applied to works of water-supply purification, sewerage and sewage treatment, the collection and disposal of municipal, rural, and industrial wastes, insect and rodent control, the engineering and administrative phases of food and milk sanitation, the sanitation of buildings, including ventilation, air conditioning, heating, plumbing and illumination, housing, industrial sanitation with particular reference to those industrial hazards the correction of which is an engineering problem should be considered. . . . The postgraduate training of the engineer should also include adequate instruction in public health, including public-health practice, epidemiology, health statistics, and health education of the public.”

⁶ *World Hlth Org. techn. Rep. Ser.* 1950, **10**, 22

⁷ *World Hlth Org. techn. Rep. Ser.* 1950, **22**, 11

The committee is of the opinion that the training of the sanitary engineer should be so designed as to arouse the spirit of inquiry in him, to train him to reason, and to analyse conditions and data. Experience in the field would be a valuable supplement to such academic education in producing a public-health or sanitary engineer.

There are great advantages in offering public-health engineering training on a regional basis and where environmental and social conditions are approximately similar to those in the areas in which the trainee is going to serve.

There are also great advantages in offering engineering training in schools where medical officers of health and other health workers are also being trained. The classes may or may not be shared, but the opportunity for the groups to mingle tends to produce mutual understanding and appreciation of the complementary functions of the various professions in public health. This will be a great asset and will pave the way for teamwork in public-health activity, which is essential for maximum success.

The committee is aware that some countries and universities have instituted undergraduate courses in public-health engineering ; this may be temporarily expedient in some places, but there is danger if it is limited to the period of normal undergraduate training.

3.2 *Plant operators*

There are other personnel working under sanitary engineers whose duties do not involve major responsibilities. They may be supervisors or plant operators ; such personnel may be trained for shorter periods than a year and may receive more-detailed instruction in a few aspects of sanitary engineering. However, the limitations of such short courses of training should be borne in mind when employing or developing such personnel.

3.3 *Medical officers of health*

Discussion of the education and training of the medical officer of health is primarily a function of the Expert Committee on Professional and Technical Education of Medical and Auxiliary Personnel. It is the opinion of the Expert Committee on Environmental Sanitation that environmental sanitation should be taught to medical officers of health by persons who themselves possess a high degree of professional competence in that subject. The teaching should be so directed that the medical officer of health may be made aware of the collaborative and fruitful contribution that other professions such as sanitary engineering can make towards the promotion of health.

3.4 *Industrial hygiene personnel*

The committee is aware of many specialist postgraduate courses of training which are available in a number of countries to medical officers, engineers, chemists, and others, to enable them to qualify in industrial hygiene. The committee endorses the view expressed in section 5.7 of the report on the first session of the Expert Committee on Professional and Technical Education of Medical and Auxiliary Personnel.⁸ It appreciates the fact that such officers are expected to acquire a knowledge of general public health, including environmental sanitation, while specializing in industrial health.

The committee suggests that their education should not be confined to a study of problems inside the factory, but should give consideration to the effects of the industry on the environment outside the factory, such as pollution of water or of the atmosphere, etc. This may be particularly significant in the case of the introduction of industry into areas hitherto non-industrial.

In the training of industrial hygiene personnel increasing attention should be paid to the problems involved in the control of the environment of the many workers employed in such places as small factories and workshops, or in agriculture, who are frequently not protected by regular industrial health programmes:

The committee is of the opinion that those responsible for safety and welfare in factories and such places should receive instruction in general health and industrial hygiene during the course of their training.

3.5 *Existing sanitation personnel*

The committee points out that special attention should be given to training designed to increase the usefulness of existing sanitation personnel as health services evolve. Such courses should be integrated with those for entering personnel and be organized to facilitate attendance by employed people.

3.6 *Training of teachers*

The committee endorses the recommendations of the Expert Committee on Professional and Technical Education of Medical and Auxiliary Personnel — outlined in section 6 of the report on its first session — concerning the award of fellowships for the training of teachers and senior personnel.⁹

⁸ *World Hlth Org. techn. Rep. Ser.* 1950, **22**, 12

⁹ *World Hlth Org. techn. Rep. Ser.* 1950, **22**, 13

The committee is of the opinion that teachers employed for training the various categories of workers should be of the highest quality available. They should be given opportunities to observe and study conditions prevailing within and outside the region and they should not be disturbed from teaching responsibilities too frequently.

3.7 *Sanitarians*

3.7.1 *Health inspector.* A large part of the training of the health inspector should consist of practical demonstrations with a period of experience in a health department. The course should be so designed that the subjects may be expanded to higher stages to enable the health inspector, with further study, to advance, if he is suitable and so desires, to the academic course. He should be imbued with a spirit of inquiry and enthusiasm for public-health ideals. The basic idea is to educate and train a good general practitioner of environmental sanitation. The courses of study should include the elements of the following subjects: mathematics, physics, chemistry, bacteriology, parasitology, epidemiology, anatomy, and physiology; the control of communicable diseases; disinfection and disinfestation; water-supply and treatment; sewerage and sewage treatment; the collection and disposal of refuse and excreta; insect and rodent control; factory inspection; building construction, including drainage, septic tanks, soakage pits, and the like; and the drawing and examination of simple plans. The health inspector should be instructed in the inspection of meat and food-stuffs and the procuring of samples for analysis, and be able to deal with special sanitary problems in places such as hospitals, schools, airports, mines, etc. He should also receive instruction in public-health administration, statistics, legislation, and legal procedure.

3.7.2 *Health assistant.* The education and training of the health assistant should be designed so that he may play an important part in environmental sanitation in urban and rural areas under suitable direction. The course of study should provide ample time for practical demonstrations. The subjects taught should include: very elementary anatomy and physiology; mensuration, simple geometry, simple arithmetic, and sketching; general hygiene, causes of disease, and sanitation, including air, water, and food. The course should provide some instruction in communicable diseases, disinfection and disinfestation, case investigation and control methods, elementary medical entomology and elementary helminthology, collection and disposal of refuse and night soil, with some information on the more complex sewerage, sewage disposal, and water-supply systems. The health assistant should also be instructed in food inspection, with visits to food production establishments; in nutrition; in rodent and insect control; in the use of artisan's tools and the construction of latrines and privies;

and in personal hygiene. He should be encouraged to promote health education in rural communities.

3.7.3 *Health aid.* Under suitable direction the health aid would be a valuable person in the promotion of rural sanitation. His instruction, therefore, should include a knowledge of sanitary work as applied to rural areas, such as the raising of the standard of housing, the improvement of rural water-supplies, and refuse and excreta collection and disposal. The course should include elementary understanding of the factors concerned in the spread of the common communicable diseases in relation to sanitation. The health aid should be able to recognize local insect pests and rodents and be instructed in disinfection and disinfestation. The course should include the preparation of simple hygiene reports and the keeping of a diary. He should be able to construct simple sanitary works.

3.8 *Voluntary leaders for mobilization of self-help*

The people in this category cannot spare the time for long and formal education far away from their homes. Short but intensive training for about two weeks has been tried and found sufficient. The curriculum should be simple and practical. Besides explaining the causes and mode of communication of the most important diseases prevailing in the area, the curriculum should emphasize the need for personal hygiene, sanitation of the environment, and maternal and child care. It should also provide data on and point out sources of materials and skilled service that may be available to the local people for improving the environment, and for constructing sanitary facilities such as wells for safe water-supplies, or sanitary latrines and privies. The trainee will have to be taught in the language of the locality. In the case of volunteers and village school-masters, the period of training should be so chosen as to interfere least with their normal business. After receiving training, the volunteers and trained teachers should be the chosen repositories of confidence of the local health-authorities in those matters which come reasonably within their competence, for example, the issue of insecticides.

4. Establishment of Training Centres

To provide adequate facilities for the education and training of the main groups of workers described in section 2, centres of different types will have to be established, as suggested below.

4.1 *Postgraduate training*

The postgraduate training of public-health engineers and medical officers of health can be carried out only at institutions and schools adequately

equipped and staffed and having facilities for field training. The establishment of such centres is not easy and requires careful planning. It may be necessary to strengthen some sections in a teaching institution or sections in a field centre conveniently accessible from the teaching institution. It is advisable to establish well-equipped regional centres rather than to encourage the multiplication of poorly equipped centres. In the equipment, supply, and training of staff for such centres WHO and other international agencies should render useful assistance.

4.2 *Training centres for inspection duties*

There should be an urban training centre in countries which have programmes for training staff for duties of inspection. This may require only technical and monetary assistance to some existing urban authority to raise the level of its services for the purpose of serving as a training centre. Along with other services such a centre should offer also an opportunity for training in factory inspection and industrial hygiene.

4.3 *Training centres for voluntary workers*

The training centres for the voluntary workers to stimulate self-help will have to be in a rural district. A rural practice field or health centre should be established in the area where the promotion of rural health and environmental sanitation is contemplated. This should not be beyond the resources of emergent countries. The centre should provide concrete examples of the application of the principles it proposes to teach. Sanitation and public-health administration in that particular area may have to be developed to a higher level than elsewhere, but not to such an unrealistic level as to be beyond the economic and the professional resources of the country. A well-developed centre of this sort can serve for training voluntary workers, rural sanitary inspectors, midwives, health visitors, etc. There are centres of this kind already in existence in many countries.

5. Utilization of Personnel

5.1 *General principles*

The fundamental principle of the utilization of sanitation workers is that each shall be employed to the full extent of his ability and training. Only in this way can the most economical and advantageous use be made of the people and facilities available.

5.1.1 In most cases it will be found that several classes of workers are required to carry out a balanced programme of sanitation. Great care

should be taken to ensure that each class is engaged on work for which it has been trained and is best fitted. Co-operation and understanding between different classes are essential for success, but each must be used primarily in its own speciality.

5.1.2 The committee is of the opinion that the proper utilization of personnel is as important as their training. It therefore urges that training should not proceed much faster than the capacity of the country to use their services.

5.1.3 The extent of the participation of sanitary engineers in some of the activities described in section 1.3 (a) varies in different countries. Nevertheless, the committee recommends the introduction of sanitary engineers into all these activities at the earliest possible opportunity and at an appropriate level.

5.1.4 Particularly in underdeveloped and emergent countries which cannot afford elaborate services for environmental sanitation and may have to carry on with modest self-help programmes, it is essential that there be competent planning and direction from at least one team of specialists, one member of which should be a sanitary engineer.

The committee considers that, even in those areas where little has as yet been accomplished in the way of environmental sanitation, it is a mistake to suppose that skilled direction at the highest level is not necessary. Indeed, such areas stand in particular need of the most careful and skilled control in order that initial efforts shall be directed along the most profitable lines.

5.1.5 The committee feels that the persons employed in duties of planning and direction, or inspection, should not be employed on a part-time basis. They should be paid adequately and employed whole time without having to depend on other supplementary employment. This will not apply to personnel mobilized for voluntary self-help.

5.1.6 The committee does not desire to record any opinion on the relative status of the various persons who work in a team to produce results in environmental sanitation. Whatever their actual status may be, mutual regard and co-operation are implicit in teamwork.

5.1.7 The committee recommends that the various categories of personnel employed in environmental sanitation services should have opportunities for advancement of their knowledge, ambitions, and status within their respective functional roles.

6. Recapitulation of Main Recommendations

In the preparation of a programme of environmental sanitation the first need is for a careful assessment of the problem and for overall planning of the necessary measures at the highest level. This is of especial importance in countries with minimum resources, where use should be made of the highest expert service available (Section 1.1.4).

Overall planning is followed by more-detailed design of the necessary works.

While acknowledging the wide variety of practice in the various countries of the world, the committee considers that the duties of personnel employed in environmental sanitation may be divided into three broad functions, as follows :

(a) Design, construction, operation, and maintenance of works intended to effect major changes in the environment in the interests of health.

(b) Inspection, reporting, prevention, and adjustment of faults in existing environmental conditions, and advising on and ensuring compliance with the law.

(c) Activities in the nature of self-help, education, and stimulation of local interest in favour of general improvement of environmental conditions.

The committee considers that activities as outlined in (c) are essential to the success of the work of categories (a) and (b) in those areas where sanitary works are new or unfamiliar (Section 1.3).

The control of the environment is essentially a multiple effort requiring the maximum co-operation of medical officers, engineers, sanitarians, and others. The categories of personnel who take part in this effort have been described in section 2.

The education and training of the medical officer of health and others in environmental sanitation should be so directed as to make them aware of the contribution that sanitary engineering can make towards the promotion of health (Section 3.3). Sanitary engineers should possess basic education and training in engineering followed by at least one academic year's specialized education and training (Section 3.1). The training and education of sanitarians has been detailed in section 3.7. The training of voluntary leaders for the mobilization of self-help should be short, intensive, and practical (Section 3.8).

Special attention should be paid to the training of teachers for a training programme (Section 3.6).

To provide adequate facilities for education and training of the main functional groups of workers, centres of different types will have to be established (Section 4).

Several classes of workers are required to carry out a balanced programme of sanitation and each class should be used in the speciality for which it has been trained (Section 5.1.1).

The extent of the participation of sanitary engineers in some of the activities described in section 1.3 (a) varies in different countries; nevertheless, the committee recommends the introduction of sanitary engineers into all these activities at the earliest possible opportunity and at an appropriate level (Section 5.1.3).

Persons employed in duties of planning and direction, or inspection, should not be employed on a part-time basis (Section 5.1.5).

The committee emphasizes strongly throughout the report the importance of teamwork and the mutual regard and co-operation which are implicit in it (Section 5.1.6).

The committee recommends that the various categories of personnel employed in environmental sanitation services should have opportunities for advancement of their knowledge, ambitions, and status within their respective functional roles (Section 5.1.7).
