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ENVIRONMENTAL POLLUTION

Determination of Priorities for
Action Programs

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ANNEX I: Declarations of the Regional Symposium on Water
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ANNEX II: Conclusions and Recommendations of the Meeting of
 WHO Experts on Air Pollution. Geneva, 1968

Bibliography

I. Introduction

The establishment of a general order of priorities based on the gathering of reliable and updated data, coupled with the thorough study, analysis, and weighing of such data, would require such a quantity of time, man-hours, and investment that it would be difficult to carry out in practice. In addition, the needs of a health, political, and social nature would also tend to impede a work of such difficulty and complexity.

It must, moreover, be taken into account that the health sector is not the only one involved in national development; the needs of others also have to be met at the same time, such as the economy, mining, defense, education, social considerations, and industry, which together entail a different order or priorities on a larger scale.

However, even if the priorities for meeting the needs of the health sector may not be drawn up in accordance with a strict technical and scientific program, the lack of resources is such that there would always be a wide field in which favorable action could be taken, provided the resources available are fully utilized.

The determining of priority lines of action according to the foregoing is, therefore, of a relative value today - well worthwhile, certainly, as a preliminary activity that will provide experience in the application of scientific principles, criteria, systems, and procedures in the solving of health problems. But it will for some time be governed by the availability of resources and the socioeconomic programming of the different countries.

"Whatever may be the environmental activities which the health organizations decide to carry out in the decade of the '70s, the main objective must be man, his health and welfare."

To achieve this goal the knowledge and know-how of widely differing disciplines will have to be combined - engineering, medicine, economics, sociology, chemistry, law, and many others whose contributions are indispensable in certain cases, and whose multiplying power amounts to a value greater than the total of the individual components.

Basically, there are only two means of improving average living conditions: one is increasing economic investments to that end, while the other is making the best possible use of the resources available.

Stepped-up investment may be applied in research, personnel training, housing construction, building of new plants, highways, hospitals, and so on. If the rate of increase in such investment exceeds the rate of population growth, living conditions will be improved. But for this to be done, resources from the common pool for development will be needed.

Living conditions would be improved if better use were made of the resources available, for example, reducing the length of stay in hospitals so as to be able to provide care for a larger number of persons with the same number of beds, or reducing to the minimum the space per person in each new dwelling built, so as to be able to provide homes with less space to a larger number of families.

It is, in any event, essential that efficient use be made of available resources, but precisely what does efficient utilization of resources amount to? The reply could be: a resource is properly used if the advantage obtained from the particular use to which it is put is greater than that which would be obtained if it were used in any other way.

II. Principles of Programming

Programming is applicable in principle to any activity in which individuals are faced with the need to make decisions, either on questions which can be solved in different ways or on various possible aims which are mutually exclusive.

The first will be termed "technique selection problems" and the second "priority problems."

An example of the first could be the choice between various types of treating plants for city water, while for the second (priorities) one could consider the extent to which certain requirements must and should be met, i.e., food, housing, or control of atmospheric pollution.

There are certain factors which increase the complexity of determining priorities. One is the time factor with regard to the duration of the needs, in that those of the present have to be met without neglecting to provide for those of the future. When more funds are utilized for meeting present needs, fewer are available for the future. This raises the hoary question of consumption versus the accumulation of capital. Another factor is selective and derives from the fact that, since it is impossible to fully meet everyone's needs, a decision has to be taken as to whose needs will be met first, hence, whose needs will have top priority. In economics this is referred to as "distribution of income" and can, in general, be termed "distributive justice."

An example of this problem could be health research. The more funds that are channeled into this, the less health will be obtained in the immediate future, but there is the promise of much greater benefits at a later stage.

In public health, distributive justice may be illustrated by considering that any decision in this field may favor either younger children over older ones, or women over men, or urban populations over rural ones.

The cost of paying attention to distributive justice for a country can be determined. For instance, first, the number of deaths that can be eliminated using the resources available but disregarding distributive justice is calculated. Next, arbitrary criteria are determined for assigning the resources among the regions of the country, such as so much per head of population. Distribution of resources in this way will bring about a lower reduction in overall mortality for the country than if the efforts are concentrated in the region where they may be applied most efficiently. This difference is the price that is paid for distributive justice. Knowledge of this price can help greatly with decisions regarding the inter-regional allocation of resources.

It has to be borne in mind that, in the selection of priorities in matters of health, there are to all intents and purposes no "opposites." The selection of priorities has to be effected within certain margins of complementarity or proportionality. A certain part of the resources has to be used to repair damage caused and another to prevent further damage; both gastroenteritis and cancer have to be fought; the health of the present and also that of the future have to be considered, and protection has to be given to both urban and rural populations.

The essence of the decision problem consists, consequently, in determining in what proportions the different objectives have to be combined. This is one of the basic principles of programming. It is not, for example, sufficient to affirm that one is endeavoring to solve a housing problem; the number of units required has to be specified, together with the time in which it is thought the job can be done. Thus defined, the objective is converted into an aim.

III. Health Programming Problems

Health planning raises fundamental problems. Its general objective has first to be defined, for simply stating that it consists in maintaining and improving health is an extremely vague way of putting it, since it does not explain what is meant by health, nor how it is measured. To get around this problem, the use of indicators has been proposed, some of them positive and others negative, the latter including those which measure health by the presence of damage.

The former include the birth rate, which may be rejected as unreliable since in many cases it is customarily high despite the existence of distinctively unsound health situations. They also include life expectancy at birth or the first year of life. It is claimed that the increase in this value from one year to another is equivalent to the improvement of health.

Life expectancy is nothing more or less than the reverse of the death rate for different age groups. The lower the mortality, especially among younger persons, the higher will be the average life expectancy.

Consequently, the use of life expectancy as a measure for health provides implicit confirmation for the view that the object of public health action is to bring down mortality, while disregarding the harm caused by morbidity.

If it is accepted that health action should bring about a reduction in both mortality and morbidity, these two objectives would have to be made mutually comparable in order to permit joint programming. On a theoretical basis, efforts have been made to solve the problem, in part by using the potential productive capacity concept, which measures the number of person-years available to a community as a whole and usable in any particular type of activity (including rest). This capacity is measured by drawing up a table of life and deducting from the total life expectancy of the entire population the time which would probably be lost on account of morbidity.

For example: A person of 40, whose life expectancy is 360 months and who will probably lose 30 months' activity through sickness, has a total productive capacity of 330 months. The objective of health action in this case would be to raise the Increase in Productive Capacity (IPC) either by increasing the life expectancy or by reducing the likelihood of sickness. The importance of each action in the health field would be judged by its effect on the IPC.

Both the IPC criterion and that of life expectancy at birth presume implicitly that the life of young persons is more important than that of older ones, since reduction of the mortality among the former increases life expectancy and IPC in greater measure than does a similar reduction among adults. In determining basic priorities, one of two exclusive criteria has to be adopted as a starting point: firstly, that the life of any one person is of equal value to that of any other person, or secondly, that the life of certain persons is of greater value to the community than that of others.

If the first of these two criteria is adopted, all other decisions regarding health will be governed by the logical corollary of the basic purpose: maximum reduction of mortality with the resources available, without paying any attention to the age of productivity of the beneficiaries.

Top preference will be given to those diseases and infirmities in which mortality can be reduced at the lowest cost per death prevented.

If the second criterion is adopted, an additional rule will have to be established, laying down how much more one life is worth than another. In the case of the above-mentioned indices, this rule is represented by that which any particular life adds to the life expectancy or the IPC. An economic rule could also be envisaged, based on the fact that a society uses a certain quantity of resources to train, keep, educate, and provide skills to an individual until the age at which he commences to produce. Depending

on various circumstances, the total value of the contribution of an individual up to a certain point in his lifespan will serve to repay the resources which society uses to convert him into a productive individual.

Beyond this point the net value of his contribution will be very high, since it will be equal to the value of his gross contribution less upkeep. Hence, if an individual dies at age five, the loss for society will be much less than if he were to die at 15 or 20.

If the criterion referred to is adopted, health action would be oriented chiefly toward reducing mortality among persons aged between 15 and 55. For instance, if the cost incurred in raising an individual to age 15 were 15 thousand monetary units and that of raising him to 5 were 3 thousand, and the costs of preventing death at 15 and 5 were, respectively, 300 and 100 units, it would be preferable to prevent death at 15 because each monetary unit would make it possible to avoid the loss of 50, whereas in the other case only the loss of 30 would be prevented. On the other hand, if it is accepted that one life is identical to another, it would be preferable to use the 300 units to reduce mortality at 5, since this would prevent three deaths, whereas if the effort is concentrated on the 15's, only one will be prevented.

A. Negative Factors

There is another consideration that is also important, based on the fact that the more the standard of living of highly developed communities is improved, the more environmental pollution is increased. At the same time, the stresses to which people are subjected are increased, and these to a large extent are detrimental to their health. New points of reference are therefore needed to evaluate these. Consideration is already being given to including these negative factors among the indicators for public health.

B. Priority in Time

As with every investment decision, the value of public health investments would have to be updated, made relevant in terms of the present, in order to be able to determine priorities in terms of time. The determining factor will be the gain in health, by which is meant the consequences to health of delaying a decision in this field. To determine priorities between alternative programs, the health losses that would ensue from postponement would have to be added to the economic costs of the respective investments.

IV. Comparability of the Alternatives

To be able to compare the alternatives, both the measurement of the resources and that of the results in health production have to be homogenized.

The measurement of the former will be determined by the monetary value of the natural, human and capital resources invested in producing the health. To measure the second, monetary values will have to be assigned to the aims achieved in terms of health.

From the foregoing may be deduced a principle of action relating to both technical selection and the combination of products, which can be expressed as follows: "Every time a choice has to be made between two or more alternative techniques or between different combinations of products, the one which shows the greatest percentage relationship between the benefit obtained and the cost of the instruments used is to be preferred."

V. Selection of Objectives

When comparing objectives, we have seen that it was necessary to homogenize the measurement of resources and results. This is a hard and slow process and impossible in some cases, but this is not sufficient reason for not attempting to apply programming to the largest possible number of activities, because the simple possibility that in some of them the resources will be used with maximum efficiency will make less dramatic the errors that are committed in allocating the resources available on a semi-arbitrary basis among various heterogeneous activities. In this field, sins of commission are preferable to sins of omission.

In view of the difficulty entailed by the strict application of exclusively technical or scientific criteria, it will be preferable at times - without doing excessive violence to these criteria - to rely on analysis of the factors and practical possibilities which make it possible, within a generous tolerance, to initiate some action in each country which can be improved upon in the course of time and with the experience gained and any additional funds obtained.

VI. The Environmental Sanitation Situation in Latin America - Environmental Pollution Problems

The remaining years of this century, and especially the 1970's, may well prove one of the most critical periods in the history of mankind. For a considerable time mankind has been accumulating a series of problems without any serious attempts to find solutions, and these are now placed before us in their full magnitude by the international associations and agencies concerned. These problems include the explosive growth of population, the uncontrollable growth of cities, pollution, environmental degradation, crime, and poverty.

a) Explosive Population Growth

According to the United Nations, Latin America, which in 1969 had a population of 276 million, has a population growth rate that

is far too high, of the order of an average of 3 per cent per annum and reaching 6 per cent per annum in some cities. At this rate, the urban population will double in about 12 years.

A city several hundred years old with this rate of population growth (6 per cent) would, during these 12 years, have to construct works to increase its services equivalent to all those built during the centuries of its existence to date. Unfortunately, the regional and metropolitan urban plans and programs do not generally plan sufficiently far ahead, restricting themselves to providing for the pressures of the moment rather than for longer-term projections.

b) Degradation of the Environment

Environmental pollution in the widest sense is the most ruinous factor in environmental degradation.

All the activities involved should be coordinated in general socioeconomic plans. The main difficulty for the planner is very often the lack of basic data to serve him as a guide in the actual interplay of social, political, and economic factors. For the planner to be able to mount effective programs, he requires the assistance of those responsible for health and the environmental sciences to provide him with guidance in the form of standards and justifications in terms of health and welfare. There is no more effective means of justifying such plans than by relating them directly to health standards. The planner's problem is, therefore, in the last analysis, one of health.

The sanitary engineers who have contributed so successfully in the past to technological progress in the environmental field must recognize the challenge now before them and utilize the new opportunities inherent in the solving of new problems in order not to lose in the future the leadership which they have exercised in this field in the past.

"Man is in general more the product of his environment than of his genetic endowment" is a view accepted by highly respected world authorities.

The environment is subject to continuous changes, and man has to adapt himself to these. His capacity for adaptation is limited, so he has to control these changes to keep them within limits acceptable to him. As generally understood, man's health and well-being comprise not just physical health but also mental health and optimum relations with the immediate environment, from home to the entire atmosphere.

In solving these problems in developing countries, we must use our own experience as well as that of developed countries, provided we adapt the latter to our particular conditions, and avoid falling into the same errors as they have, which have resulted in some of them being referred to as maldeveloped countries.

It is important that we should press ahead with research and the search for new solutions to existing problems and to new ones, applying methods which are more economic and better adapted to the conditions prevailing in each country.

VII. Determination of Priorities for Latin America

Of these problems, perhaps the most important for Latin America in relation to environmental pollution are the following:

- A. Water supplies, especially in terms of quantity and quality
- B. Sewerage
- C. Treatment of waste water and combating of water pollution
- D. Collection, treatment, and disposal of solid wastes
- E. The campaign against the vectors and other possible hosts of pathogenic germs
- F. Food hygiene
- G. Campaign against atmospheric pollution
- H. Work hygiene
- I. Town planning, regional planning, and housing hygiene

A. Water Supply

Water is of primary importance, not only as a liquid indispensable for human life, but also as a vehicle universally used for the collection of human excreta.

The Governments of Latin America and the Caribbean, meeting at Punta del Este in 1961, laid down the importance of this service and set as the goals for the decade 1961-1971 that at least 70 per cent of the urban population and 50 per cent of the rural population should be provided with water and sewerage services.

The position in those countries as it was in 1961 and the goals set are shown in Table 1.

The results obtained up to 1970 are given in Table 2. It will be noted that of a total population to be served by 1970 of 276,206,000, only 48 per cent have been served.

Of the urban population, totaling 148,829,000, 75 per cent have been served.

TABLE 1

TEN-YEAR PLAN FOR URBAN AND RURAL WATER SUPPLIES IN LATIN AMERICA, 1961-1971

Country	Urban Population (in thousands)				Average Population Served Annually (in thousands)	Annual Cost of Construc- tion at US\$50 per capita (in \$1000's)	Rural Population (in thousands)				Average Population to be Served Annually (in thousands)	Annual Construc- tion Cost (in \$1000's)	
	Total		Without Water				Total		Without Water			at \$10 per capita	at \$15 per capita
	1961	1971	1961	1971			1961	1971	1961	1971			
<u>Total</u>	<u>101,661</u>	<u>147,630</u>	<u>41,297</u>	<u>87,266</u>	<u>4,441.9</u>	<u>233,248</u>	<u>107,000</u>	<u>128,009</u>	-	-	<u>5,825.6</u>	<u>58,256</u>	<u>87,385</u>
Argentina	15,531	18,743	5,385	8,597	297.4	14,870	5,570	6,744	5,495	6,669	329.7	3,297	4,946
Bolivia	1,448	2,120	640	1,312	67.6	3,380	2,367	2,755	-	-	137.8	1,378	2,067
Brazil	32,963	49,807	14,932	31,776	1,683.4	84,170	40,125	48,300	-	-	2,415.0	24,150	36,225
Chile	4,874	6,830	1,285	3,241	143.8	7,190	2,486	2,610	2,086	2,190	90.5	905	1,358
Colombia	6,289	9,437	1,334	4,482	248.1	12,405	8,663	10,587	5,171	7,095	180.2	1,802	2,703
Costa Rica	421	676	9	264	25.0	1,250	766	969	587	690	20.6	206	309
Cuba	3,855	5,100	1,673	2,918	138.8	^a 10,410	3,121	3,452	-	-	172.6	1,726	2,589
Ecuador	1,248	2,337	522	1,611	91.0	4,550	3,183	3,533	-	-	177.0	1,770	2,655
El Salvador	799	1,403	332	936	51.5	2,575	1,675	1,854	-	-	92.7	927	1,390
Guatemala	961	1,206	590	835	47.3	2,365	2,900	3,628	875	1,602	80.1	801	1,202
Haiti	402	541	300	439	27.7	1,385	3,700	4,740	3,700	4,740	237.0	2,370	3,555
Honduras	618	879	406	667	40.3	2,015	1,373	1,703	1,270	1,600	75.0	750	1,125
Mexico	18,398	28,152	8,316	18,070	962.4	48,120	17,490	20,359	-	-	1,018.0	10,180	15,270
Nicaragua	568	890	353	675	40.8	2,040	950	1,164	947	1,161	57.9	579	868
Panama	514	741	81	308	19.1	955	574	703	-	-	35.2	352	528
Paraguay	624	980	452	808	51.4	2,570	1,146	1,220	1,146	1,220	61.0	610	915
Peru	4,878	7,288	1,517	3,927	174.1	8,705	5,487	7,620	-	-	381.0	3,810	5,715
Dominican Republic	867	1,580	375	1,088	61.4	3,070	2,095	2,556	1,719	2,180	90.2	902	1,353
Uruguay	1,750	1,950	460	660	14.7	735	620	680	605	665	32.5	325	488
Venezuela	4,653	6,970	2,335	4,652	256.1	^a 20,488	2,709	2,832	-	-	141.6	1,416	2,124

^a At \$75 per capita for Cuba and \$80 for Venezuela.

NOTE: Urban population is defined as the population of communities with 2,000 inhabitants or more, except in Colombia (5,000) and Cuba (1,000).

TABLE 2

Population in Thousands

Country	Date	WATER SUPPLY															
		TOTAL					URBAN					RURAL					
		Popula- tion	Homes Con- nected	Easy Access	Total	%	Popula- tion	Homes Con- nected	%	Easy Access	Total	%	Popula- tion	Homes Con- nected	Easy Access	Total	%
Argentina	Oct. 70	23,450	12,454	1,100	13,554	58	17,800	11,800	66	0,900	12,700	71	5,650	0,654	0,200	0,854	15
Barbados	Dec. 70	0,254	0,130	0,124	0,253	99	0,116	0,103	89	0,013	0,116	100	0,138	0,027	0,111	0,138	99
Bolivia	Nov. 70	4,931	0,578	0,481	1,059	21	1,072	0,513	48	0,463	0,976	91	3,859	0,065	0,018	0,083	2
Brazil	Dec. 70	96,775	26,210	4,000	30,210	31	50,300	26,210	52	2,000	28,210	56	46,475	--	2,000	2,000	4
Honduras	Apr. 70	0,119	0,032	0,015	0,047	39	0,064	0,024	37	0,015	0,039	61	0,055	0,008	--	0,008	15
Chile	Nov. 70	9,270	4,370	1,830	6,200	67	6,400	4,250	66	1,700	5,950	93	2,870	0,120	0,130	0,250	9
Colombia	Dec. 69	20,619	9,300	6,500	15,800	77	12,002	7,800	65	3,900	11,700	97	8,617	1,500	2,600	4,100	48
Costa Rica	Sep. 70	1,753	1,157	0,203	1,360	78	0,859	0,799	93	0,060	0,859	100	0,894	0,358	0,143	0,501	56
Cuba	Jun. 66	7,950	5,610	0,650	6,260	79	5,020	3,840	76	0,650	4,490	89	2,930	1,770	--	1,770	60
Dominican Rep.	Oct. 70	4,012	1,040	0,456	1,496	37	1,604	0,934	58	0,291	1,225	76	2,408	0,106	0,165	0,271	11
Ecuador	Nov. 70	6,005*	1,555	0,422	1,977		2,277	1,389	61	0,312	1,701	75	3,728	0,166	0,110	0,276	8
El Salvador	Jul. 70	3,534	1,396	0,133	1,529	43	1,364	0,813	60	0,133	0,946	70	2,170	0,583	--	0,583	27
Guatemala	Dec. 70	5,160	0,772	1,250	2,022	39	1,779	0,725	41	0,872	1,597	90	3,381	0,047	0,378	0,425	13
Guyana	Dec. 70	0,764	0,400	0,028	0,420	56	0,240	0,224	93	0,007	0,231	96	0,524	0,176	0,021	0,197	38
Haiti	Jul. 70	4,866	0,196	0,330	0,526	11	0,914	0,150	16	0,250	0,400	44	3,952	0,046	0,030	0,126	3
Honduras	Nov. 70	2,636	0,593	0,317	0,910	35	0,772	0,475	62	0,245	0,720	93	1,864	0,118	0,072	0,190	10
Jamaica	Jul. 70	1,979	0,649	0,262	0,911	46	0,557	0,537	96	0,006	0,543	98	1,422	0,112	0,256	0,368	26
Mexico	Feb. 70	48,313	25,260	4,000	29,260	61	27,851	19,490	70	4,000	23,490	84	20,462	5,770	--	5,770	28
Nicaragua	Dec. 70	1,948	0,617	0,245	0,862	44	0,785	0,557	71	0,185	0,742	95	1,163	0,060	0,060	0,120	10
Panama	Oct. 70	1,425	0,660	0,055	0,715	50	0,676	0,611	50	0,037	0,648	96	0,749	0,049	0,018	0,067	9
Paraguay	Nov. 70	2,379	0,160	0,213	0,373	16	0,874	0,160	18	0,125	0,285	33	1,505	--	0,088	0,088	6
Peru	Sep. 70	12,852	2,980	2,060	5,040	39	5,831	2,900	50	1,300	4,200	72	7,021	0,080	0,760	0,840	12
Surinam	Dec. 70	0,410	0,145	0,030	0,175	43	0,140	0,140	100	--	0,140	100	0,270	0,005	0,030	0,035	13
Trinidad & Tobago	Dec. 70	1,060	0,562	0,460	1,022	97	0,358	0,297	83	0,059	0,356	99	0,702	0,265	0,401	0,666	95
Uruguay	Nov. 70	2,838	1,922	0,248	2,170	77	2,106	1,853	88	0,189	2,042	97	0,732	0,069	0,059	0,120	17
Venezuela	Sep. 70	10,400	7,206	1,897	9,103	88	6,900	5,300	77	1,520	6,820	99	3,500	1,906	0,377	2,283	65
Eastern Carib.	Dec. 70	0,504	0,131	0,232	0,363	72	0,168	0,074	44	0,055	0,129	77	0,336	0,057	0,177	0,234	70
Total		276,206	106,085	27,541	133,626	48	148,829	91,958	66	19,287	111,255	75	127,377	14,117	8,254	22,371	18

* Population Dec. 1959. Date: Nov. 1970

Of the rural population, totaling 127,377,000, 18 per cent have been served.

In the different countries, the percentage of the urban population served ranges from 100 to 33 per cent, and of the rural population from 99 to 2 per cent.

It may be concluded that the goals for 1971 will not be achieved in all the countries; differential goals should therefore now be fixed for the different countries, depending on what has already been achieved, based on the following:

Efforts should be made to ensure that the largest number of dwellings have round-the-clock drinking water service at adequate pressure, for which it would be necessary:

1. To formulate national drinking water supply plans within the general socioeconomic development plans.
2. To carry out feasibility studies for the execution of such plans, paying special attention to the possibilities for obtaining finance.
3. To prepare training programs for staff of all levels in the design, construction, operation, and maintenance of drinking water supply systems.
4. To obtain immediate technical assistance through international organizations in cases where this is necessary.

B. Sewerage

The importance of sewerage systems as a means of controlling pollution was also brought out in the aims set at Punta del Este, which laid down that such systems should be constructed to serve at least 70 per cent of the housing in urban areas and 50 per cent in rural areas.

These goals were more difficult to achieve than those relating to water supply, since at that time (1961) sewerage services were only available for urban and rural populations which together made up 1.3 per cent of the total, whereas it was estimated that some 32 per cent were connected to water supplies, and also in view of the difficulty in obtaining financing for sewerage.

The results achieved up to 1970 are shown in Table 3. Information to date indicates that, overall, it has only been possible to provide sewerage services for 23 per cent of the population of Latin American and the Caribbean, this percentage ranging from 2 per cent to a maximum of 50 per cent. This could be explained by the fact that sewerage cannot be used until homes are connected to the water supply, so that the latter has to

TABLE 3

Population in Thousands

Country	Sewer Service					
	Date	Population	Population Connected			
			Urban	Rural	Total	%
Argentina	Oct. 70	23,450	6,200	-	6,200	26
Barbados	Dec. 70	0,254	-	-	-	-
British Honduras	Apr. 70	0,119	0,002	-	0,002	6
Bolivia	Nov. 70	4,931	0,320	-	0,320	6
Brazil	Dec. 70	96,775	13,440	-	13,440	14
Colombia	Dec. 69	20,619	8,600	1,800	10,400	50
Costa Rica	Sep. 70	1,753	0,206	-	0,206	12
Cuba	Jun. 66	7,950	1,700	-	1,700	21
Chile	Nov. 70	9,270	2,430	0,185	2,615	28
Ecuador	Nov. 70	6,005*	1,311	0,040	1,351	22
El Salvador	Jul. 70	3,534	0,731	0,004	0,735	21
Guatemala	Dec. 70	5,160	0,728	-	0,728	14
Guyana	Dec. 70	0,764	0,093	-	0,093	12
Haiti	Jul. 70	4,866	0,075	-	0,075	2
Honduras	Nov. 70	2,636	0,387	0,002	0,389	15
Jamaica	Jul. 70	1,979	0,139	0,008	0,147	7
Mexico	Feb. 70	48,313	14,040	-	14,040	29
Nicaragua	Dec. 70	1,948	0,342	-	0,342	18
Panama	Oct. 70	1,425	0,460	0,004	0,464	33
Paraguay	Nov. 70	2,379	0,125	-	0,125	5
Peru	Sep. 70	12,852	3,700	0,012	3,712	29
Dominican Republic	Oct. 70	4,012	0,258	-	0,258	6
Surinam	Dec. 70	0,410	0,083	-	0,083	20
Trinidad & Tobago	Dec. 70	1,060	0,181	0,002	0,183	17
Uruguay	Nov. 70	2,838	1,200	-	1,200	42
Venezuela	Sep. 70	10,400	3,272	0,100	3,372	32
Eastern Caribbean	Dec. 70	0,504	0,014	-	0,014	3
Total:		276,206	60,037	2,157	62,194	23

* Population, Dec. 1969. Date: Nov. 1970.

come first. Providing both services simultaneously would be far too costly in many cases. The cost of water supply and sewerage services rises with the dispersal of buildings, which means that the density of construction should be increased, particularly in rural areas, and that the concentration of dwellings should be encouraged.

The lag which has occurred in the provision of sewerage services in Latin America and the Caribbean should be an occasion for a major effort to meet the goals referred to, in relation to what has already been achieved in each country.

C. Water Pollution

The pollution of water is an important and complex phenomenon and one which affects the economy and health of a nation. The use of water generally entails a deterioration in its quality. From the economic point of view this deterioration represents a reduction in value of a resource, while from the health angle it is highly important, since it could entail a health hazard and limit the use of the water in satisfying essential requirements for human life.

The type and degree of pollution depends on the use made of the water, but in general the main sources of pollution are household wastes, industrial wastes, and contaminating substances carried in rain water.

In urban areas the accelerated urbanization and industrialization process characteristic of developing countries calls for increasing quantities of water and at the same time produces more household and industrial wastes.

For logical reasons, sewerage systems are generally installed after water supply, and treatment plants after the sewers have been laid. As a result of this sequence, a large part of the domestic and industrial wastes reach the water into which they are discharged with little or no treatment. Domestic effluents are of a more or less uniform composition and are characterized by the presence of pathological agents, while industrial wastes may contain the most varied chemical compounds, including toxic and radioactive substances which may affect flora, aquatic fauna, and, directly or indirectly, man.

It is well known that water may serve as a medium for the transmission of enteric-type diseases, and also others through vectors associated with it. Chemical and radioactive contaminants are becoming a health hazard, chiefly in industrial regions, since many of them have a high persistence, because the correlation between cause and effect is hard to ascertain and because man apparently does not develop resistance to them - rather, their toxic effect becomes higher upon accumulation.

Although the uses of water are multiple, and are of interest in the most varied ways, owing to the relationship between water and health, it is evident that sanitary activities have an indisputable responsibility in the control of water pollution.

AIDIS has been considering the subject of water pollution at its congresses, and has underscored its importance in many resolutions.

In August 1970, PAHO/WHO sponsored jointly with Venezuela's Ministry of Health and Social Assistance and the National Institute of Sanitary Works a regional symposium, held in Caracas, to study and assess the present status of the water pollution problem in Latin America and the Caribbean area.

The information presented at that symposium revealed that, even though insufficient data are available for Latin America, many countries are suffering from the effects of water pollution and many of them are also taking action to control it. The symposium concluded with the declarations given as Annex I.

D. Solid Wastes

The term solid wastes is being increasingly used to denote all non-gaseous and nonliquid wastes from communities, homes, industries, and business premises.

The environment is being polluted more than ever now through the increase in such wastes. Economic prosperity and the industrialization of agricultural production are two of the causes of this increase.

In a certain sense, man is more of a user of what he purchases than a consumer. It is more what he discards than what he consumes or destroys. The proliferation of packagings of all types is also a factor in the rise in solid wastes. The form in which one disposes of the residue or accompanying material of what one consumes constitutes to a greater or lesser extent pollution of the environment.

Effective solutions are needed to the problems of storing, collecting, treating, converting, reusing, and finally disposing of these wastes. Such solutions have technical, political, financial, legal, administrative, and coordinatory implications.

Possibly no other problem relating to environmental pollution has been pushed into the background so much as this one, even though any solution to it would be warmly welcomed by most people.

The technical requirements and needs in terms of specialist personnel of agencies responsible for finding solutions to this and like problems have generally been underrated.

The professional and technical bodies responsible for the design, operation, and maintenance of sewerage systems are generally many times more numerous than those relating to the design of systems for storing, collecting, treating, and disposing of solid wastes. It ought to be the other way around, if it is borne in mind that sewage is a liquid of more or less constant characteristics conveyed by pipes in which the invariable physical laws of hydraulics apply. Solid wastes, on the other hand, vary in both composition and characteristics. Their collection is affected by problems relating to the habits of the users, the nature and conditions of road and waterways used, and especially by the involved technical and economic problems connected with the proper treatment and final disposal of such wastes.

A very common feature of solid-waste collection and disposal systems is that they are operated at a loss, economically speaking. In the majority of cases, this is due to the lack of rationally determined rates; many of those applied at present are flat rates with no direct connection between the service received and the amount to be paid by the user.

Greater attention should be given to the training of specialized personnel for this work, special care being taken over the planning of collection and the incorporation of new treatment and disposal techniques.

The establishment of technically competent services operated on sound economic principles should be promoted; such services should be based on the application of rational charges which make them self-supporting.

E. Campaign against Vectors

The success achieved in some American countries in eradicating malaria should serve as an example for those which have not yet succeeded in doing so, and serve to spur on those which have to campaign to eradicate other endemic diseases which afflict them: Chagas' disease, which finds ideal conditions for its continued existence in wattle and plaster huts, especially in rural areas; schistosomiasis, which is on the increase because of the extension of irrigation systems in the affected areas; and also yellow fever and diseases transmitted by arthropods, molluscs, and rodents.

The introduction of new pesticides has made possible considerable advances, but it should not be forgotten that certain vectors can develop resistance to them and that they may have toxic effects for man.

Research should be stepped up into other means of controlling these pests, such as genetic modification.

F. Contamination of Food

Protection of foodstuffs is in itself quality control and should be applied in the different stages of production, distribution, storage, preparation, presentation to the public, and consumption. Quality control is

applied for the producer or industrialist, for the dealer, and for the consumer. Combination of all of these actions for purposes of pollution control will produce the greatest effect.

The development of sanitary control has not paralleled that of manufacturing know-how or transport. Engineering has here a wide field for identifying and solving problems connected with the production, preservation, and protection of foodstuffs.

1) Need for Research

The protection of foodstuffs and sanitary control in relation to them has both microbiological and chemical aspects. Study of the former is essential to discover the pathological agents and other organisms. Study of the latter includes that of additives which may be toxicity factors.

The large variety of foodstuffs consumed today and the diversity of the techniques used in their preparation, preservation, and consumption means that more research is needed to be fully informed about them and their possible effects on man.

The knowledge obtained through this research and related studies must then be applied in practical prevention and control measures.

2) Rules

Basic sanitary rules on foodstuffs, as for the installations, equipment, machinery, and utensils for their preparation, should be an essential prerequisite for any control program, which ought itself to be implemented at the points of production, processing, and manufacture and in distribution networks, storage facilities, and sales outlets.

The first area would include control of the health of plants and animals, and checks on pesticides, fertilizers, and water pollution. The second would include the inspection and supervision of slaughterhouses and industrial plants, the granting of licenses for the construction, modification, and expansion of industrial enterprises, and also control over manufacturing. The third would comprise inspection of premises and preservation procedures during storage and marketing.

3) Training of Personnel

It is said that education has to precede law. The training of competent personnel at all levels to carry out the above functions is the essential basis for all action in this field.

4) Specialized Centers and Institutes

The organization of centers and institutes to engage actively in research on food-transmitted diseases, and also on the conditions under which foods are processed and distributed, would make it possible to point up and define the main problems in a particular region or country. In this way, the objectives and procedures on which action programs should be based could be determined.

G. Atmospheric Pollution

The fact that air is vital to us from the moment we are born to that of our death, and that we cannot do without it for longer than a very few minutes, increases the seriousness of the problem of its pollution.

The control of atmospheric pollution is perhaps the most important challenge before engineers in this space age. They have to find solutions to the pollution problems created by the miracle technology of this age.

In the United States of America it is calculated that cars are responsible for three-fourths of the carbon monoxide discharged into the atmosphere. They also generate more than half of the hydrocarbons and more than half of the nitrogenated oxides and are the chief cause of lead pollution. Specifications are being drawn up so that the engines installed in new models will progressively reduce this pollution. As, generally speaking, Latin America obtains a large number of its vehicle engines from the United States of America, it would be prudent for Latin American countries to set similar specifications requiring that engines imported from the United States of America meet the same standards as are fixed in that country. For this particular problem the aim is clear: a vehicle has to be produced that does not pollute the atmosphere.

Automobiles are generally the main cause of air pollution; however, other industries also contribute to this serious problem. The problem is worldwide and the cause is too: "The technical know-how and the resources employed to create and maintain a high rate of technological progress have not been used to establish mechanisms which would make it possible to control the harmful wastes which this same technological progress produces."

The July 1968 meeting of WHO experts at Geneva reached the conclusions and recommendations published in 1969, in Bulletin No. 410 of WHO's Technical Report Series, while the conclusions and recommendations of the Latin American Seminar on Air Pollution held in Rio de Janeiro in November 1968, were published in Document ES-6, April 1970, Technical Series of the Environmental Engineering and Sciences Department (CEPIS) (See Annex II).

H. Occupational Hygiene

No health planning should fail to pay due attention to the problems of work hygiene. By the very nature of their jobs, certain workers in industry are exposed to conditions which could be harmful to their health.

These conditions include toxic substances, temperature, humidity, dust, noise, vibrations, excessive pressures, smoke, and radiation, while lighting and ventilation are also factors which must be taken into account.

I. Town Planning and Housing

1) Town Planning

Town planning as a science and a technique has as its object knowledge of the forms or patterns of organization of human activities or, in other words, the utilization of the environment in relation to such activities.

It is made up of the total of studies concerning public hygiene in connection with the location and building of new cities, and the adaptation of existing ones to meet present and future needs. Correct application of its principles means that men are able to use cities and communities as instruments for living that are more favorable economically and socially and in terms of health and well-being.

The lack of adequate zoning will cause permanent difficulties in a city. The incorrect location of an industrial zone will be a continual source of nuisance, unhealthy conditions, and dangers which will affect adjoining residential areas. Too great distances between places of work and educational facilities and residential areas will breed lasting traffic problems.

Nonexistent or badly planned roads in outlying areas will make the installation of public services difficult or impossible and greatly hinder the full utilization of community services, owing to difficulty of vehicular access.

Factors of equal or greater importance all have to be taken into account when new cities are planned. For these and many other reasons affecting environmental conditions and public health, it is essential to promote the training of specialized personnel, at all levels, who will work in these fields. The utilization of the technical, economic, and human resources available for the solution of such problems should be encouraged by all means.

2) Housing

One of the objectives of town planning is the promotion of residential areas where housing that is adequate from the health angle is built.

The importance of housing lies not only in the amount of time which one spends in it and the protection which it offers against the elements, but also and very definitely in its contribution toward physiological and emotional health.

Industrialization and urbanization are seriously aggravating housing deficits in Latin America (see Table 4).

The construction of housing and provision of public and community services represent costly investments.

It can be estimated that for a million housing units in urban areas there are required:

30,000 hectares of fresh urban land

1,000 new primary schools

500 new secondary schools

Water supplies of a capacity of 1,920,000 cubic meters of drinking water per day

Sewerage systems to collect and dispose of an equal quantity of waste water

6,600 kilometers of new urban roads

In terms of Venezuelan costs, the investment called for would be of the order of US\$6.87 billion.

The scale of the figures involved in the solution leads one to think in terms of reducing standards and specifications to the minima possible in order to satisfy the requirements of the largest number of beneficiaries.

VIII. Summary

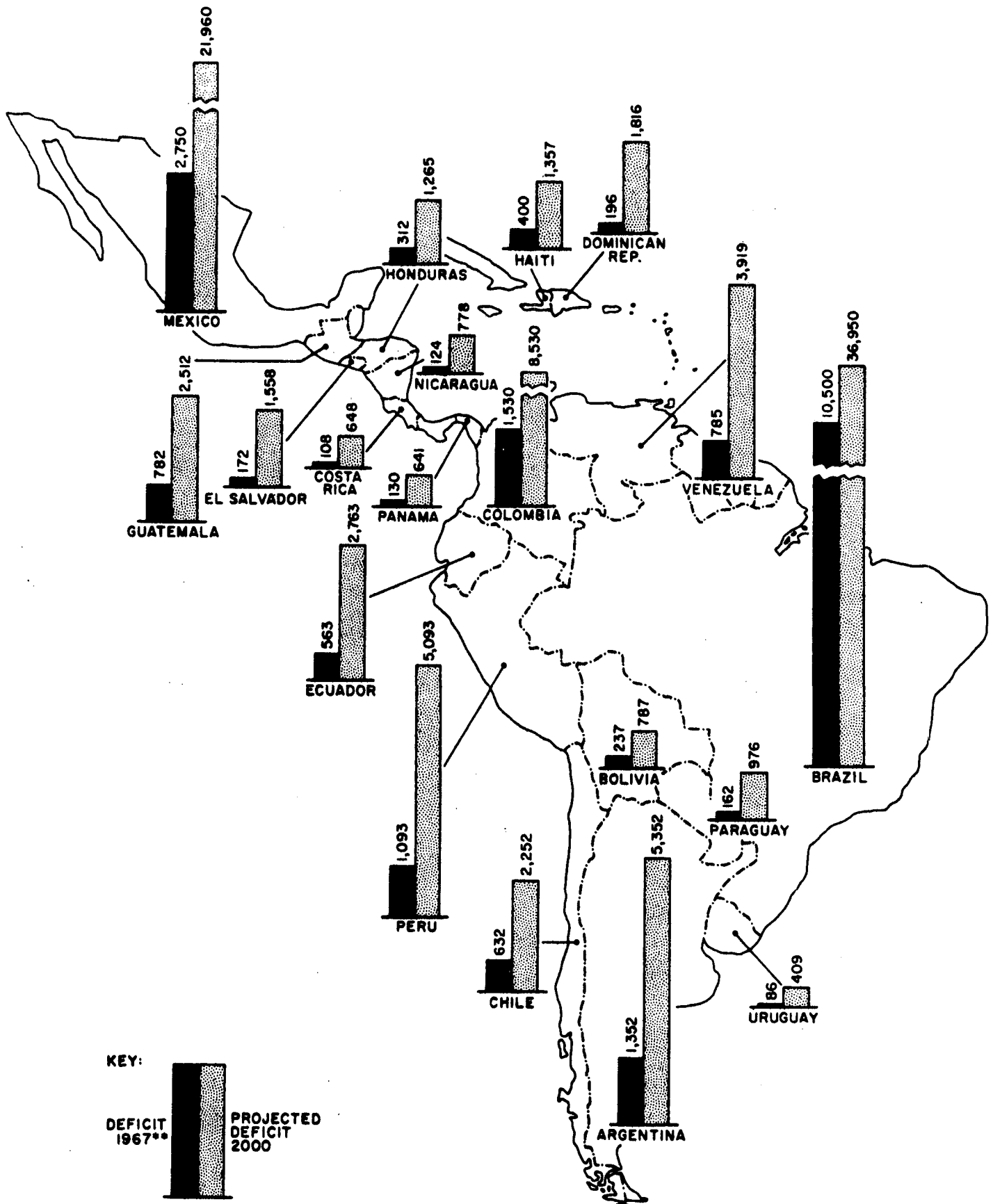
From the foregoing, it may be concluded that there are two groups of actions to be carried out in the environmental pollution control field:

A. Preventive actions, comprising:

1. Research
2. Education
3. Legislation

TABLE 4

HOUSING DEFICITS* (IN THOUSANDS OF UNITS)



*Figures are intended only as indicators of Latin America's Housing deficit.

**Or latest available year.

- B. Curative actions, which include those necessary to solve pressing or imminent problems. For these, urgent measures are needed, although without distracting attention from the fact that the steps called for to provide a lasting solution to such problems through the actions listed under Section A. should be taken at the same time.

As already noted, on account of the complexity of the problems due to the wide variations in conditions in the different countries of Latin America and the Caribbean, the particular circumstances and conditions prevailing in each one will have to be taken very much into consideration when establishing the order of priorities for the actions to be taken.

It will be a responsibility of the international agencies and institutions to advise and assist the different countries in solving their health problems.

Annexes

A. General

Water pollution is not a potential or future problem; it already exists in our countries, with its corresponding economic and social implications in relation to man and his environment.

This situation of progressive deterioration is a product of our high rate of population growth, of the ever-increasing use of fertilizers and pesticides and the growing need for industrialization, while the proper attention has not been paid to preventing the environmental pollution which such development entails. To the foregoing must be added the limitation of resources, both economic and human, engaged in this activity.

Recognition of the problem does not mean that we have a clear understanding of the extent and depth of the damage already done, or even less so of the likely future situation, owing to the lack of any reliable and appropriate permanent system of recording and producing data.

B. Technical Aspects

The final aim has to be the optimum use of water, as an instrument for reaching acceptable social and economic levels. For this purpose, one can take as field of programming the hydrological basins included in a development region or area.

As a first stage, the existing problem must be assessed in all the countries by means of simple procedures, to be filled out later by detailed technical, epidemiological, and other studies, the complexity of which will depend on the water resources available, the multiple uses made of them, and the origins of the pollution.

C. Organizational and Administrative Aspects

In view of the importance of water and the diversity of interests involved in its multiple use, the institutionalization at the highest governmental level is suggested of the planning bodies set up to insure optimum utilization of the capacity of the authorities and organizations charged with administering water resources in the countries.

D. Legislation and Regulations

Since legislation and regulations are governed by local conditions and considerations, it is suggested that PAHO prepare a study that would lay down the general criteria which would serve to guide the countries in formulating their own legislation and regulations.

Declarations of the Regional Symposium
on Water Pollution

E. Functions of the Countries

It is proposed that the countries should provide the responsible organizations with the means required to fulfill their functions, paying special attention to the prompt evaluation of the prevailing situation, which will be the basis for all future stages.

F. Function of the Pan American Health Organization

It is suggested that PAHO should assist with the following aspects:

1. Studying and proposing to the countries of the Region a minimum basic information system which will permit exchange and comparison of data.
2. Technical and economic cooperation in applied research programs, designed mainly to appraise the problem, in conjunction with universities and other technical and research institutions.
3. Provision of technical information and relevant bibliographies, through the Pan American Sanitary Engineering and Environmental Sciences Center (CEPIS).
4. Stepping up highly specialized technical cooperation, through CEPIS.
5. Promoting the obtaining of funds for this program from public and private funds, the United Nations Development Program, and other sources and institutions.
6. Establishing a specific training program for specialist personnel by means of short courses, observation fellowships, and in-service training, seminars, and symposia.
7. Organization and sponsorship of meetings at appropriate intervals which will serve as occasions for exchanges of experience, introduction to new techniques and procedures, to continuing appraisal of the problem, and the putting forward of a tentative and uniform policy to be followed by the countries of the Region.

G. National and International Finance Agencies

In view of the importance of the subject and the need for funds in seeking a solution, it is suggested:

1. That both national and international credit organizations make available funds that can be used to expand programs in this field.

2. That, in coordination with the responsible national authorities, minimum treatment requirements be included as a condition for the financing of certain types of industries and development works which, by their nature, capacity, and other features and factors, can develop into potential sources of pollution.

Conclusions and Recommendations of the Meeting
of WHO Experts on Air Pollution

The conclusions and recommendations of the meeting of WHO experts held at Geneva in July 1968 were as follows:

1. In view of the variety of methods used to analyze pollutants and gather data, it is difficult to compare pollution levels in different countries or the relative contributions of motorized vehicles and other sources in a given country. An international study of air pollution in urban areas is required, using comparable techniques and data-collecting methods, including meteorological observations. The aims of such a study should be:
 - a) To obtain a measure for establishing the relative contributions of sources of pollution in different countries.
 - b) To forecast the future trend in pollution in order to provide bases for action and future studies.
 - c) To facilitate international comparison of the effects of air pollution.
 - d) To systematically collect and exchange information on air pollution.
2. Although there are some gaps, the data at present available are sufficient to permit an initial assessment of the quality of the air in relation to certain pollutants; however, since many of the recently published works are highly technical, the Committee recommends that the information on individual pollutants be evaluated periodically at a meeting of experts. The works on carbon monoxide, lead, hydrocarbons, nitrogenated oxides, and other oxides require such evaluation.
3. It is possible that effects as yet unknown may result from the accumulation of potentially toxic substances, when these are in contact with the body over long periods. In this connection, thorough epidemiological and experimental studies should be carried out on lead and possibly other metals as well.

Potentially toxic substances in water, soil, and foodstuffs should also be considered in addition to air pollutants. Such studies should lead to a better understanding of the concentration and distribution of such pollutants.
4. More data are needed on the levels of carboxyhemoglobin and other biochemical indicators in persons exposed to pollution produced by motor vehicles. Research must be carried out to obtain these data in order to supplement the work being done on pollutant levels in the air. The effects of the concentration of carbon monoxide which results in carboxyhemoglobin levels below 10 per cent of saturation are not fully understood, and more research is needed on this subject.

5. Research, sampling, and the analyzing of pollutants must be continued, and simpler methods ought to be developed for analyzing the exhaust gases of motor vehicles. Cooperative research programs between the laboratories of the various countries should be encouraged.
6. Since technical feasibility and economic implications are necessarily involved in control of air pollution, data on this subject should be summarized in order to help the countries to prepare well-balanced programs.
7. Integrated chemical, physical, and meteorological studies are required in certain areas where the threat of photochemical pollution by motor vehicles appears greatest.
8. Attention should be paid to smoke and odor emission by diesel engines, and the most effective measures for controlling these emissions by legislation and inspection. More research is needed on means of measuring odor.
9. There is a lack of information on training facilities for air pollution control. Systematic courses are needed for training pre- and post-graduate professional staff and for training in research methods. It is recommended that institutions be established for field work, applied research, and specialized training, and that existing institutions be expanded and strengthened.

The conclusions and recommendations of the Latin American Seminar on Air Pollution, held in Rio de Janeiro in November 1968, concurred in general terms with the foregoing. There are, however, some which are more specifically related to PAHO, viz.:

- a) That the cooperation of PAHO be sought for the preparation of a standard questionnaire for collecting data. That the Organization's assistance be requested for standardizing the methods of sampling, analysis, and periodical review employed in the participating countries.
- b) That the cooperation of PAHO be sought for the collection and distribution of technical information, in particular, statistical analysis of data and solutions applied to the specific problems under reference, by means of a periodical bulletin which could be published by the Pan American Sanitary Engineering and Environmental Sciences Center (CEPIS).
- c) That the assistance of PAHO be sought for organizing inter-American technical meetings of the same type as the Rio seminar, to be held as frequently as possible.

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