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PLANNING THE PREVENTION AND CONTROL OF
ENVIRONMENTAL POLLUTION¹

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1. INTRODUCTION

An essential element of preventive medicine is the control of pollution of the environment in order to promote our enjoyment of physical, mental and social well-being. In most countries it is possible to identify the effects of the pollution of air, water and the land, of substandard housing and of demoralizing urban environments.

Population growth, advancing industrialization, and urban expansion are aggravating adverse environmental conditions at an increasing rate, and to such an extent that action to slow down the deterioration of the environment is now imperative.

No country can afford to waste its resources in ineffectual action and each country should make the best of what it already has and what it can reasonably expect. Therefore planning of the control of pollution of the environment is essential now if we are to prevent what might later become impossible to cure.

2. THE NEED FOR PLANNING

The need for planning in the control of the environment^{1, 2, 3, 4} has been mentioned in many reports of WHO expert committees. A most comprehensive and relevant report is that of the Expert Committee on National Environmental Health Programmes: Their Planning, Organization and Administration.⁴ Although this is not indicated in the title of the report, much of its content deals with the environmental health aspects of the control of pollution or the more positive expression of the same idea, preserving the quality of the environment. Experts, observers and advisers in all countries, including those in the Western Pacific Region, are becoming aware of the rapidly increasing problems arising from the concentration of people in urban areas, increasing industrialization, the development of more intensive agriculture, the rising standard of living and the growing aspirations of peoples for a better life. Careful planning is essential for the following reasons:

- (1) The concentration of people, and the increasing tendency towards total economic planning, are bringing about a reduction in the available capacity of air, land and water to absorb wastes without causing health risks and a loss of environmental quality.
- (2) Man's ability to disturb or alter great natural forces has increased to the extent that he may be initiating irreversible trends that may have disastrous consequences.

/ (3) Man's ...

- (3) Man's resources are finite and the exhaustion of some vital resources within a few generations is predictable.
- (4) The process of biological adaptation through selection and genetic development takes generations, whereas large environmental changes now occur within a few years.
- (5) There is, and will continue to be, a shortage of trained manpower in all activities connected with the control of pollution.
- (6) There is a need for a stronger commitment to the control of pollution by governments, local government, industry, agricultural interests, engineers, scientists, educationists, economists, the public and all others concerned.

3. THE ROLE OF THE HEALTH AGENCY

Although the degree of involvement of health agencies in the control of pollution varies in different countries, there should be no difference in the degree of interest and concern. Because pollution affects man's environment and influences his health, agencies with health responsibilities should maintain a close interest in its reduction. Unless they do, there will be losses of motivation, direction and efficiency in the planning and management of control activities.

The control of pollution is an integral part of the environmental health programme because it is significant in the maintenance of the ecological balance which must exist between man and his environment in order to ensure his well-being. This concerns the "whole man", his physical and mental health, and the optimum social relations with his environment. Similarly, it concerns his "whole environment" from the individual human dwelling to the entire atmosphere. Environment means "surroundings" or as one author has said, "everything that is not me".

Adverse environmental conditions resulting from pollution may cause

1. communicable or chronic disease,
2. physical offence or nuisance,
3. mental stress,
4. aesthetic offence or
5. loss of environmental quality.

Health agencies are, traditionally, involved directly in the prevention or curing of the first three but have little experience of the incidence and the effects of the last two. Health agencies tend to

/be preoccupied ...

be preoccupied with programmes to prevent the spread of communicable diseases and to reduce the incidence of chronic diseases. Although these remain their highest priority, they should not neglect the more sophisticated areas of control of pollution where the effects on human health are more difficult to measure and where the sum of many minor episodes of pollution may cause a demonstrable loss of health.

In some countries government health agencies have acted with other government departments to form water pollution control authorities. This, though primarily an environmental health matter, involves recreational, agricultural, industrial, municipal and conservation interests, and is most suitably controlled by agencies such as river boards that are responsible for water resources. In other countries it has been shown that the administration of the control of water pollution may be developed initially and effectively by a government health agency alone. Even after the delegation of functions by the central government to local agencies, the health agency should maintain a powerful and effective influence in the central authority for pollution control. Whether directly responsible for the administration of pollution control programmes or not, the health agency should monitor the state of the environment and conduct surveillance. It should set standards, produce guidelines and promote legislation, research and the education and training of manpower. In those countries which conduct socio-economic planning programmes, the government health agency should be influential in representing to the responsible body the importance of controlling pollution.

In short, health agencies should establish and maintain leadership in the prevention and control of environmental pollution.

4. PRINCIPLES OF PLANNING

Planning is a process by which available data, needs and resources are appraised, analysed and used in preparing for change. The fundamental principles involved in the planning process, and the resulting product in each case, may be listed as follows:

<u>Process</u>	<u>Product</u>
goal (objective) - setting	objective
data collection	information
plan formulation	plan
implementation	action
evaluation	review
revision	modified plan.

/A basic ...

A basic requirement for the success of plans is that they should be simple. A more detailed examination of the different phases of the planning process should help towards an understanding of the contribution that health agencies can make to the control of pollution of the environment.

5. GOAL-SETTING AND OBJECTIVES

The public health objective of pollution control programmes may be stated as

The promotion of complete physical, mental and social well-being, so far as it can be achieved by environmental control.

Other government agencies and public bodies usually wish to extend the objectives to cover the conservation of natural resources and natural life. The interests of agriculture and industry have also to be considered.

More limited targets should be set as steps towards the ultimate objective. A time scale should also be established, approximate though it may be, since an objective stated in absolute terms may not make the formulation of policies easier.

The four main stages in environmental health activity, as defined in broad terms by the American Public Health Association, can be usefully applied when setting objectives to be reached in the control of pollution. They are as follows:

1. Ensuring the elements of simple survival.
2. Preventing disease and poisoning.
3. Maintaining an environment suited to man's efficient performance.
4. Preservation of comfort and the enjoyment of living.⁵

In any country there will be areas of varying stages of development, from a simple rural village type of life, through provincial urban living to sophisticated metropolitan living. Different objectives, related to the appropriate stage of health activity in various parts of the country, should therefore be considered. On the other hand, where the general standard of living is similar in town and country, there should be no difference in objective. Such differences have been factors influencing the siting of polluting industries by leading to the choice of areas where objectives, and consequently standards for control are lower in preference to more developed areas where controls are stricter.

/The health ...

The health agency should avoid establishing objectives that are so unrealistic that the effort needed to achieve the objectives of the first two stages may be overlooked. As one member of an underprivileged urban group is quoted as saying during a discussion on priorities in pollution control: "I couldn't care less about air pollution; I'm not going to live long enough to die from it!"⁶

5.1 Policy-making

Policies for the control of pollution of the environment should be made harmonious with other social objectives and they should fit into the political and administrative systems in which they will be implemented. Pollution control should be considered as a part of environmental health programmes, and the health agency should be involved in all policy-making connected with it.

In the making of policy the following points should be considered:

- (1) Pollution control programmes should be related to other government priorities such as economic development, and to other environmental health programmes in particular.
- (2) Government agencies and public bodies responsible for executing policy decisions should be strengthened to enable them to accomplish their objectives. They should also be given facilities for the promotion of understanding of their objectives with a view to enlisting public support for their activities. Every individual has a responsibility for preserving the quality of the environment.
- (3) The necessity for monitoring and surveillance of the environment should be given early consideration in the policy-making process.

The report of the WHO Expert Committee on National Health Programmes⁴ discusses the relationship between environmental health programmes and national and socio-economic planning. As pollution control programmes have socio-economic objectives in addition to the preservation of health, they may be under the jurisdiction of other agencies than health. In that case they should be integrated in the national development plan, and the health agency should be involved in the formulation of policies and the review of operations. The health agency should strive continuously to maintain its role in promotion, co-ordination, surveillance, and evaluation of activities in the field of environmental protection. This may be most difficult in countries where comprehensive government agencies have been established for the control of the environment, and where the health agency has been excluded from or, at best, given a weak influence in such agencies. Such organizations will eventually lack health motivation and may even lead to public dissatisfaction. A better approach may be to recognize the interest of most government agencies in the

/control of ...

control of environmental quality and to appoint a "minister for the environment" to act as the co-ordinator of government policies for the prevention and control of pollution and of the activities of government agencies in that field. Advantage may thus be taken of the self-interest and experience of government agencies to make control programmes more effective. In many countries, and particularly in health agencies, there is no lack of knowledge of the problems of environmental pollution or of appropriate solutions, but in most countries there has not been sufficient recognition of the need for a greater emphasis on pollution control in national financial policies.

5.2 Responsibility for control of pollution

In the development and operation of environmental health programmes certain tendencies are common. The need for new programmes is recognized by the national health agency, an appraisal is made of both the available and the necessary manpower resources, and a plan is prepared for effective execution. The plan will follow patterns of administration that involve the recognition of the need for a central organization and for decentralization of field control to local agencies of the central agency. This may affect the national health agency or other government agencies at the central and local levels. Where there is an established system of national, state and local government, the tendency will be to delegate responsibility for local control of activities to local government whether or not there is an intervening state level of government. While this is administratively desirable, the ability to function effectively must be given adequate consideration if pollution is to be controlled. Frequently, local government agencies are not staffed for the purpose, nor have they sufficient expertise, funds or facilities. In such cases the central agency should consider to what extent there should be delegation of responsibility and whether central government should not continue to control pollution, and especially pollution from sources that require the greatest technical expertise for their supervision and control, while still assisting the local agencies in staff training. This type of relationship tends to develop a comprehensive involvement in pollution control programmes, which leads to effective control. No matter which type of administrative system is adopted, the health agency should be actively engaged in it. If there is a total delegation to local government, the health agency should continue with its monitoring and surveillance of the environmental factors that are of significance to health.

5.3 Land - Planning

Much pollution may be prevented by locating industries correctly in relation to dwellings and in places where controlled discharges of wastes will cause the least harm to the environment. Examples of incorrect siting of industry are

/1. producers of ...

1. producers of air pollutants established in areas of natural atmospheric stagnation,
2. industries that discharge large volumes of liquid wastes located alongside small streams which afford inadequate capacity for dilution, and
3. uncontrolled, noisy processes operating too close to residential areas.

The essential components of towns should be so related to each other that environmental offence is avoided. Motorways and other transport systems should be so sited as to avoid the creation of air and noise pollution in residential areas. Refuse disposal operations should be located away from dwellings.

The proper application of zoning in town and country planning, supported by effective legislation, should prevent most pollution and reduce what is inevitable to levels at which it can be readily controlled.

The importance of the need for land planning legislation to complement and reinforce pollution control legislation, should be recognized in the formulation of policies.

6. DATA COLLECTION

A plan is likely to be no better than the information upon which it is based. The collection of valid, comprehensive and significant information, and its collation, co-ordination and interpretation, consumes much time of specialists. As regards the control of pollution, most of the information that is needed initially should already be available from the records of the health agency.

A study of health statistics should show

1. the type and incidence of diseases caused by or related to environmental factors,
2. the incidence of morbidity and mortality related to toxic substances,
3. the impact of environmental factors on life expectancy, and
4. the general state of physical, mental and social well-being related to environmental factors.

/Information more ...

Information more closely related to local environmental conditions is likely to be available from the field officers of the national health agency and from the records of local government authorities and other government agencies. This could relate to types and severity of pollution, numbers and types of sources of pollution, and assessments of relative priorities for the establishment of control. Such information might be sufficient as the basis for the initial plan which could incorporate proposals for the collection of more definitive data on which to base subsequent modifications.

The information required will include the available resources in manpower, laboratories and training and research institutions. As the plan will include proposals for enabling legislation, information about existing laws and their application will be essential.

Existing environmental health programmes will also provide relevant information. The effects of government subsidies for water supplies and sewage disposal, and government-supported schemes for training operators of waterworks and waste treatment plants, should be assessed and allowed for in the plan for pollution control.

The study of other countries' pollution problems and programmes for pollution control can provide important information on which to plan local action. Other countries' standards and criteria should be used to assess the degree of local pollution, and adapted or modified to suit local conditions and requirements. Similarly, systems and methods of control which have proved successful in other countries should be carefully evaluated in relation to local social attitudes and availability of resources. While it is important that plans should be based on adequate information, and should be practicable and reasonable, the planning process should not be so prolonged that opportunities for preventive action are lost. The planners should not "let perfection be the enemy of the good".

7. THE PLAN

The plan, while representing the consensus of opinion of those responsible for its drafting, will not be universally acceptable if it provides for really effective control of pollution. The major dischargers of polluting wastes will be concerned about its effect on the cost of their operations, while "conservation" interests are likely to describe it as offering "too little too late". It is important that the agency which is to be responsible for pollution control should have a major share in the drafting of the plan, in order to have confidence in it. The health agency should have an important say in the preparation of the plan, whether or not it is to be responsible for control.

/The plan should ...

The plan should

1. be simple and straightforward,
2. be capable of achieving its objectives,
3. be flexible and adaptable,
4. be realistic in terms of economics, available resources, social acceptability, and legal application,
5. be subject to regular evaluation and change,
6. clearly define the distribution of responsibilities, especially among the government agencies concerned,
7. acknowledge the need for public support by including, where possible, adequate provision for the information, education and participation of the public,
8. recognize the need for research and
9. involve health agencies to the maximum extent compatible with their responsibilities for environmental health programmes.

8. EVALUATION AND REVIEW

The continuing success of programmes for the control of environmental pollution depends on regular reviews and comparisons of achievements with targets.

The report of the WHO Expert Committee on National Environmental Health Programmes⁴ states that "evaluation and planning are complementary and cannot be regarded as entirely separate or consecutive operations. The "feed-back" from evaluation makes possible continual adjustment of plans of action to meet changing conditions and unforeseen developments and to correct any errors that come to light."

A well-planned and well-developed system of environmental monitoring and surveillance, such as is provided by many health agencies, is essential to produce the information on which evaluation can be based. The system should rely on the employment of well-trained health inspectors supported by a laboratory service. In the circumstances existing in many countries, a limited use of automatic monitoring devices may be helpful to supplement the information provided by other means, but such devices are not a reliable substitute for health inspectors conducting sanitary surveys.

8.1 Environmental surveillance

Once again, the same Expert Committee report⁴ provides clear guidelines.

The purpose of surveillance are

1. to determine the quality and quantity of environmental factors and to measure the progress of a programme,
2. to determine the efficiency of control operations and the effectiveness of results, and
3. to provide results that can be used in planning future programmes or in modifying the current programme.

Surveillance involves collecting accurate and comprehensive data, analyzing and evaluating the data and making recommendations for future courses of action.

The methods used include

1. the assessment of the importance of certain environmental factors that might adversely affect the health and well-being of the population,
2. the monitoring of different parts of the environment, of sources of pollution and of control equipment for sanitary works to find out whether the established standards of quality or performance are being met,
3. the investigation of the effects of the environment on the population at large or on certain population groups and support of research in this field, and
4. the collection and presentation of the data and statistics needed to keep all groups concerned informed on the current situation and on the progress made.

The surveillance system must be concerned with the quality of the whole of man's environment but it is usual, for technical and administrative reasons, to consider different parts of the environment separately. The evaluation of all aspects of the pollution of the environment should however be developed in conjunction to prevent the control of pollution of one element giving rise to pollution of another; for example, waste-water treatment processes may cause air pollution.

8.2 Standards and criteria

Evaluation is dependent on the existence of standards and criteria by which to measure performance.

The WHO Expert Committee on National Environmental Health Programmes⁴ suggested that in establishing standards for environmental quality the following should be considered:

1. the present levels of environmental quality;
2. the desirable levels of environmental quality;
3. whether the desirable levels are feasible and attainable;
4. whether the desirable levels are enforceable.

The Committee defined criteria, guides and standards of environmental quality as follows:

1. Criteria for guides to environmental quality are the tests which permit the determination of the nature and magnitude of the effects of certain environmental factors on man and his environment.
2. Guides to environmental quality are sets of levels and exposure times that are associated with specific effects of varying levels of environmental factors on man, animals and vegetation, and the environment in general.
3. Standards of environmental quality are guides that have been adopted by governments and other competent authorities and therefore have legal force. In some contexts, however, standards may include recommendations that need not be rigidly enforced.

Guides and standards are based on 'dose-response' relationships which are known for only a few environmental factors. Consequently in the absence of more precise information, standards are based on the best evidence available and should allow for revision as new knowledge accumulates.

Standards could be set at levels which would prevent all pollution by prohibiting all discharges of waste. Not only would all industry have to cease operation, but the disposal of human wastes would become impossible. Such a policy would cripple the economy, reduce living standards and produce unacceptable living conditions around homes, resulting in poorer health instead of better.

It would be more practical to base policy on the taking of calculated risks, setting standards which are a compromise between the perfect, and the practical and reasonable. A systematic basis that can be used is cost-

/benefit analysis, ...

benefit analysis, in which the cost of applying standards is set against the value of the benefits resulting from their application. This system meets considerable difficulties in assessing certain benefits that are hard to value such as recreation, or priceless such as scenery. Nevertheless the system can be useful if its limitations are recognized.

9. REVISION AND THE MODIFIED PLAN

After careful study of the data produced in the course of the evaluation process, it may be decided to amend the plan in detail or in principle. Should the latter be the case, it is important to reconsider the original plan in order not to overlook its basic intention of preventing and controlling pollution.

Unless there is a full understanding of the basis for action, which is reflected in the revised plan, the whole programme may become ineffectual. This may sometimes happen following litigation, which may frustrate action which is significant for the success of the programme. For these and other reasons all parts of the plan should remain flexible and be constantly evaluated in the light of changing circumstances.

10. CONCLUSION

This paper has concentrated on planning for the control of long-recognized, and in many cases long-established, sources of pollution which result from traditional ways of life and economic development. The recognition of the growing pressure of expanding populations on finite resources is leading to the development of new concepts for the prevention of pollution not only by family planning programmes but also by reconsidering production methods and economic targets with the aim of reducing the wasteful use of finite resources and the overproduction of wastes. The effect of population control may not be seen for a generation or two, but the conservation of resources could produce earlier results. However it is not likely that such a drastic reorientation of economic policies will be adopted quickly.

Meanwhile health agencies should not be diverted from their traditional role of promoting environmental quality. In most countries there are many problems for which solutions are available. They include over-crowding, poor housing, hunger, poverty, lack of safe drinking water and lack of waste disposal systems. While dealing with these problems we should be planning and acting to prevent pollution and, where it is inevitable, to contain it at levels which, in total, are acceptable and permit the promotion of the enjoyment of health.

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