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República del Perú

MINISTERIO
DE SALUD
Dirección Técnica
de Salud Ambiental

National Plan for Surveillance of Drinking Water Supply Services

SUMMARY

THE
ROBENS
INSTITUTE

DelAgua PERU
CONSULTORES EN SALUD
PUBLICA Y AMBIENTAL

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NATIONAL PLAN FOR SURVEILLANCE OF DRINKING WATER SUPPLY SERVICES

- SUMMARY -

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INTRODUCTION

This document is a summary of the **"NATIONAL PLAN FOR SURVEILLANCE OF DRINKING WATER SUPPLY SERVICES"**, prepared within the context of the Programme of Technical Cooperation between the Peruvian Government and the Government of the United Kingdom.

The Technical Cooperation Programme has provided support and technical advisers to the Technical Directorate of Environmental Health of the Ministry of Health for the development of a pilot programme in water supply surveillance in the Departments of Junin, Huancavelica and Pasco, and in the urban aarea of the cities of Lima and Callao.

The National Plan was drafted in July 1988. It has been accepted by the Ministry of Health and has also been presented to the National Committee for Coordination of Basic Sanitation and the National Planning Institute for their consideration, and approval, and for inclusion in the National Plan for the Development of Peru.

The Plan covers a ten-year period. In an initial three-year phase, existing surveillance coverage will be consolidated and the support programmes will be developed and progressively implemented. In this period, support will also be sought from credit agencies to permit consolidation of the support programmes and increase surveillance coverage to national level during the second seven-year phase.

February 1989

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BACKGROUND

The Peruvian National Committe for Coordination of Basic Sanitation prepared the National Plan for Basic Sanitation in 1984, in response to the declaration of the International Decade for Drinking Water Supply and Sanitation. The initial Plan was subsequently readjusted and in 1986 was incorporated by the National Planning Institute into the National Plan for Medium-Term Development of Peru (1986-1990).

Independently, in 1985, the development of a surveillance pilot programme began in the rural sector of the central region of Peru via a Technical Cooperation Agreement between the Peruvian Government and the Government of the United Kingdom. This began in the Departments of Junin and Huancavelica (Health Region XIII, termed the "Pilot Region"), was expanded to include the Department of Pasco and subsequently expanded further to include the urban and peri-urban sectors of Metropolitan Lima. After four years, this work has permitted the adaption of surveillance methods appropriate to the country and has made possible the identification of programmes, both of implementation and of support, for the execution of the Drinking Water Supply Surveillance Programme.

Following development of the methodology and actions necessary for the execution of surveillance, a document was prepared to define with greater precision the scope of these activities, thus originating the National Plan for Surveillance of Drinking Water Supply Services.

JUSTIFICATION AND DIAGNOSIS

Population of Peru

The preparation of the National Plan for Surveillance of Drinking Water Supply Services has been based on the total population and number of centres of population in the country, and on projections of these data to 1988 as presented in Tables Nº 1 and Nº 2.

Table Nº 1
TOTAL POPULATION OF PERU
(Thousands of Inhabitants)

POPULATION	1985	1988	1993	1998
Total	19,698	21,256	23,996	26,821
Urban	12,546	13,890	16,361	18,889
Rural	7,152	7,366	7,635	7,932

Source : National Statistics Institute (1981 Census)

Table Nº 2

PERU : POPULATION SERVED WITH DRINKING WATER (In thousands of inhabitants and percentage of total)

POPULATION	1985	1990	1995
Total	10,344 52.2 %	15,819 70.8 %	20,708 82.4 %
Urban	9,148 72.9 %	12,290 82.7 %	15,263 87.8 %
Rural	1,196 16.7 %	3,529 47.3 %	5,445 70.4 %

Source : National Committee for Basic Sanitation - National Plan for Basic Sanitation, June 1986

In turn, the projection of the total number of centres of population to be provided with drinking water supplies (and therefore to be considered by the Surveillance Plan) is presented in Table Nº 3.

Table Nº 3

CENTRES OF POPULATION TO BE SUPPLIED WITH DRINKING WATER ATTENDED BY THE SURVEILLANCE PLAN

SIZE OF POPULATION CENTER	1985		1988		1993		1998	
	Total	With Water Supply	Total	With Water Supply	Total	With Water Supply	Total	With Water Supply
100 - 200	11,230	175	11,565	320	11,996	2,270	12,454	4,225
200 - 500	9,686	1,300	9,975	1,475	10,347	4,440	10,742	7,970
500 - 2,000	3,093	862	3,185	945	3,304	1,790	3,429	3,035
2,000 - 5,000	309	105	342	155	403	325	466	440
5,000 - 50,000	221	207	245	228	289	278	332	327
50,000-100,000	33	33	36	36	42	42	49	49
> 100,000	30	30	33	33	39	39	45	45

The Health of the Population of Peru

The most sensitive indicator of the health of the population is morbidity, since it provides information concerning diseases which do not necessarily cause death, but which reduce the capacity to work and the well-being of the population, and stimulate the demand for health services.

The most important causes of transmissible disease in the country (as notified by medical staff in 1984) are summarised in rank order in Table Nº 4, showing for each the recommended means of control.

Table Nº 4

RECOMMENDED ACTIONS FOR THE CONTROL OF INFECTIOUS DISEASES

PRINCIPAL DISEASES (in order of frecuency)	VACCINATION I	CURATIVE TREATMENT II	ENVIRONMENTAL CONTROL III	HYGIENE EDUCATION IV
1. Acute Respiratory			x	x
2. Gastroenteritis and Dysentery			x	
3. Helminthiasis			x	
4. Malaria			x	
5. Respiratory TB	x			
6. Typhoid and Paratyph.			x	
7. Chickenpox	x			
8. Measles	x			
9. Mumps	x			
10. Influenza	x		x	x
11. Viral Hepatitis			x	
12. Whooping Cough	x			

Source : Dr. Omar Borges - CEPIS (Personnal Comunication)

This table clearly shows the importance of programmes of environmental control and vaccination in combating the most important causes of transmissible diseases. It should, however, be contrasted with the investments made by the health sector in 1984 - see Table Nº 5 - where the relatively low level of support for these activities can be seen.

Table Nº 5
INVESTMENTS MADE IN THE CONTROL OF DISEASE BY THE HEALTH SECTOR
(Percentage of investments by institution)

	Ministry of Health	PSSI *	Non	Total Public
- Attention	93.9	-	-	98.8
. Preventive	(7.7)	-	-	(1.8)
. Curative	(85.2)	100	100	(97.0)
- Control of transmissible diseases	3.9	-	-	0.8
- Environmental Sanitation	2.2	-	-	0.4

Source : Ministry of health - ANSSA - ExplorativeReport Nº 8 - Health Sector Financing in Perú
* Peruvian Social Security Institute

It can be said that curative action - the last barrier of control - is that which consumes the greatest percentage of the budget, followed in importance by vaccination, control of infectious diseases and, finally, environmental sanitation. Environmental sanitation receives only 0.4% of the funds for health sector activity.

Public Health

Interventions in public health are based on the raising of barriers in chosen points in the cycle of disease transmission. The following are the principal barriers in the case of environmental sanitation.

1.- Water supply

2.- Sewage and excreta disposal

3.- Control of foodstuffs

4.- Collection and disposal of rubbish

5.- Control of public establishments

6.- Vector control

7.- Household hygiene

8.- Occupational health

9.- Environmental contamination

Impact of Water Supply on Disease

Drinking water supply systems - when adequately administered, operated and maintained - constitute one of the principal barriers which contribute to the prevention of infectious disease in the population using them and thus contribute to health improvement.

Table Nº 6 (below), summarises the influences of water on human health.

Table Nº 6
INFLUENCES OF WATER ON HUMAN HEALTH

CATEGORY	EXAMPLES	CONTROL
I. Water borne (faecal - oral) (a) Classical (b) Non classical	 Typhoid, cholera, etc. Infectious Hepatitis	 Improvement of microbiological quality
II. Hygiene - Related (a) Skin and eyes (b) Diarrhoea	 Fleas, Trachoma, etc. Bacillary Dysentery, etc.	 Improvement of availability
III. Water - Based (a) Penetrating (b) Ingested	 Schistosomiasis Draconthiasis, etc.	 User protection Source protection
IV. Water - related vectors (a) Biting (b) Reproducing in water	 Trypanosomiasis, etc. Yellow fever, etc.	 Pipe from supply to use
V. Sanitation - related	Hookworm	Improvement in excreta disposal

Classification of water - related diseases according to the Ross Institute, University of London.

It is therefore clear that the adequate accessibility, continuity, quantity and quality of water contribute to the prevention of many gastro-intestinal diseases as well as those related to the hygiene habits of the consumers. In Table Nº 7, the mean reductions in morbidity observed in various studies intended to measure the reduction in diarrhoeal disease due to improvements in basic sanitation are presented.

Table Nº 7
REDUCTION IN DIARRHOEAL DISEASE DUE TO IMPROVEMENTS IN BASIC SANITATION

IMPROVEMENT	NUMBER OF STUDIES	MEAN REDUCTION
Water Quality	9	18
Quantity	17	25
Quality and Quantity	18	37
Excreta Disposal	10	22

Source : Esrey, Feachem and Hughes, 1985

Drinking Water Supply Surveillance

Drinking water supply surveillance is distinct from quality control, although the two activities are compatible and complementary.

Surveillance is an investigative activity whose emphasis is human health and is the responsibility of the Ministry of Health; while Quality Control is a monitoring activity intended to guarantee the service and is the responsibility of the supply agency. The activities

are clearly distinguished by the World Health Organization as follows :

> ***"In general, it is the resonsibility of the local water authority to ensure that the water it produces meets the quality defined in drinking-water standards. However, the surveillance function (i.e. a policing function on behalf of the public, to oversee operations that ensure the reliability and safety of drinking-water) is best conducted in a separate agency (whether national, state, provincial, or local). Although these two functions are complementary, experience suggests that they are better carried out in separate agencies because of the conflicting priorities that exist when both functions are combined".***

Drinking Water Supply Surveillance in Peru

It is known that drinking water supply surveillance in Peru began in Lima towards the end of the 1940s as an activity of the Departments of Sanitary Engineering of the Ministry of Health. Surveillance continued during the 1950s, diminished gradually during the 1960s and had practically disappeared by 1970. No data remain.

Since 1985, the members of the Technical Cooperation Agreement between Peru and the United Kingdom have been implementing surveillance, principally in the rural sector of the Departments of Junin, Pasco and Huancavelica. This has estimated (as of 1987), that the coverage of communities with water supplies reached 54%, but that the average coverage within each community was 56%. Overall therefore, only 30% of the rural population was supplied with drinking water. This work also showed that 88% of treatment systems were supplying highly contaminated water (with faecal coliform levels greater than 10 per 100 ml) and that 67% of pumped systems were supplying water in this category. In contrast, 34% of simple gravity systems were supplying water with this level of contamination. The water quality results obtained from this work are summarised in Table Nº 8.

Table Nº 8

WATER QUALITY BY SUPPLY TYPE
Rural Sector of the Central Region of Peru, 1987

SYSTEM TYPE	Nº	WATER QUALITY (% of systems)*			
		A	B	C	D
Simple, gravity	273	23	43	17	17
Gravity with treatment	25	4	8	12	76
Pumped (without treatment)	9	11	22	23	44
TOTAL Nº	307	65	119	52	71
%	100	21	39	17	23

(*) A = 0 faecal coliforms/100 ml.
B = 1-10 faecal coliforms/100 ml.
C = 11-50 faecal coliforms/100 ml.
D = more 50 faecal coliforms/100 ml.

THE PLAN

Objectives of the Surveillance Plan

The general objective of surveillance is :

> ***"to contribute to health improvement and to improve the quality of life of the population served by collective water supply systems, especially the under-attended populations of the rural, peri-urban and urban areas of low economic potential, by inducing actions of improvement of the quality of the water supply services."***

The specific objectives are :

1.- Quantify the physical, chemical and microbiological quality of water intended for human consumption.

2.- Determine the risk to human health presented by sanitary deficiencies in the different components of the water supply systems.

3.- Quantify the regional and national coverage with water supply services.

4.- Evaluate the quantity of water supplied for domestic use.

5.- Determine the degree of continuity of the supply services.

6.- Determine the cost of water intended for domestic use.

7.- Reinforce the National Committee for Basic Sanitation and its Regional Offices by providing data concerning the status of coverage and service quality.

8.- Contribute to rehabilitation and expansion programmes by identifying the priority areas for investment and indicating to the relevant national and regional bodies the communities with greater problems, via reports concerning basic service characteristics.

9.- Promote at both technical and political levels the results of the Surveillance Plan.

10.- Contribute to the improvement of the educational level of the population served via programmes of environmental culture.

11.- Incentivate the population, and especially that of the rural and peri-urban areas, to organise local surveillance committees to supervise and pressurise continually for the improvement of their water supply systems.

12.- Develop a system of epidemiological surveillance to evaluate the impact of the surveillance plan and of actions taken for improvement.

Scope

The Surveillance Plan includes two key areas : the physical state of the supply system itself, and service quality. The supply system comprises the supply and distribution network, including all of it's components; while service quality is measured by the parameters of QUALITY, QUANTITY, CONTINUITY, COVERAGE and COST.

Supply System (physical infrastructure)	Exposed to minimal risk of contamination or being contaminated
	Observation of appropriate water quality as supplied by the system components.

Service Quality

- Quality	Suitable for human consumption
- Quantity	Sufficient for domestic purposes
- Coverage	Of the maximum percentage of the population
- Continuity	Available all day and all year
- Cost	Minimum necessary

Coverage

In its final stage, the Surveillance Plan will cover the entire national territory and all centres of population with over 200 inhabitants and with a collective water supply system. The Plan is intended to survey service quality and aims to contribute to the improvement of the health status of the population of Peru without discrimination by geographical area, type of community or social level.

Programmes Considered

The Programmes intended to support the implementation of surveillance have been classified in the following manner :

IMPLEMENTATION PROGRAMMES

Programme 1	:	Sanitary Inspection and Evaluation of Service Quality
Programme 2	:	Analysis of Water Quality

SUPPORT PROGRAMMES

Programme 3	:	Institutional Development
Programme 4	:	Legal Aspects
Programme 5	:	Human Resource Development
Programme 6	:	Environmental Education
Programme 7	:	Epidemiological Surveillance
Programme 8	:	Community-level Surveillance

Implementation Programmes

Programme Nº 1 : Sanitary Inspection and Evaluation of Service Quality

The programme is intended to catalogue and determine the risk presented by water supply system installations and to indicate to the institutions responsible the problems which exist in order that corrective action is taken which will tend to improve service quality.

The Programmes Comprises :

a) Development of an inventory concerning each of the centres of population with a drinking water supply
b) Inspection of the existing urban installations in order to catalogue and quantify the components of the supply systems.
c) Inspection of all rural supply systems.
d) Evaluation of risk.
e) Evaluation of service quality and level of service.
f) Feed a database and process the information with the aim of determining the sanitary status of the services.

Programme Nº 2 : Analysis of Water Quality

The programme is intended to secure the potability of water supplied for consumption.

The programme comprises :

a) Formulation and establishment of quality standards.
b) Implementation of laboratories.
c) Establishment of a sampling system and execution of programmes of sampling and analysis.
d) Development of a programme of analytical quality control.

Support Programmes

Programme Nº 3 : Institutional Development

Is intended to organise the surveillance system as a coordinating, supervisory and administrative element for efforts directed to improve water supply services.

The programme will be developed via three projects.

a) Institutionalisation of the national surveillance system.
b) Development of the system of information, notification and control.
c) Reinforcement of the executive and coordinating bodies (see Figure Nº 1)
   - Project Administration
   - Administration of Financing

Programme Nº 4 : Legal Aspects

The success of the Plan rests on the legal mechanisms which favour it's implementation, for which three actions have been identified.

a) Revision of existing legislation related to the Plan.
b) Establishment of new legal mechanisms to make the execution of the Plan viable.
c) Formulation of standards and their progressive application.

Programme Nº 5 : Human Resource Development

This activity is intended to create and train adequate and sufficient personnel as required by the institutions involved to fulfill their responsibilities.

The programme comprises :

a) Inventory of surveillance personnel.
b) Inventory of national and international institutions which provide training.
c) Determination of personnel requirements.
d) Determination of training requirement of current personnel and for future needs.
e) Formulation, evaluation and revision of training modules.
f) Formulation of training scheme.
g) Definition of career structure within the institution.

Programme Nº 6 : Environmental Education

This programme is intended to raise levels of consciousness of the population regarding the importance for human health of drinking water supply and excreta disposal. It will similarly encourage the good use of water and the protection of water resources.

The programme comprises actions of :

a) Education in schools
b) Mass communication
c) Programmes based in health posts and health centres

Programme Nº 7 : Epidemiological Surveillance

This activity is intended to diagnose and evaluate the impact of actions of sanitation on health; furthermore it should permit priorisation of investment in the health sector according to anticipated health impact.

The actions identified are :

a) Revision and expansion of the obligatory notification procedure for infectious diseases to evaluate health impact.
b) Preparation of a system for analysis of the information collected.

Programme Nº 8 : Community-Level Surveillance

This programme is intended to obtain and organise the active participation of the population in surveillance. In the peri-urban area this will occur via the formation of local surveillance committees and in the rural area via the reinforcement of existing and creation of new surveillance authorities.

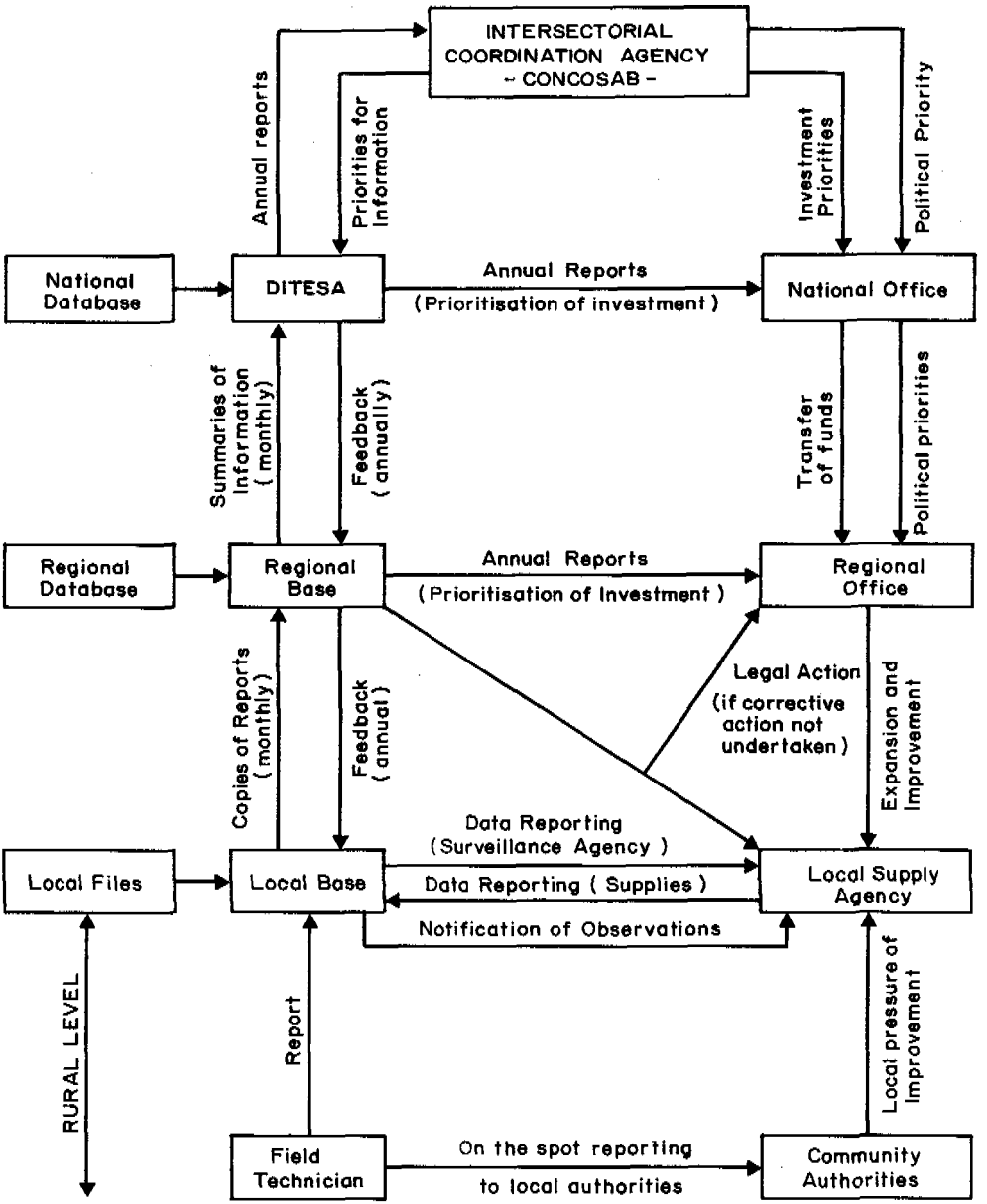
The surveillance committes and existing authorities will provide continuity for surveillance and will contribute to improvement by supervision and by pressurising for the execution of actions for improvement based on the observations made by the surveillance programme.

The programme comprises :

a) Definition of existing hierarchies and authorities in the various regions of the country.
b) Design of the system for participation of the local surveillance committees.
c) Provision of training for the members of the committees and local authorities.

Figure Nº 1

INFORMATION FLOW SCHEME FOR SURVEILLANCE



Cost of the Programmes

In the calculation of costs, the following factors have been taken into account :

a) Population growth according to the National Statistics Institute

b) Projected coverage with supplies according to the National Committee for Coordination of Basic Sanitation

c) Population to be served in the next 10 years

d) Number of population centres as of 1981 and projected to 1988 in function of population growth

e) Projected population as a total and that to be served with drinking water as a function of size of community

f) Projections of the number of communities to have drinking water supply (1985-1988)

g) Number of samples to be analysed bacteriogically each year by size of centre of population

h) Number of sanitary inspections to be carried out annually according to the size of centre of population

i) Number of physical/chemical analyses by source type and size of centre of population

j) Percentage distribution of source types by size of centre of population

k) Number of physical/chemical determinations by source type and size of centre of population

l) Number of sanitary inspectors required for the sampling programme according to size of centre of population

m) Number of sanitary inspectors required to carry out sanitary inspections according to size of centre of population

n) Support personnel required for the execution of the surveillance plan by size of population centre

o) Transport, laboratory and field equipment requirements

p) Overall estimates of cost for the support programmes.

Taking into account the economic situation of the country and the health status of the population, it is recommended that the goal for the next 10 years be to cover 90% of the sanitary inspections and service quality evaluations and 50% of bacteriological analyses in all centres of population with over 200 inhabitants.

The cost of achieving this goal will be approximately US$ 9'600,000.00. The annual investments during the ten-year period are shown in Table Nº 9, while the percentage distribution of responsibility to be assumed by the different institutions involved in the Surveillance Plan is presented in Figure Nº 2. This sum represents approximately 0.7% of the investment proposed by the National Plan for Basic Sanitation for expansion of coverage in the same period (a total investment of US$ 1'384,028.00).

Table Nº 9

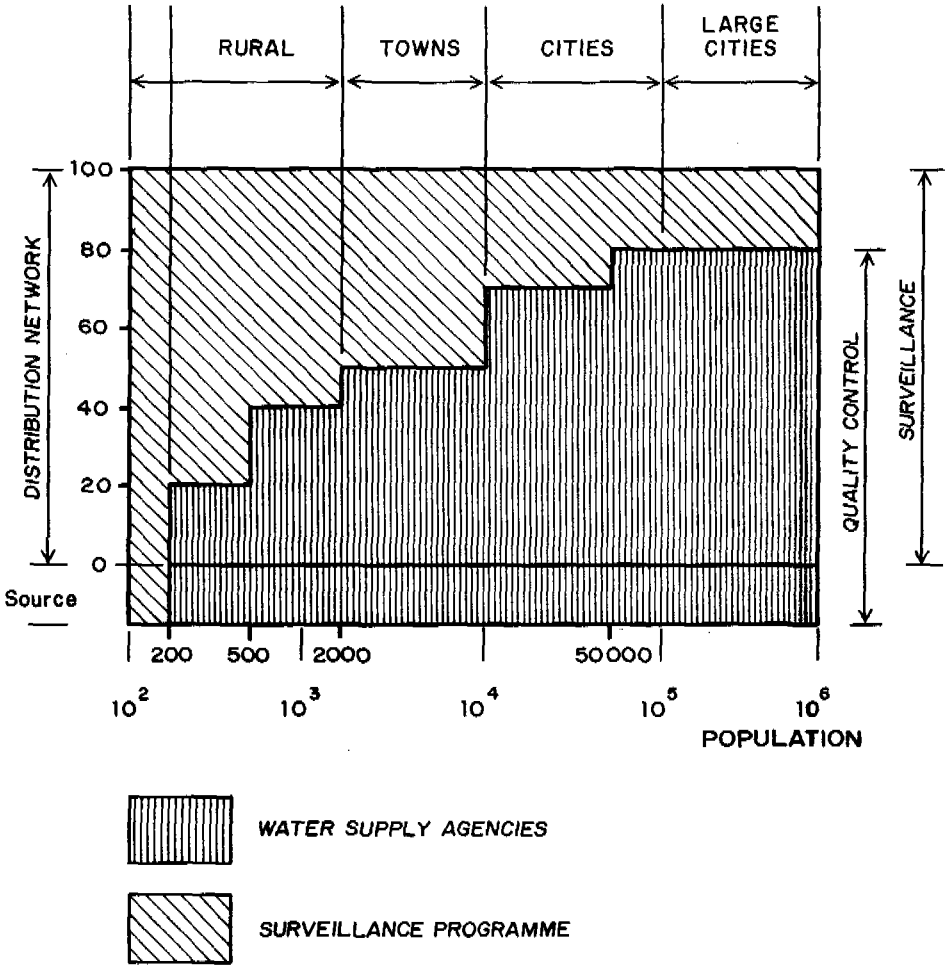
ANNUAL INVESTMENT
(Expressed in Thousands of US Dollars)

YEAR	Personnel and Analyses	Laboratories	Transport	Support	Total	%
1988	6	229	261	63	559	5.8
1989	13	177	261	58	509	5.3
1990	22	152	279	61	514	5.4
1991	56	140	298	70	564	5.9
1992	89	134	317	80	620	6.5
1993	148	126	344	98	716	7.5
1994	205	117	374	116	812	8.5
1995	321	99	399	149	968	10.0
1996	433	91	429	182	1135	11.8
1997	676	76	446	248	1446	15.1
1998	921	70	451	315	1757	18.2
TOTAL	2,890	1,411	3,859	1,440	9,600	100.0
%	30.1	14.7	40.2	15.0	100.0	

Figure Nº 2

PARTICIPATION OF THE INSTITUTIONS INVOLVED IN WATER SUPPLY AND SURVEILLANCE

(Expressed as percentage of samples)



Institutional Outline

The execution of the Plan is the responsibility of the Ministry of Health. The Technical Directorate for Environmental Health is responsible for coordination, planning, administration and supervision at national level and the Health Departments are responsible for the implementation of the Plan.

To fulfill the established objectives, it is both necessary and imperative to promote the integrated and coordinated activity of the participating institutions in the sub-sector such as the National Drinking Water Supply Service ("SENAPA"), the Departmental Drinking Water Supply Services (affiliates of SENAPA), the Directorate of Basic Rural Sanitation ("DISABAR"), the National Institute of Municipal Promotion ("INFOM"), the Regional Development Coorporations ("CORDES") etc. in such a way as to optimise the effort and human, material and economic resources applied.

The scheme presented above will tend to facilitate the execution of the Plan by introducing an element of joint coordination between the surveillance agency and the agencies for provision of drinking water supply services. For coherency, this coordination should occur via the National Committee for Coordination of Basic Sanitation ("CONCOSAB").

The above indicates the importance of reinforcing the national surveillance system via CONCOSAB. For this it will be necessary to define the functions and responsibilities of all the institutions involved and the mechanisms of planning, control, financing and information management in such a way as to permit the fulfillment of the proposed objectives of the Plan.

Results Anticipated

The implementation of the Surveillance Plan will allow : The improvement of the health and level of life of the population of Peru via the definition of :

a) An integral analysis of the state of the water supply services
b) Deficiencies in the state of the supply from the point of view of health risk
c) Service level at household level (both installations and use).

The first result will allow the priorisation of investments for expansion and improvement of existing systems by CONCOSAB.

The second group of results will demand the establishment of a close coordination at national and regional level between the surveillance agency and the agencies responsible for the provision of drinking water supply services in order to establish realistic goals intended to reduce the sanitary risks of the installations. Investments in this field will have to be defined by CONCOSAB, based on criteria of priority established by mutual agreement between the institutions in charge of the supply services and the Health Sector. It is based on this agreement that fulfillment of priority criteria will be demanded.

Finally, the third groups of results are associated with the planning of educational activities via campaigns of social communication, these will be directed towards appropriate water use and care of household installations.

Figure Nº 3 shows the proposal of the national system of planification to achieve the improvement of the water supplies through the definition of the goals. These goals have been designed to reduce the risk on health and the priorisation of investment for expansion and improvement of the operation from the data of the actions of surveillance.

Together, these acivities will allow the social progress and development of the country and the reduction and control of transmissible diseases.

Phases of Execution

Taking into account the socio-economic condition of the country, it is proposed that the Plan should be implemented in two phases. In the first phase, the Pilot programmes being executed at present (Regions Huanca, Grau and Arequipa, and the cities of Lima and Callao) will be consolidated in both the rural and urban sectors. At the same time, the support programmes and laboratory network will be developed and progressively implemented and surveillance coverage expanded to the Regional Capitals. The formulation of the definitive project will also be finished and financing obtained for the second, seven-year phase, in which surveillance coverage will be gradually expanded to national level.

In summary, the phases comprise :

First Phase

- Institutionalization of the Surveillance Plan
- Continuation of the Plan at pilot level in the Regions Huanca, Grau and Arequipa and the cities of Lima and Callao and periodic evaluation of results
- Planning for expansion to national level
- Implementation of surveillance in all Regional Capitals
- Establishment of the database and systems for information flow, notification and internal control
- Establishment of the Law of Drinking Water Supply Surveillance
- Formulation of the definitive project
- Formulation of the objective of the support programmes.

Second Phase

- Expansion of surveillancec to national level

During the second phase, the initial emphasis during expansion will be on sanitary inspection and will subsequently be expanded to include the control of bacteriological quality.

Evaluation and Control

In addition to the planning and execution, the development of the Plan includes its evaluation and control.

Evaluation and control will provide feedback for the processes of planning, execution and administration of surveillance and will be based on the political and investment guidelines proposed for reduction in the levels of risk in water supply systems. This will permit cyclic and coordinated readjustment of strategies, policies of work and the scheme of the Plan itself in order to fulfill its objectives.

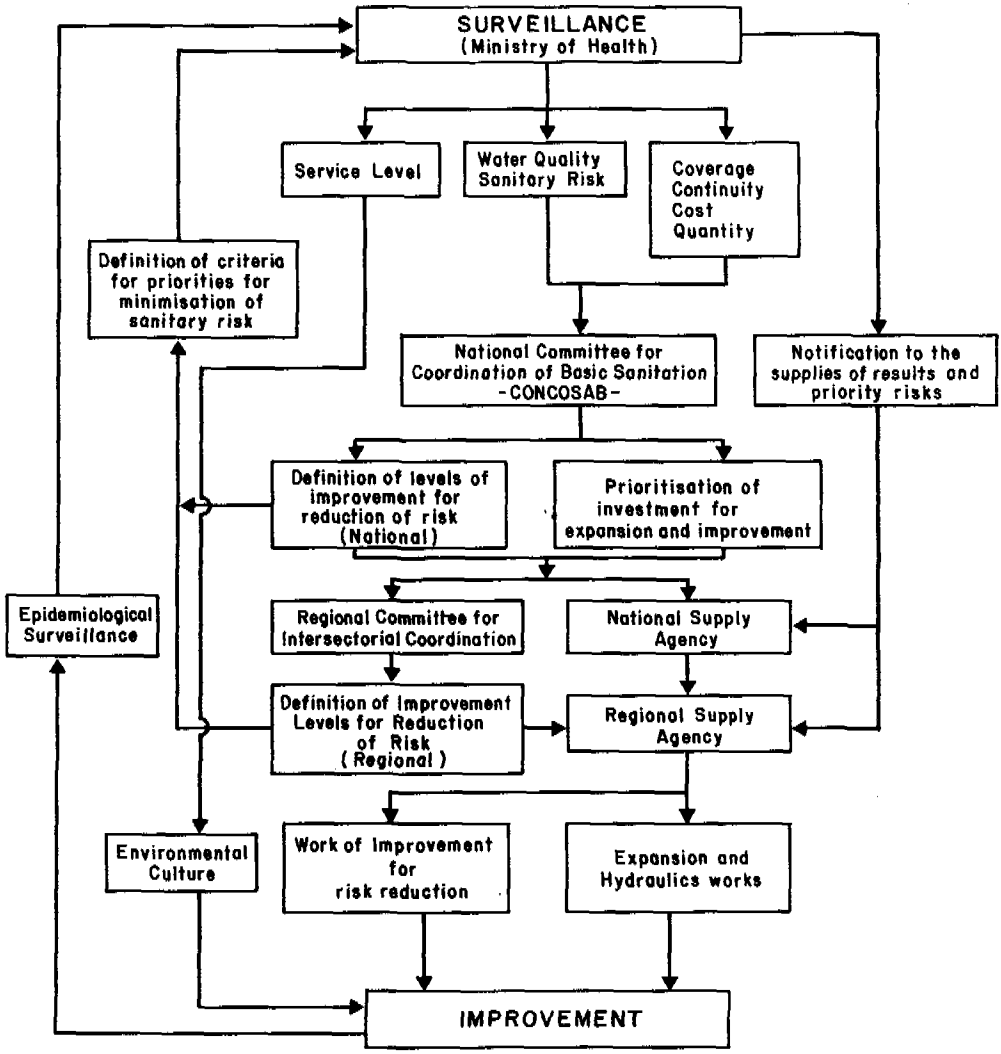
It will be necessary to establish orientations, methodologies, guidelines and solutions as bases for the subsequent phases. The development of this task to an adequate level is the responsibility of DITESA, as is the development of a deeper and more precise undertanding of the tasks involved, actions necessary and desired results.

Evaluation and control will be undertaken continuously and will feed into an efficient information system at regional and national level (see Figure Nº 1, page 16)

In this way, the Plan will have to be ajusted to new conditions derived from the process of evaluation and the refinement of the information.

Figure Nº 3

NATIONAL SYSTEM OF PLANIFICATION TO ACHIEVE THE IMPROVEMENT OF THE WATER SUPPLIES



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