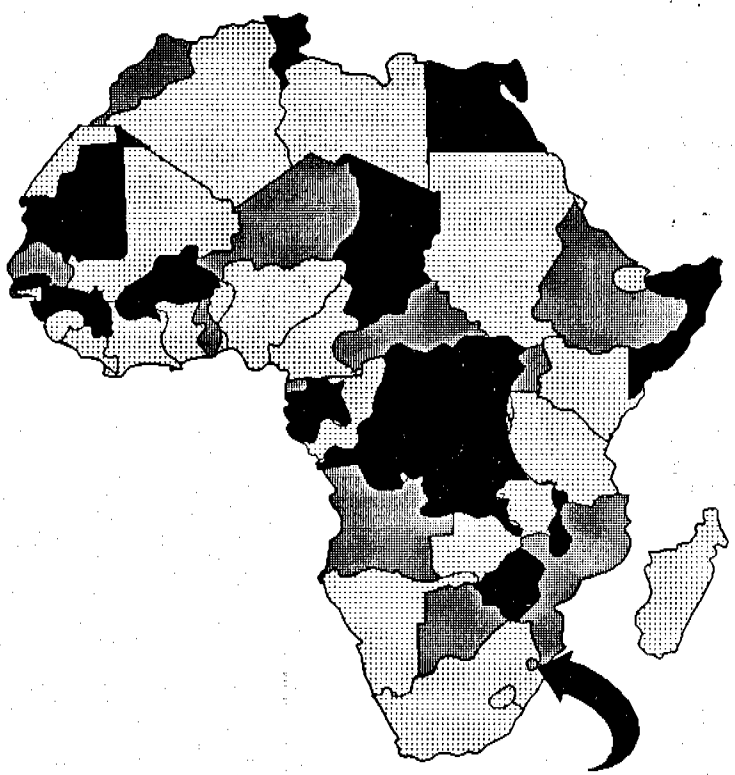
WORKSHOP ON
WATER AND SANITATION MONITORING IN THE 1990s

EAST AND SOUTHERN AFRICA



Swaziland
18-22 May 1992

World Health Organization (WHO)

United Nations Childrens' Fund (UNICEF)

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FRONT COVER POCKET:

- **WASAMS Flyer**
- **Puerto Rico Declaration**
- **World Declaration and Plan of Action from The World Summit for Children**
- **WASAMS Computer Disketts (2)**

BACK COVER POCKET:

- **Daily Workshop Evaluation forms**
- **Final Workshop Evaluation form**
- **WATERFRONT Newsletter, Issue 1 February 1992**

Agenda
WORKSHOP ON WATER AND SANITATION MONITORING IN THE 1990s

East and Southern Africa

Swaziland 18-22 May 1992

ORGANISED AND SPONSORED BY WHO AND UNICEF

DAY 1

MONDAY, 18 MAY

SESSION 1 — SESSION OBJECTIVE: PROVIDE AN OVERVIEW OF THE WORKSHOP.

8:30 - 8:40 — ***WELCOME (UNICEF Maputo/Mbabane)***

8:40 - 9:00 — ***INTRODUCTORY REMARKS***

- Joseph Christmas, Chief, Water and Environmental Sanitation Section, UNICEF, New York.
  - Sector Goal Year 2000:
  - Sector Objective 1990s:
  - Overall Workshop Purpose:
- Gregor Watters, CWS/WHO, Geneva, Switzerland.

9:00 - 9:50 — ***INTRODUCTION OF PARTICIPANTS***

SESSION 2 — SESSION OBJECTIVE: PROVIDE AN HISTORICAL AND FUTURE PERSPECTIVE OF SECTOR MONITORING.

9:50 - 10:20 — ***BACKGROUND ON WATER AND SANITATION SECTOR MONITORING***

- Evolution of Sector Monitoring up to 1990 **(Watters)**
- Decade Evaluation in Africa **(de Rooy/Doyle)**

10:20 - 10:40 *COFFEE BREAK*

10:40 - 11:00
- Future thrust of monitoring and introduction of the Joint Monitoring Programme **(Christmas)**

11:00 - 11:20 ***PLENARY DISCUSSION***

SESSION 3 **SESSION OBJECTIVE:** PROVIDE A CONCEPTUAL FRAMEWORK FOR SECTOR INFORMATION MANAGEMENT AND MONITORING AS A MANAGEMENT TOOL.

11:20 - 12:30 ***WATER SUPPLY AND SANITATION SECTOR MONITORING WITHIN THE FRAMEWORK OF INFORMATION MANAGEMENT***

- Different information needs for sector planning and management: CESI-Plus **(Watters)**
- Need for monitoring of selective "core indicators" initially, as a sector management tool **(Christmas/de Rooy)**
- Plenary Discussion

SESSION 4 **SESSION OBJECTIVE:** PROVIDE GUIDELINES TO ENHANCE SECTOR PLANNING, SETTING OF GOALS AND SUBSEQUENT MONITORING AGAINST THESE GOALS.

12:30 - 13:00 ***LINKAGE BETWEEN SECTOR MONITORING AND SECTOR PLANNING*** **(de Rooy/Doyle)**

13:00 - 14:30 *LUNCH*

SESSION 5 **SESSION OBJECTIVE:** TO IDENTIFY STRATEGIES AND KEY INDICATORS FOR ENHANCED SECTOR MONITORING.

14:30 - 16:00 ***GROUP WORK: DEVELOPMENT OF STRATEGIES AND MAIN INDICATORS FOR IMPROVEMENT OF SECTOR MONITORING.***

(Five working groups of approximately six participants each).

Terms of Reference:

1. Determine how coordination and unification of sector agencies/departments can be achieved.

2. Determine how any existing monitoring systems at country level can be optimally used to enhance water and sanitation sector monitoring.

3. List a limited number of simple "key indicators" you would use to start sector monitoring (in order of priority).

4. Determine how other sectors can contribute to water and sanitation sector monitoring, e.g. statistics office, health sector, national census, hydrogeological service, etc.

(Flip charts and overhead transparencies to be used for presentations on Day 2).

16:00 - 16:20 *COFFEE BREAK.*

16:20 - 17:00 ***CONTINUATION OF GROUP WORK.***

DAY 2

TUESDAY, 19 MAY

8:30 - 10:00	***PRESENTATIONS AND PLENARY DISCUSSIONS OF GROUP WORK.***
10:00 - 10:20	*COFFEE BREAK*
10:20 - 12:20	***CONTINUATION OF PRESENTATIONS AND PLENARY DISCUSSION OF GROUP WORK.***
12:20 - 13:00	***PRELIMINARY SYNTHESIS OF THE OUTCOME OF THE FIVE WORKING GROUPS*** **(de Rooy/Doyle)**
13:00 - 14:30	*LUNCH*
SESSION 6	**SESSION OBJECTIVE:** TO IDENTIFY INDICATOR GAPS AND HARMONISE NEEDS FOR SECTOR MONITORING IN EAST AND SOUTHERN AFRICA.
14:30 - 16:00	***COMPARISON OF OUTCOME OF GROUP WORK SESSION 5 WITH EXISTING DEVELOPMENTS FOR WATER SUPPLY AND SANITATION SECTOR MONITORING.***
16:00 - 16:20	*COFFEE BREAK*
16:20 - 17:00	***PLENARY DISCUSSION ON PREVIOUS SESSION.***

DAY 3

WEDNESDAY, 20 MAY

SESSION 7

SESSION OBJECTIVE: ESTABLISH WHAT STEPS ARE REQUIRED AT COUNTRY LEVEL SUBSEQUENT TO THIS WORKSHOP, TO OPERATIONALIZE ENHANCED SECTOR MONITORING.

8:30 - 10:00 ***GROUP WORK: COUNTRY LEVEL IMPLEMENTATION OF SECTOR MONITORING***

(Five working groups of approximately six participants each).

Terms of Reference:

Develop and outline plan and list appropriate strategies to be adopted for the implementation of an enhanced sector monitoring system at country level. In doing this exercise, please highlight important/priority "milestones" that should be achieved in sequential order.

Reference Materials:

- Background on water and sanitation monitoring
- Water supply and sanitation sector monitoring within the framework of information management
- Linkage between sector monitoring and sector planning
- Outcome of group/s Work Session 5 and the pertinent plenary discussions

(Flip charts and overhead transparencies to be used for presentations in afternoon sessions).

10:00 -10:20 *COFFEE BREAK*

10:20 - 13:00 ***CONTINUATION OF GROUP WORK***

13:00 - 14:30 *LUNCH*

14:30 - 17:00 ***PRESENTATIONS AND PLENARY DISCUSSIONS OF GROUP WORK***

DAY 4

THURSDAY, 21 MAY

SESSION 8(a) — SESSION OBJECTIVE: HIGHLIGHT THE TYPE OF "OUTPUT" WHICH WASAMS CAN GENERATE.

8:30 - 9:00 — ***PRESENTATION OF WASAMS COMPUTER PROGRAMME*** **(Watters/Mazuranic/de Rooy)**

- The "end product" and its use for water supply and sanitation sector planning, management and advocacy.

SESSION 8(b) — **SESSION OBJECTIVE:** PROVIDE AN OVERVIEW OF THE WASAMS COMPUTER PROGRAMME AS A MONITORING TOOL.

9:00 - 10:00 — ***OUTLINE OF MECHANISM TO ARRIVE AT END PRODUCT*** **(Watters/de Rooy/Mazuranic)**

10:00 - 10:20 — *COFFEE BREAK*

10:20 - 13:00 — ***SESSION 8 CONTINUED, DISCUSSIONS***

13:00 - 14:30 — *LUNCH*

THIS PERIOD WILL BE DIVIDED AS FOLLOWS:

SESSION 9(a) — SESSION OBJECTIVE: PROVIDE A "HANDS-ON" EXPOSURE TO THE WASAMS COMPUTER PROGRAMME (A MONITORING TOOL).

14:30 - 16:00 — **GROUP A →** Will work on the WASAMS computer programme to gain hands-on experience.

SESSION 9(b) **SESSION OBJECTIVE:** SYNTHESIZE THE OUTCOME OF GROUP WORK SESSIONS 5 AND 7, AND SUBSEQUENTLY ESTABLISH GUIDELINES ON A SEQUENCE OF STEPS TO ASSIST GOVERNMENTS ENHANCE SECTOR MONITORING.

14:30 - 16:00 **GROUP B →** Will make a synthesis of the Workshop.

Reference materials:

- Presentation overheads/flip charts developed and used by the five working groups during Group Work Sessions 5 and 7.
- Summary charts developed by the Secretariat.
- TORs for Group Work Sessions 5 and 7.

(Flip charts and overhead transparencies to be used for presentations at noon on Day 5).

16:00 - 16:20 *COFFEE BREAK*

16:20 - 17:00 ***CONTINUATION OF GROUP WORK***

DAY 5

FRIDAY, 22 MAY

(SESSION 9(a) CONTINUED)

8:30 - 10:00	***HANDS-ON EXPERIENCE ON WASAMS COMPUTER PROGRAMME, CONTINUED.*** (In this session, special training will be provided to Group **B** to help catch-up with Group A).
10:00 - 10:30	*COFFEE BREAK*
10:30 - 12:00	***CONTINUATION, HANDS-ON EXPERIENCE ON WASAMS COMPUTER PROGRAMME.***

SESSION 10

12:00 - 13:00	***PRESENTATION BY GROUP B: SYNTHESIS OF WORKSHOP.***
13:00 - 13:30	***CLOSE OF WORKSHOP.***

APRIL 3, 1992

Workshop on Water and Sanitation Monitoring in the 1990s

East and Southern Africa

Referenced Reading Materials

SESSION	REF. MATERIAL	LOCATION IN FOLDER
1	• New Delhi Statement • The Dublin Statement • World Declaration and Plan of Action from the World Summit for Children • Puerto Rico Declaration	Section 2, all pages Section 2, all pages Front pocket, pg. 31-35 Front pocket, pg. 15-22
2	• Summary Report: Joint Monitoring Programme Pre-test Workshop, Geneva 1991 • The Decade and Beyond: At a Glance	Section 4, pages iii-6 Section 6, all pages
3	• Summary Report: Joint Monitoring Programme, Pre-test Workshop, Geneva 1991	Section 4, pages 3-7
4	• Summary Report: Joint Monitoring Programme, Pre-test Workshop, Geneva 1991	Section 4, pages 10-11, 23-26
5	• TORs for Group Work • The Dublin Statement • World Declaration and Plan of Action for the World Summit for Children	Section 1, agenda, p. 3 Section 2, all pages Front pocket, pg. 24-30
6	• Summary Report: Joint Monitoring Programme, Pre-test Workshop, Geneva 1991 • WASAMS Questionnaire	Section 4, pages 4-7 Section 5, all pages
7	• See TORs/Reference materials for Group Work • Summary Report: Joint Monitoring Programme, Pre-test Workshop, Geneva 1991	Section 1, Agenda p. 5 Section 4, pages 23-26
8(a)	• Materials on the presentation will be handed out at the end of the Session	
8(b)	• Materials on the presentation will be handed out at the end of the Session	
9(a)	• WASAMS Users Guide • WASAMS Tutorial • WASAMS Technical Manual • Mapping Programme Manual	Section 7, all pages Section 7, all pages Section 8, all pages Section 8, all pages
9(b)	• See Session Objective and Reference Materials	Section 1, Agenda, p. 7

THE NEW DELHI STATEMENT

THE NEW DELHI STATEMENT IS AN APPEAL TO ALL NATIONS FOR CONCERTED ACTION TO ENABLE PEOPLE TO OBTAIN TWO OF THE MOST BASIC HUMAN NEEDS -- SAFE DRINKING WATER AND ENVIRONMENTAL SANITATION.

THE STATEMENT WAS ADOPTED BY 600 PARTICIPANTS FROM 115 COUNTRIES AT THE GLOBAL CONSULTATION ON SAFE WATER AND SANITATION FOR THE 1990s HELD IN NEW DELHI, FROM 10 TO 14 SEPTEMBER 1990. ORGANIZED BY THE UNITED NATIONS DEVELOPMENT PROGRAMME AND HOSTED BY THE GOVERNMENT OF INDIA, THE CONSULTATION WAS CO-SPONSORED BY UN STEERING COMMITTEE FOR THE INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE AND BY THE WATER SUPPLY AND SANITATION COLLABORATIVE COUNCIL.

NEW DELHI, INDIA, 14 SEPTEMBER 1990

"SOME FOR ALL RATHER THAN MORE FOR SOME"

The New Delhi Statement

Safe water supplies and environmental sanitation are vital for protecting the environment, improving health, and alleviating poverty. Disease, drudgery and millions of deaths every year are directly attributable to lack of these essential services. The poor, especially women and children, are the main victims.

Concerted efforts during the 1980s brought water and sanitation services to hundreds of millions of the world's poorest people. But even this unprecedented progress was not enough. One in three people in the developing world still lack these two most basic requirements for health and dignity.

Every developing country learned its own lessons during the International Drinking Water Supply and Sanitation Decade (1981-1990). The global community must now more effectively combine these experiences with a renewed commitment to sustainable water and sanitation systems for all. Access to water and sanitation is not simply a technical issue; it is a crucial component of social and economic development. Sustainable and socially acceptable services can be extended by using appropriate technologies, adopting community management and enhancing human resources.

Political commitment is essential and must be accompanied by intensive efforts to raise awareness through communication and mobilization of all sections of society.

Challenge

Entering the 1990s, governments face formidable challenges. Population growth continues apace. Infrastructure in many cities is stretched to breaking point. Uncontrolled pollution is putting greater stress on the living environment. Depletion and degradation of water resources are causing the costs of new water supplies to escalate. Without fundamentally new approaches, the broadscale deprivation will turn into an unmanageable crisis.

Creating the right conditions for accelerated progress will often involve profound institutional, economic and social changes, as well as reallocation of resources and responsibilities at all levels.

To achieve full coverage by the year 2000 using conventional technologies and approaches would require five times the current level of investment. However, there is a realistic two-pronged alternative:

(1) Substantial reduction in costs of services, through increased efficiency and use of low-cost appropriate technologies.

(2) Mobilization of additional funds from existing and new sources, including governments, donors and consumers.

If costs were halved and financial resources at least doubled, universal coverage could be within range by the end of the century.

Guiding Principles

For countries taking up this challenge -- "Some for all, rather than more for some", the New Delhi Global Consultation recommends four Guiding Principles:

1. Protection of the environment and safeguarding of health through the integrated management of water resources and liquid and solid wastes.

2. Institutional reforms promoting an integrated approach and including changes in procedures, attitudes and behaviour, and the full participation of women at all levels in sector institutions.

3. Community management of services, backed by measures to strengthen local institutions in implementing and sustaining water and sanitation programmes.

4. Sound financial practices, achieved through better management of existing assets, and widespread use of appropriate technologies.

Principle No. 1: The Environment and Health

Safe water and proper means of waste disposal are essential for environmental sustainability and better human health, and must be at the center of integrated water resources management.

Rapid population growth and accelerating urbanization, threaten health and the environment, presenting governments with daunting challenges in the 1990s. The poor, especially women and children, will continue to be the hardest hit.

Every day, water related diseases cause the deaths of thousands of children, and untold suffering and loss of working time for millions. Safe water combined with improved hygiene and better nutrition can reduce, and sometimes even eliminate these diseases.

The dramatic reduction of dracunculiasis (Guinea worm disease) has resulted from the provision of improved water supplies and hygiene education in endemic areas. The target of total eradication by 1995 should be fully supported. Affected countries should accord it high priority in investment programmes.

Toxic and industrial wastes pose increasing dangers to the environment in developing countries. They represent a significant threat to human health through direct contact and the pollution of water and soil. Governments and responsible agencies must take steps to control these health hazards.

Improvements to the household environment can be best achieved through the community's involvement as an equal partner with government and sector agencies. This means building on indigenous knowledge, so that policies and programmes are credible and relevant to the beneficiaries. Emphasis must be placed on education, social mobilization and community participation.

Proper drainage and disposal of solid wastes have a major impact on the neighbourhood environment. New solutions are needed which are environmentally appropriate and affordable to the communities they serve and which also conserve water resources and minimize pollution.

Integrated water resources management is necessary to combat increasing water scarcity and pollution. This includes water conservation and reuse, water harvesting, and waste management. An appropriate mix of legislation, pricing policies and enforcement measures are essential to optimise water conservation and protection.

Principle No.2: People and Institutions

Strong institutions are essential for sustainable development.

They require sound management, motivated people and an enabling environment of appropriate policies, legislation and incentives. Institutional development takes time. The short term achievement of production targets should not take precedence over the need for capacity building. The overall objective is achieving sustainable facilities which are used effectively by the beneficiaries.

A changing role of government is envisaged, from that of provider to that of promoter and facilitator. This will enable local public, private and community institutions to deliver better services. Decentralization demands a strong policy and support role from central governments, while local private enterprise can assist in improving the efficiency and expansion of service delivery.

The special role in development of non-governmental organizations (NGOs) and of volunteers must be acknowledged and strengthened. NGOs are flexible, credible, ready and able to experiment with innovative approaches. Governments should support the NGOs in replicating these approaches, and include NGOs, wherever appropriate, as partners in projects.

Human resources development (HRD) at all levels, from community members to politicians, is essential to institutional development. Training of professionals, managers, technicians and extension workers builds competence and confidence. Information, education and communication strategies must be integrated within HRD policies. Women must be trained and guaranteed equal employment opportunities at all levels of staff and management. National professional associations can play an important role in better HRD.

Education is a key part of the new approach. Schools offer a vast, most receptive audience for hygiene education. Polytechnics and universities already include water and sanitation related subjects in their curricula, but must be encouraged to respond to this sector's needs for multidisciplinary skills. Sanitary and environmental engineering curricula should incorporate substantial elements of community development, communications, appropriate technology, and project management.

Principle No. 3: Community Management

Community management goes beyond simple participation. It aims to empower and equip communities to own and control their own systems.

Community management is a key to sustaining services for the rural poor and is a viable option for poor urban settlements. Governments should support community management, through legislation and extension, and give it priority in national sector strategies for the 1990s.

Communities should have prominent roles in planning, resource mobilization, and all subsequent aspects of development. Within these strategies, gender issues will be all important. Women should be encouraged to play influential roles in both water management and hygiene education. Capacity building is necessary to make community management effective and enable women to play leading roles.

Linkages must be established to ensure that national plans and programmes are responsive to community needs and desires. Methods for evaluating community management have been developed for rural areas. They should now be adopted at the national level and implemented through participatory monitoring and evaluation techniques.

Principle No. 4: Finance and Technology

Given the number of people unserved and the growing demand, more effective financial strategies must be adopted in the 1990s for the long-term sustainability of the sector.

Current levels of investment in the sector are about US$ 10 billion per year.It is estimated that approximately US$ 50 billion a year would be needed to reach full coverage by the year 2000, using conventional approaches. Such a five-fold increase is not immediately feasible.

New strategies should aim towards two key objectives:

* Increased efficiency in the use of available funds

* Mobilization of additional funds from existing and new sources, including governments, donors and consumers.

Substantially increased effectiveness in the use of financial resources can yield major gains in sustained coverage. This will require changes in the way service agencies operate, to make them more cost-effective and responsive to consumer needs and demands. Involving consumers in choice of technology and service levels has proved to have a positive impact on cost recovery and sustainability.

A powerful case can be made for greater government and external support agency support. However, economic and social benefits need to be better quantified. Clear sector strategies and action plans increase the likelihood of water and sanitation programmes receiving higher priority in national planning processes. They may also make the sector more attractive for support from external support agencies (ESAs).

The high debt burden of many developing countries makes it particularly difficult for them to consider loans at market interest rates for all investments in this sector. With this in mind, lending agencies and donors are urged to look favourably on requests for grants or soft loans to support water and sanitation programmes. ESAs can also help by developing procedures or guidelines which will reduce project preparation and approval time. Support should also be given for the establishment of financial intermediaries to make credit more widely available.

Restructuring the utilization of funds for sector investments and setting of user charges are key issues in sector finance. Maximum benefits can be accrued by allocating a higher proportion of funds to affordable and appropriate projects in rural and low-income urban areas, where needs are greatest.

Rehabilitation of defective systems, reductions in wastage and unaccounted for water, recycling and reuse of wastewater, and improved operation and maintenance can often be more effective than investment in new services. Choices of technology and levels of service are major factors in determining construction, operation and maintenance costs of new projects. Due attention must be given to operation and maintenance arrangements which will ensure sustainability before investments are made.

Higher budget allocations and recovery of recurrent costs of operation and maintenance to ensure system sustainability are primary goals to be achieved. Effective cost recovery requires that sector institutions be given autonomy and authority. Further, there must be widespread promotion of the fact that safe water is not a free good. Appropriate charging mechanisms must be adopted, which reflect local socio-cultural and economic conditions. Collection should be decentralized so that revenues are available for management and operation of services.

Public sector institutions frequently default on payments for water supply and waste disposal services. For reasons of financial viability and equity, this practice is unacceptable. Increasing collection efficiency must be part of better financial management.

Research and development in developing countries has resulted in widespread application of much improved handpump and on-site sanitation technologies. The momentum established during the 1980s must be maintained and increased in the next ten years. Among the priority needs for the 1990s are improved household technologies for protecting water quality from source to mouth and low-cost wastewater disposal systems for low-income urban areas. Exchanges of information and experience among developing countries (South-South cooperation) must be further developed.

Follow-up

Implementation of the approaches outlined in this Statement will need to be part of country specific strategies.

Countries and ESAs are urged to formulate and implement action plans for water and sanitation incorporating the Guiding Principles of the New Delhi Statement. UNDP is invited to take a leading role in this process, in collaboration with other UN-system agencies.

The Water and Sanitation Collaborative Council, created immediately prior to the New Delhi Global Consultation, offers a new global forum for the exchange of information and promotion of the sector.

This New Delhi Statement will be reflected in a document to be presented to the World Summit for Children in late September 1990, along with a UNICEF-initiated statement on behalf of children, which was adopted at the Global Consultation.

The New Delhi Statement will be presented by the Government of India to the 45th session of the United Nations General Assembly in October 1990.

In addition, it is recommended that this Statement be brought to the attention of the organizers of the 1992 United Nations Conference on Environment and Development in Brazil, with a request that it be tabled to emphasize the special importance of water and sanitation in environmental management.

STATEMENT ON WATER AND SANITATION ON BEHALF OF CHILDREN

FROM THE GLOBAL CONSULTATION ON SAFE WATER AND SANITATION FOR THE 1990s New Delhi, India 10 - 14 September 1990

TO HEADS OF STATES AND GOVERNMENTS, WORLD SUMMIT FOR CHILDREN AT THE UNITED NATIONS New York 29 - 30 September 1990

The hundreds of millions of people yet unserved with accessible safe water and sanitary means of excreta/waste disposal, pose a distinct threat to the achievement of "Health for All" by the year 2000. Almost half of these unserved are children. The consequences of this, in terms of human health and suffering, as well as social and economic cost, are staggering.

It is clear that over three-quarters of the unserved population reside in rural and peri-urban areas for which appropriate solutions at affordable cost are readily available, requiring only political will for action. As indications are that these areas can be covered with water and sanitation systems in a very cost effective manner via appropriate technologies, it is imperative that attention should be focused more on the rural and peri-urban areas, especially in terms of resource allocation.

In response to the afore-mentioned threat, the Global Consultation on Safe Water and Sanitation for the 1990s, at its meeting in New Delhi, India on 10 - 14 September 1990, urges the Heads of States and Governments at their World Summit for Children at the United Nations in New York, USA, on 29 - 30 September 1990, to support and promote efforts for the achievement of universal access to, or widespread coverage with, safe water and sanitation by the year 2000 .... as a gift to the children of the twenty-first century.

Issued 14 September 1990
New Delhi, India

THE DUBLIN STATEMENT

ON WATER AND SUSTAINABLE DEVELOPMENT

Scarcity and misuse of freshwater pose a serious and growing threat to sustainable development and protection of the environment. Human health and welfare, food security, industrial development and the ecosystems on which they depend, are all at risk, unless water and land resources are managed more effectively in the present decade and beyond than they have been in the past.

Five hundred participants, including government-designated experts from a hundred countries and representatives of eighty international, intergovernmental and non-governmental organizations attended the International Conference on Water and the Environment (ICWE) in Dublin, Ireland, on 26-31 January 1992. The experts saw the emerging global water resources picture as critical. At its closing session, the Conference adopted this Dublin Statement and the Conference Report. The problems highlighted are not speculative in nature; nor are they likely to affect our planet only in the distant future. They are here and they affect humanity now. The future survival of many millions of people demands immediate and effective action.

The Conference participants call for fundamental new approaches to the assessment, development and management of freshwater resources, which can only be brought about through political commitment and involvement from the highest levels of government to the smallest communities. Commitment will need to be backed by substantial and immediate investments, public awareness campaigns, legislative and institutional changes, technology development, and capacity building programmes. Underlying all these must be a greater recognition of the interdependence of all peoples, and of their place in the natural world.

In commending this Dublin Statement to the world leaders assembled at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992, the Conference participants urge all governments to study carefully the specific activities and means of implementation recommended in the Conference Report, and to translate those recommendations into urgent action programmes for:

WATER AND SUSTAINABLE DEVELOPMENT

GUIDING PRINCIPLES

Concerted action is needed to reverse the present trends of overconsumption, pollution, and rising threats from drought and floods. The Conference Report sets out recommendations for action at local, national and international levels, based on four guiding principles.

Principle No. 1 - ***Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.***

Since water sustains life, effective management of water resources demands a holistic approach, linking social and economic development with protection of natural ecosystems. Effective management links land and water uses across the whole of a catchment area or ground water aquifer.

Principle No. 2 - ***Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.***

The participatory approach involves raising awareness of the importance of water among policy-makers and the general public. It means that decisions are taken at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects.

Principle No. 3 - ***Women play a central part in the provision, management and safeguarding of water.***

This pivotal role of women as providers and users of water and guardians of the living environment has seldom been reflected in institutional arrangements for the development and management of water resources. Acceptance and implementation of this principle requires positive policies to address women's specific needs and to equip and empower women to participate at all levels in water resources programmes, including decision-making and implementation, in ways defined by them.

Principle No. 4 - Water has an economic value in all its competing uses and should be recognized as an economic good.

Within this principle, it is vital to recognize first the basic right of all human beings to have access to clean water and sanitation at an affordable price. Past failure to recognize the economic value of water has led to wasteful and environmentally damaging uses of the resource. Managing water as an economic good is an important way of achieving efficient and equitable use, and of encouraging conservation and protection of water resources.

THE ACTION AGENDA

Based on these four guiding principles, the Conference participants developed recommendations which enable countries to tackle their water resources problems on a wide range of fronts. The major benefits to come from implementation of the Dublin recommendations will be:

Alleviation of Poverty and Disease

At the start of the 1990s, more than a quarter of the world's population still lack the basic human needs of enough food to eat, a clean water supply and hygienic means of sanitation. The Conference recommends that priority be given in water resources development and management to the accelerated provision of food, water and sanitation to these unserved millions.

Protection against natural disasters

Lack of preparedness, often aggravated by lack of data, means that droughts and floods take a huge toll in deaths, misery and economic loss. Economic losses from natural disasters, including floods and droughts, increased three-fold between the 1960s and the 1980s. Development is being set back for years in some developing countries, because investments have not been made in basic data collection and disaster preparedness. Projected climate change and rising sea levels will intensify the risk for some, while also threatening the apparent security of existing water resources.

Damages and loss of life from floods and droughts can be drastically reduced by the disaster preparedness actions recommended in the Dublin Conference Report.

Water Conservation and Reuse

Current patterns of water use involve excessive waste. There is great scope for water savings in agriculture, in industry and in domestic water supplies.

Irrigated agriculture accounts for about 80% of water withdrawals in the world. In many irrigation schemes, up to 60% of this water is lost on its way from the source to the plant. More efficient irrigation practices will lead to substantial freshwater savings.

Recycling could reduce the consumption of many industrial consumers by 50% or more, with the additional benefit of reduced pollution. Application of the "polluter pays" principle and realistic water pricing will encourage conservation and reuse. On average, 36% of the water produced by urban water utilities in developing countries is "unaccounted for". Better management could reduce these costly losses.

Combined savings in agriculture, industry and domestic water supplies could significantly defer investment in costly new water resource development and have enormous impact on the sustainability of future supplies. More savings will come from multiple use of water. Compliance with effective discharge standards, based on new water protection objectives, will enable successive downstream consumers to reuse water which presently is too contaminated after the first use.

Sustainable Urban Development

The sustainability of urban growth is threatened by curtailment of the copious supplies of cheap water, as a result of the depletion and degradation caused by past profligacy. After a generation or more of excessive water use and reckless discharge of municipal and industrial wastes, the situation in the majority of the world's major cities is appalling and getting worse. As water scarcity and pollution force development of ever more distant sources, marginal costs of meeting fresh demands are growing rapidly. Future guaranteed supplies must be

based on appropriate water charges and discharge controls. Residual contamination of land and water can no longer be seen as a reasonable trade-off for the jobs and prosperity brought by industrial growth.

Agricultural Production and Rural Water Supply

Achieving food security is a high priority in many countries, and agriculture must not only provide food for rising populations, but also save water for other uses. The challenge is to develop and apply water-saving technology and management methods, and, through capacity building, enable communities to introduce institutions and incentives for the rural population to adopt new approaches, for both rainfed and irrigated agriculture. The rural population must also have better access to a potable water supply and to sanitation services. It is an immense task, but not an impossible one, provided appropriate policies and programmes are adopted at all levels - local, national and international.

Protecting Aquatic Ecosystems

Water is a vital part of the environment and a home for many forms of life on which the well-being of humans ultimately depends. Disruption of flows has reduced the productivity of many such ecosystems, devastated fisheries, agriculture and grazing, and marginalized the rural communities which rely on these. Various kinds of pollution, including transboundary pollution, exacerbate these problems, degrade water supplies, require more expensive water treatment, destroy aquatic fauna, and deny recreation opportunities.

Integrated management of river basins provides the opportunity to safeguard aquatic ecosystems, and make their benefits available to society on a sustainable basis.

Resolving Water Conflicts

The most appropriate geographical entity for the planning and management of water resources is the river basin, including surface and groundwater. Ideally, the effective integrated planning and development of transboundary river or lake basins has similar institutional requirements to a basin entirely within one country. The essential function of existing international basin organizations is one of reconciling and harmonizing the interests of riparian countries, monitoring water quantity and

quality, development of concerted action programmes, exchange of information, and enforcing agreements.

In the coming decades, management of international watersheds will greatly increase in importance. A high priority should therefore be given to the preparation and implementation of integrated management plans, endorsed by all affected governments and backed by international agreements.

THE ENABLING ENVIRONMENT

Implementation of action programmes for Water and Sustainable Development will require a substantial investment, not only in the capital projects concerned,but, crucially, in building the capacity of people and institutions to plan and implement those projects.

The Knowledge Base

Measurement of components of the water cycle, in quantity and quality, and of other characteristics of the environment affecting water are an essential basis for undertaking effective water management. Research and analysis techniques, applied on an interdisciplinary basis, permit the understanding of these data and their application to many uses.

With the threat of global warming due to increasing greenhouse gas concentrations in the atmosphere,the need for measurements and data exchange on the hydrological cycle on a global scale is evident. The data are required to understand both the world's climate system and the potential impacts on water resources of climate change and sea level rise. All countries must participate and, where necessary, be assisted to take part in the global monitoring, the study of the effects and the development of appropriate response strategies.

Capacity Building

All actions identified in the Dublin Conference Report require well-trained and qualified personnel. Countries should identify, as part of national development

plans, training needs for water resources assessment and management, and take steps internally and, if necessary with technical co-operation agencies, to provide the required training, and working conditions which help to retain the trained personnel.

Governments must also assess their capacity to equip their water and other specialists to implement the full range of activities for integrated water resources management. This requires provision of an enabling environment in terms of institutional and legal arrangements, including those for effective water demand management.

Awareness raising is a vital part of a participatory approach to water resources management. Information, education and communication support programmes must be an integral part of the development process.

FOLLOW-UP

Experience has shown that progress towards implementing the actions and achieving the goals of water programmes requires follow-up mechanisms for periodic assessments at national and international levels.

In the framework of the follow-up procedures developed by UNCED for Agenda 21, all Governments should initiate periodic assessments of progress. At the international level, United Nations institutions concerned with water should be strengthened to undertake the assessment and follow-up process. In addition, to involve private institutions, regional and non-governmental organisations along with all interested governments in the assessment and follow-up, the Conference proposes, for consideration by UNCED, a world water forum or council to which all such groups could adhere.

It is proposed that the first full assessment on implementation of the recommended programme should be undertaken by the year 2000.

UNCED is urged to consider the financial requirements for water-related programmes, in accordance with the above principles, in the funding for implementation of Agenda 21. Such considerations must include realistic targets for the time frame for implementation of the programmes, the internal and external

UNCED is urged to consider the financial requirements for water-related programmes, in accordance with the above principles, in the funding for implementation of Agenda 21. Such considerations must include realistic targets for the time frame for implementation of the programmes, the internal and external resources needed, and the means of mobilizing these.

The International Conference on Water and the Environment began with a Water Ceremony in which children from all parts of the world made a moving plea to the assembled experts to play their part in preserving precious water resources for future generations.

In transmitting this Dublin Statement to a world audience, the Conference participants urge all those involved in the development and management of our water resources to allow the message of those children to direct their future actions.

unicef

United Nations Children's Fund Fonds des Nations Unies pour l'enfance Fondo de las Naciones Unidas para la Infancia
Детский Фонд Организации Объединенных Наций 联合国儿童基金会 منظمة الأمم المتحدة للطفولة

Message from Mr. James P. Grant
Executive Director, United Nations Children's Fund (UNICEF)

to the

Conference of African Water Ministers

delivered by

Mr. Stanislas S. Adotevi, UNICEF Regional Director
West and Central Africa Regional Office

Ouagadougou - 3-5 February 1992

It is an honour for me to speak to you on behalf of Mr. James P. Grant, UNICEF's Executive Director, who regrettably isn't able to be with us here today, but who very much wishes this important meeting every success. As you know, within UNICEF's mandate of concern for all the children of the world, Africa and its children are our number one action priority. It is in Africa where the crisis of the old world order is most acute and where the more peaceful, democratic and equitable new world order now struggling to be born will receive its most severe test.

For the first time in the modern era, a subcontinent is sliding back into poverty. Unless drastic measures are taken, sub-Saharan Africa will find itself more or less permanently locked out of world markets and more than half of its population will live below the poverty line by the year 2000. As we meet here today, some thirty million people risk malnutrition and starvation from the famine and drought spreading across Africa; a total of 40 million are now "displaced" by military conflict or environmental disaster.

At the same time, there is a new spirit moving in Africa, a spirit of progressive political and economic reform that makes prospects for renewed economic growth and social progress stronger in the 1990s than at any time in the last two decades. This meeting is a reflection of this new spirit and of Africa's commitment to seize the opportunity which this last decade of the 20th century represents. Mr. Grant asked me to assure you of UNICEF's strong support in the challenging task of providing all Africans -- first and foremost, its children and women -- with access to safe water and adequate sanitation by the year 2000.

Like a still pond that captures the reflection of surrounding trees and mountains, water also mirrors the state of civilization at any given time. As government ministers and officials responsible for the water and sanitation sector, you find yourselves at the strategic convergence point of three -- and

arguably, four -- building blocks of a meaningful new world order: first, what you do every day brings the goal of health for all by the year 2000 that much closer; secondly, your efforts are key to poverty alleviation and sustainable development; third, you are on the frontline of the struggle to protect and preserve our fragile environment; and, lastly, there is an increasing awareness of the centrality of progress in the area of water and sanitation to the advancement of women, especially rural women. These mutually-reinforcing roles mean that you work along the cutting edge of some of the central dynamics of our times, a fact that deserves much greater recognition by politicians, financial planners, the public and the media. As part of its advocacy work, UNICEF is committed to raising awareness of the importance of your work and the need to integrate the sector more fully into development planning, financing and programming.

Twenty-five to thirty years ago, when most of Africa was engaged in the historic struggle to gain independence, less than 15 per cent of the population had access to safe water and adequate sanitation. The intervening years have witnessed significant progress in meeting basic human needs. The provision of water and sanitation was accelerated during the 1980s' International Drinking Water Supply and Sanitation Decade, and they now reach 40 per cent and 32 per cent of the population, respectively. Many governments in Africa can justifiably feel proud of their achievements during this period. Progress in water and sanitation has contributed significantly towards the reduction of child death, illness and disability caused by unsafe water supplies and lack of proper sanitation. It has also helped reduce, in some small measure, the daily drudgery of the African woman and girl child's traditional burden of collecting water from distant sources. The Water Decade has also provided us, as policy makers, with many valuable lessons and experiences. We can now use these as the cornerstone for water and sanitation development for Africa in the 1990s.

At the same time, the water and sanitation sector stands to benefit from the political consensus that has been growing in recent years to place the human being at the very centre of the economic development process. It is significant that the world's top leaders, meeting for the first time in a near-global summit a year ago, embraced the goals set at the New Delhi conference on water and sanitation (which many of you attended) as part and parcel of the human development agenda for the 1990s. Provision of safe water and sanitation to all by the year 2000 was one of the seven over-arching goals adopted at the World Summit for Children, and we fully expect the upcoming Earth Summit in Rio to strongly reinforce momentum toward its implementation.

Notwithstanding the progress that has already been made, a tremendous task is still before us. Today, more than 264 million people in Africa still lack a basic safe water supply and almost 350 million lack proper sanitation. And with rapidly expanding populations coupled with shrinking resources due to past and ongoing economic crises, further constraints are being put on water and sanitation development. The global economic climate holds out little immediate hope for significant increases in resource and assistance flows to the developing world.

Here is where experiences from past programmes provide us with a wealth of lessons and choices on which to base realistic policies, plans and actions that take these constraints into account.

In the 1980s, some US$10 billion a year was spent in the developing world on water and sanitation -- a not insubstantial sum. But 80 per cent of it went into high cost technology for improving services for people who already had water and sanitation. Only 20 per cent of the money spent went to low-cost, appropriate technologies for the unserved poor. If we continue this pattern in the 1990s -- given its slow implementation rate and the implacable growth of the population -- we will not only miss our target, but will actually fall behind. A continuation of the priorities of the 1980s will leave us worse off by the year 2000, with approximately 465 million people without safe water and proper sanitation in Africa alone.

Moreover, the cost of providing these services using the strategies of the past has become unsustainable; by the mid-1990s, they would cost a staggering US$70 billion per year. If, however, we concentrate our efforts on providing the poor with water and sanitation through optimal use of intermediate and low-cost technologies, we could reach universal coverage by the year 2000 for a fraction of the cost.

That is the first and perhaps most important lesson learned in the 1980s. We must now focus our efforts on reaching the unserved, the poor whose numbers are rapidly growing. The second lesson concerns the role of governments. We have found that unless there is an active involvement of governments in sector promotion, little attention will be given to this politically voiceless population. The guiding principle for national governments must be "some for all, rather than more for some," that is, ensuring at least a minimum amount for those who have no access to clean water, instead of improving the supply for the relatively privileged. In this period of renewed appreciation of free-market approaches, we must not lose sight of the importance of the public sector's role in promoting human development, with special emphasis on the poor. There is an important role for the private sector, however; this is our third lesson of the 1980s. Here the potential of the private sector in the delivery of water and sanitation services to the better-off needs to be more fully tapped. At present, this population enjoys government subsidies which they could very well do without, while the poor often pay exorbitant prices for poor levels of these services.

The fourth lesson we have learned concerns the need to build into water and sanitation programmes some elements of cost-recovery, based on the high level of demand for improved services. Experience has shown that where services have been provided totally free of charge, the upkeep and recurrent costs soon prove problematic and there is a sense of lack of "ownership" on the part of the local population. The lessons learned from Africa's Bamako Initiative in the area of primary health care clearly indicate that local management and financing greatly contribute to the sustainability of services. Income that is generated through cost-recovery schemes is recycled for maintenance of services and provides additional input for grassroots

development. Just as Africa has innovated for the world with the Bamako Initiative, you can break new ground by applying similar principles to the water and sanitation sector. This is already happening in several countries in Africa, with promising initial results.

Another important lesson is the need to use appropriate, low-cost technologies. We now have at our disposal a series of models for water supply and sanitation developed during the 1970s and 1980s which are efficient, easy to maintain and inexpensive. The use of these appropriate technologies must be greatly expanded if we are to meet the goal of universal access by the end of this decade. You know better than anyone else the reluctance by some to accept handpumps and latrines as a solution, and yet without such transitional technologies the poor have little hope for advancement. Until such time as the gap between rich and poor has narrowed, no nation can afford to deny some basic level of services while, in the longer term, aiming for the best that modern technology can provide.

The fragmentation of the water and sanitation sector has proven to be a major handicap for development and must be overcome in the 1990s. Currently, water and sanitation projects are often implemented by different actors working in isolation from one another, resulting in waste and duplication of scarce resources. Governments, international agencies and donors should give high priority to coordinating the presently dispersed activities within the sector. It is impossible to "go to scale" in the absence of a clear strategy and government leadership that facilitates the optimal use of human and financial resources.

Another key lesson of the past is that development is contingent upon the active involvement and empowerment of women. Just so long as Africa's women and girls must spend a major portion of their time and energies on water collection, human and economic development will continue to lag. Only by involving women in the decision-making process of water and sanitation programming can we expect sustainability of services. There are numerous examples in Africa and elsewhere showing that women's involvement in the planning, implementation and maintenance of water and sanitation systems has been the linchpin for success.

Finally, experience has shown the importance of water and sanitation sector monitoring. Establishing a baseline is obviously critical to the setting of goals and determining what resources are required to meet them. Systematic but simple and easily implementable monitoring is indispensible as a management tool at every stage of the process.

The 1990s present us with a window of opportunity to improve the well-being of the majority, through the provision of water and sanitation services. This can be done by:

* focusing on the rural and peri-urban poor;

* employing low-cost and appropriate technologies on a massive scale;

* promoting the participation of households and communities in planning, implementing, financing and maintaining water and sanitation projects.

Countries that apply this approach in the coming years can rightfully expect increased donor support for their efforts. Moreover, I have been instructed by our Executive Director to propose a challenge along these lines to this important gathering. If your governments were to actively pursue such a strategy, by preparing a plan for safe water supplies for all who remain unserved today, at a per capita cost of US$30 or less, and by demonstrating national commitment by putting resources behind such a strategy, UNICEF would be willing to spearhead an international drive to cover at least half of the cost through external assistance. The balance would be covered by national governments and beneficiary communities. Such a plan could be incorporated in the National Programmes of Action to implement the goals of the World Summit for Children, currently being developed by most countries around the world. If you see the value in such an African initiative, you might wish to establish — with the support of the UN system — a task force to develop a more detailed proposal that could be taken up by the International Donors' Conference for African Children called by the OAU for later this year. This could become an important African sectorial initiative for the world.

We have a choice. We can continue with "business as usual", neglecting the poor majority, or we can shift our focus to providing "some for all, rather than more for some". By opting for the latter, we can help shape a better and more just new world order and contribute to environmental sustainability into the 21st century.

JOINT MONITORING PROGRAMME

PRE-TEST WORKSHOP

GENEVA, SWITZERLAND 2 - 5 APRIL 1991

A SUMMARY REPORT

WORLD HEALTH ORGANIZATION
WHO

COMMUNITY WATER SUPPLY
AND SANITATION UNIT
1211 GENEVA 27
SWITZERLAND

UNITED NATIONS CHILDREN'S FUND
UNICEF

WATER AND ENVIRONMENTAL
SANITATION SECTION
UNICEF HOUSE (H-11F)
3 UNITED NATIONS PLAZA
NEW YORK, NY 10017 USA

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APPENDICES

EXECUTIVE SUMMARY

The urgent need in the 1990s to improve and strengthen water and sanitation sector monitoring and information management was put forward and documented on different occasions towards the end of the International Drinking Water Supply and Sanitation Decade (IDWSSD) 1981-90. These included the **New Delhi Consultation** and the **World Summit for Children**, both in September 1990, and the **Report of the Secretary-General** on the "Achievements of the IDWSSD 1981-1990," which was presented to the General Assembly in December 1990.

With the demand for improved sector monitoring clearly established, the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) widened their collaborative efforts to incorporate the strengthening of sector monitoring. This collaboration is being undertaken via a **Joint Monitoring Programme (JMP)** for the water and sanitation sector, between the two agencies.

The Joint Monitoring Programme's support to developing countries is based on enhancing monitoring capacity at country level through establishment of **WASAMS** (Water and Sanitation Monitoring System) to facilitate sustainable acceleration of service coverage during the 1990s.

Sector monitoring itself, which includes, sector-action-planning, the strengthening of national data collection processes and networks, and also systematic assessment, analysis and responsive action, is thus seen within the context of a broader framework involving management capacity building at the country level. The WASAMS is tailored to country specific needs and, at the same time, is focused on a few carefully selected core indicators for regional and global monitoring.

In response to these sector needs of the 1990s, UNICEF and WHO jointly organized a workshop in Geneva. The workshop brought together twenty seven sector professionals from seven selected countries namely India, Indonesia, Egypt, Ethiopia, Togo, Jamaica and Guatemala and, from WHO and UNICEF headquarters and, the UNDP/World Bank - RWSG/EA. The objectives of the workshop were:

. To briefly review monitoring of the Water and Sanitation sector in the 1980s.

. To conceptualize Monitoring as a Management Tool for the 1990s.

- To review the WASAMS Questionnaire and test its computer programme through practical application and participatory discussions.

- To explore the most appropriate means of establishing and strengthening Sector Monitoring at country level.

- To initiate sector-action-planning for the seven pilot countries.

- To determine through daily and final workshop evaluations, and group discussions how to best develop an improved training programme for future regional workshops on WASAMS.

As an immediate follow-up to the JMP Pre-Test Workshop, WHO and UNICEF will provide in-country assistance to these seven pilot countries for:

- Sector-action-planning (in collaboration with the UNDP/ World Bank RWSGs where feasible).

- The establishment of National Monitoring Units (NMUs), including the Provision of hardware and the WASAMS computer programme.

- The necessary follow up to institutionalize monitoring as an effective sector management instrument.

The mid-term aim of the JMP is to successfully establish WASAMS in approximately 120 developing countries by 1995. This process will be facilitated through eight regional JMP Workshops scheduled between December 1991 and September 1993. Selected staff from the afore-mentioned pilot countries will be used as resource persons at these workshops. Furthermore, the seven pilot countries will be utilized as referral points for the countries within their respective region.

CHAPTER I

GENERAL BACKGROUND

1.1 INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE (IDWSSD)

On 10 November 1980, the General Assembly of the United Nations proclaimed the period 1981-1990 as the IDWSSD. The primary goal of the IDWSSD, as conceived then, was to achieve full access to water supply and to sanitation for all inhabitants in developing countries by 1990.

At the end of the IDWSSD, it is clear that the primary goal of full access to water supply and sanitation has not been achieved by the target year of 1990. Consequently, both the developing countries, themselves, and the External Support Agencies (ESAs) have reached a broad consensus to continue the existing thrust of the IDWSSD, beyond 1990, to coincide with the goal of "Health for All by the Year 2000".

1.2 WORLD SUMMIT FOR CHILDREN

The World Summit was held at United Nations Headquarters in September 1990 and attended by seventy-one Heads of State and Government, endorsed several development goals for the year 2000. In their proposal to achieve the "Major Goals for Child Survival, Development and Protection," a most prominently stated objective directly relates to the Water and Sanitation Sector, among others. This objective aims to reduce diarrhoea mortality rates by 50% and diarrhoea morbidity rates by 25%.

Therefore, to achieve this the Summit put forward a series of goals, of which the sector related ones are:

- Universal (widespread) access to safe drinking water.
- Universal (widespread) access to sanitary means of waste (excreta) disposal.
- Eradication of dracunculiasis (guinea worm disease).

1.3 NEW DELHI STATEMENT

This is an appeal to all nations for concerted action to enable people to obtain two of the most basic human needs: safe drinking water and environmental sanitation. The statement was adopted by approximately 600 participants from 115 countries in September 1990.

For countries taking up this challenge -- "Some for all, rather than more for some", the New Delhi Global Consultation recommends four Guiding Principles:

1. Protection of the environment and safeguarding of health through the integrated management of water resources and liquid and solid wastes.

2. Institutional reforms promoting an integrated approach and including changes in procedures, attitudes and behavior, and the full participation of women at all levels in sector institutions.

3. Community management of services, backed by measures to strengthen local institutions in implementing and sustaining water and sanitation programmes.

4. Sound financial practices, achieved through better management of existing assets, and widespread use of appropriate technologies.

1.4 REPORT OF THE ECONOMIC AND SOCIAL COUNCIL

This report on the "Achievements of the IDWSSD" to the United Nations Secretary-General proposes a strategy for the 1990s. This strategy for the accelerated expansion must be based on the establishment of realistic targets by governments in terms of level of service coverage to be achieved, and the formulation of sustainable social and economic plans. A summary of this strategy follows:

- Ensure that the development and management of the sector takes place in the context of national planning.

- Assess the current status of institutional structures with a view to strengthening their capacity to plan and manage the sector.

- Monitor service coverage for both water supply and sanitation.

- Prioritize allocation of development financing to the sector.

- Ensure operation and maintenance of systems at all levels.

- Assign high priority to expansion of service coverage to low income populations.

- Improve coordination within the United Nations system to enhance its catalytic role at country level, and as a focal point for promoting global initiatives.

- Promote appropriate low-cost technology, and the adoption of suitable operation and maintenance procedures.

CHAPTER II

OPENING OF WORKSHOP

2.1 INTRODUCTION OF THE JOINT MONITORING PROGRAMME (JMP) PRE-TEST WORKSHOP

The workshop was opened on behalf of the Director-General of WHO, Dr. Hiroshi Nakajima, and the Assistant Director-General, Dr. N.P. Napalkow, by Dr. W. Kreisel, Director, Division of Environmental Health.

Dr. W. Kreisel reflected on the present situation where, despite the accelerated programme efforts and commendable achievements of the IDWSSD, large numbers of people are still without access to adequate and safe water supply and appropriate sanitation. Two lessons learned from these efforts are: 1) the potential of coordination in rendering external support and national resources more effective, and 2) the need for sector information systems for the effective planning and implementation of national water supply and sanitation programmes.

These efforts aimed at improving the effectiveness of national programmes will also significantly contribute towards the goals of Health for All, and Child Survival, of which the provision of safe and adequate water supply and appropriate sanitation are essential components.

2.2 CONTEXTUAL FRAMEWORK

Dr. Denis Warner, Manager, Community Water Supply (CWS), WHO, described the contextual framework in which WASAMS would operate. He briefly reviewed the status of the sector at the end of the IDWSSD. Presently there are still an estimated 1200 million people in the world's developing countries without access to a safe water supply and approximately 1800 million without appropriate means of excreta disposal.

Experience during the 1980s and the situation at the start of the 1990s have been taken as the basis for the development of strategies for the years ahead. These include is the strengthening of national sector information systems and monitoring as essential

planning and management tools, and as a means of directing national, regional and global programmes towards the goals of Health for All and Child Survival.

A brief historical overview explained how the WHO, has over the past decade, made periodic assessment of developments within the sector. This was undertaken by means of a questionnaire named "DEMOS" (Decade Monitoring System) by distributing from the agency's Geneva headquarters via its regional offices to a number of developing countries every two to three year.

In 1984, a meeting held by the External Support Agencies at Konigswinter, W. Germany gave birth to "CESI" (a Sector Information Management System) and in 1989 following the Sofia Antipolis meeting in France, DEMOS was computerized and incorporated into CESI. At that meeting UNICEF proposed a new concept for sector monitoring involving a systematic way of "annually taking the pulse of the sector." This was later referred to as WASAMS. As a follow-up, UNICEF and WHO have joined forces in an attempt to assist governments to better manage the sector. This cooperation has come to be known as the **Joint Monitoring Programme** (JMP). The main focus of this JMP will be country level.

The key to the JMP's strategy is its simplicity, selectivity in terms of performance indicators, and its country-focus. Once this programme of activities is fully functional and performing effectively, countries may opt for a more advanced sector monitoring system.

2.3 CESI Plus

Mr. Ingvar Ahman, CWS, CESI Coordinator WHO, provided an overview of the CESI Plus information management system developed by WHO with support from UNDP, GTZ and others which is supplementary and complementary to WASAMS. CESI Plus can be viewed as a further stage along the road of sector monitoring. The system is broader based than WASAMS, and comprises of four topics which can be introduced individually or as a package. These include human resources development, project development information, sector statistics and general sector information.

2.4 FUTURE THRUST OF MONITORING

Dr. Joseph Christmas, Chief, Water and Sanitation Section, UNICEF highlighted the need for a **"future thrust of monitoring."** This entails a more management oriented style in the 1990s, based on the concept of management by objectives, in which monitoring becomes a management tool. To achieve this, monitoring has to be an ongoing process with systematic reporting at least annually, to

regularly appraise management regarding the performance of the sector so that remedial action can be taken as appropriate.

He explained how this monitoring initiative has considerable potential for improved sector management during the 1990s. It is a powerful tool for governments, government agencies and others participating in the sector development. The JMP displays not only obvious tangible benefits, but the empowerment which it confers on national entities, may significantly contribute to sector sustainability and expansion.

It will be country level focused, with each country playing the lead role, only assisted, if and where required, by ESAs of which WHO and UNICEF will be the focal point. Reviewing the experience of the Universal Child Immunization (UCI) programme in the 1980s, he stressed that the successes of the programme were not directly attributed to the initial quality of data collection but rather through the process of regular monitoring which began with rough estimates that were gradually improved.

For governments to begin monitoring the sector in the 1990s on a sound foundation, he referred to the application of the "triple-A cycle," i.e., assessment of the situation, then analysis of the causes followed by action based on the analysis and available resources.

Using the term **"looking back to the future"** he highlighted the disparities and differential in water and sanitation facilities, and coverage between rural and urban areas. In doing so he stressed the risk of serious sector coverage shortfalls by the year 2000 if implementation rates of the 1980s remain constant.

If full sector coverage is to be attained by the year 2000, programme implementation rates will have to increase by factors of 1.5 to 4.0, depending on the subsector. This implies that funding to the sector be increased by a factor of 3.6 which equates to annual investments of US$ 36 billion until the year 2000.

He clearly emphasized that the possibility exists of attaining 80%, coverage with only 30% of the above projected total cost requirements if low-cost technologies were optimally used. This salient fact stresses the real need for a concerted effort to shift more resources from high-cost technologies to low-cost alternatives.

The WASAMS computer programme has been designed around a set of "core indicators" to enable analysis for global sector information, promotion and advocacy. The core indicators are:

i. COVERAGE:

Functioning: Systems/installations functioning (No. of persons served by these systems).

Utilization: Systems/installations utilization (No. of persons effectively using functioning systems).

ii. MANAGEMENT: Percentage of financial contributions to maintenance by governments/communities/ESAs/ other.

iii. SECTOR FUNDING: Total annual capital investment to sector and proportion to low-cost technologies.

At country level, as governments may wish to add-on other specific indicators that they consider necessary, the WASAMS programme has been designed with this facility in mind.

2.5 INTRODUCTION OF THE JOINT MONITORING PROGRAMME

Mr Carel de Rooy, Senior Project Officer, UNICEF, presented an introduction to the JMP, he explained why WHO and UNICEF were joining forces through the combined experience gained by WHO using DEMOS in the 1980s and UNICEFs corporate experience with UCI also in the 1980s, and to pursue management by objectives as stressed in the World Summit for Children. He emphasized the fact that UNICEF has substantial strength and sector involvement at country level and that this could contribute to sector monitoring capacity building.

A quick examination of the difference between DEMOS and WASAMS was provided, followed by some of the finer details of WASAMS and its specific application at country level. He concluded by giving an overview of the schedule and budget of the JMP in terms of procedures, field-testing, expansion, global operations and options and its phases over the next five years.

2.6 WASAMS QUESTIONNAIRE

Dr. Gregor Watters, CWS, WHO, provided a detailed explanation of the WASAMS Questionnaire, he focused attention on the need for more relevant data collection regarding coverage etc., and how this would in the long-term contribute to better sector management. He highlighted the need to encourage community participation in monitoring system utilization at local level.

In examining the experience of the IDWSSD in relation to the application of various technologies vis-a-vis their

appropriateness, and cost effectiveness, the need to give careful attention to sector funding and low-cost technologies was stressed.

This was followed by a very detailed item by item examination and description of the WASAMS Questionnaire. He conclude the session by describing the relationship between WASAMS, DEMOS and CESI (see Appendix VII).

CHAPTER III

WASAMS COMPUTER PROGRAMME

3.1 DEMONSTRATION: WASAMS I, DATA INPUTTING (45 minutes)

Mr. Ivan Mazuranic, CWS, WHO, gave a 45 minute introduction to the WASAMS computer programme. He concentrated on data-inputting, the hands-on exercise to follow. Using a bar-code projector he was able to project the screens from the computer onto a wall-screen, this provided each participant with a clear view to what was happening on the computer. The objectives of this session were:

- Provide an introduction to the WASAMS computer programme.
- Introduce non-computer users to the keyboard and functions of the computer.
- Determine how to load the WASAMS computer software into the lap top computers provided.
- Learn how data inputting is done.
- Test the data-inputting system for faults, errors, mistakes.
- Determine how user-friendly the system is.

3.2 HANDS ON: RAW DATA INPUTTING (115 minutes)

The objective of this session was to allow participants to gain experience with the WASAMS computer programme through data inputting. Fifteen lap-top computers were made available for the duration of the workshop (i.e. one for every two participants on average). This session began with the loading of WASAMS software into the computer by the participants, a follow-up to what they learned in the previous session. With this achieved, the participants grouped into country-teams and began data inputting using the information from the completed WASAMS Questionnaires for 1990.

3.3 **DEMONSTRATION: WASAMS II, MERGE AND REPORT** (45 minutes)

This session was jointly presented by Dr. Gregor Watters and Mr. Ivan Mazuranic. Again the same technique of projecting the computer screens was used. The objectives of this session were:

- To explain the functions and uses of the three data bases: **Production**, **Simulation** and **Test/Control**.

- How to generate reports from the WASAMS information in the computer system and how to merge reports e.g. to merge say sixty village reports into one county report or, say five district reports into one national report.

- Explain the use of other geographic and mapping software packages to enhance reporting for say advocacy purposes.

3.4 **HANDS ON: DATA MERGING AND REPORTING** (275 minutes)

The objective of this session was to allow participants to gain practical experience of generating reports and, merging reports from several levels. This hands on experience enabled each of the participants to fully familiarize themselves with the use of the WASAMS computer programme, especially the functions of merging and reporting.

CHAPTER IV

COUNTRY LEVEL IMPLEMENTATION

4.1 ***SECTOR/NMUs/NETWORKING/REPORTING:***

This session was presented by **Dr. Joseph Christmas** as a lead into the next session entitled "Group Work: challenge posed; constraints and possible solutions." He explained how the establishment of the NMUs at country level will constitute the "kingpin" of the entire monitoring approach.

At country level the NMU should determine the most effective way to provide the surveillance and data collection. As most countries have already some type of surveillance and data collection system in use to cater with development statistics like immunization, primary health care, education, guinea worm, etc. Therefore the WASAMS could somehow be incorporated into such an existing functioning monitoring system rather than creating a new one, unless unavoidable.

The WASAMS will allow the NMU to analyze raw data channeled upwards. Data concerning the core indicators as earlier described

will be channeled from the NMU to WHO and UNICEF headquarters level, where it will be analyzed from a global perspective for advocacy and sector promotion. This information will ultimately be reverted to regional and country levels.

The information flow-system of the WASAMS, is not merely a one-way system. For every report on the upward chain, there is need for a feed-back report in order to effectively manage the sector and, extracting relevant information for advocacy and sector promotion.

He stressed the importance of knowing the status of the sector as of the end of 1990 through the use of the completed WASAMS Questionnaire. This baseline is essential to enable realistic goal-setting for the year 2000. The proposed **strategy** for the 1990s entails:

4.2 **STRATEGY OUTLINE**

- **The development of a national action plan;**
- **Monitoring against this action plan;**
- **Reporting;**
- **Responsive action.**

For more details see Appendix II.

He referred to the benefits accruing from such a strategy being:

- Better management of the sector by the national authorities.
- Provision of reliable data on the performance of the sector.
- A catalytic effect in accelerating coverage.
- Increasing the potential to attract more funds to the sector.

In concluding, he highlighted why monitoring should be conceived as a development process rather than purely data-collection. In looking to the future and the formidable challenges the sector poses and the urgent need to accelerate coverage he cautioned, that we must **"hurry slowly"** if we are to avoid repeating the mistakes of the past.

4.3 **GROUP WORK: CHALLENGE POSED; CONSTRAINTS AND POSSIBLE SOLUTIONS** (250 minutes)

The objective of this exercise was to stimulate the participants into problem solving, through group brain-storming and coming up with a set of possible solutions or guidelines that might assist governments establish the WASAMS in a true functional way to improve sector management.

Three sector specific scenarios (profiles of fictitious countries) were used. Each had its own particular set of development problems. In all, the three scenarios presented a wide spectrum of realistic development problems (that face many developing countries) which could pose initial constraints to the establishment of WASAMS.

Each group was given one scenario with alist of pertinent questions to examine and come up with possible solutions or guidelines. In selecting the members of each group, careful attention was given to avoid having two persons from any one country together, or having two UNICEF or WHO persons from the same region together. The idea behind this approach, was to provide a wide "cross-fertilization" of ideas and professional experience from different countries. This facilitated each participating country in having one member in all three working groups thereby, giving valuable experience from all regions represented.

Through this process it was hoped that participants would emerge better equipped to tackle the next session.

CHAPTER V

COUNTRY LEVEL PLANNING

5.1 **PREPARATION OF PRELIMINARY COUNTRY WORK PLANS** (140 minutes)

The objective of these exercises was to develop a framework for national sector action plans (for each country represented), for monitoring the sector in the 1990s.

The methodology used was group-work consisting, where possible, of the three representatives from each country (i.e. government, WHO and UNICEF). The completed 1990 WASAMS Questionnaire was used to form the baseline or "benchmark" of the sector for the 1990s.

Each group drawing from their own country specific experience and the experience gained during the previous exercise proceeded to develop preliminary country work-plans.

5.2 OUTCOME OF COUNTRY WORK-PLANNING

The need for a general framework to guide country level action planning emerged from this exercise (see Appendix II for a detailed version). The major points that emerged were:

- Set sector baseline as of December 1990, from the completed WASAMS Questionnaire.
- Make extrapolation of sector coverage to year 2000 using 1980s implementation rates.
- Make estimation of sector funding required to achieve full coverage by year 2000.
- Determine sector policies and their implications upon the sector resource base for the 1990s.
- Determine technology choice and its implications upon service coverage in the 1990s.
- Establish realistic sector goals for the year 2000.
- Make a breakdown of sector goals into annual targets to the year 2000.

The results of the seven groups are summarized as follows:

ETHIOPIA: Actions require the following: convene meetings to brief government and ESAs supporting the sector at country level on the JMP.

The most appropriately location of the NMU might be the Water Resources Commission which has satellite offices throughout the country.

TOGO: A major constraint is the reliability and usability of current sector data.

Actions required include the sensitization of Government to the JMP, the role of Togo and the WASAMS programme, through meeting(s) for all institutions active in water supply and sanitation. Amongst the outcomes should be decisions on location of the NMU, data collecting networks, training, and resources required.

INDIA: The review of the situation in India resulted in the conclusion that two NMUs at central level would be required, one for rural and one for urban services. The challenge is to harmonize WASAMS with an elaborate existing monitoring system.

Also it stressed that an important selling point of WASAMS would be the inclusion of graphical/mapping reporting capability.

INDONESIA: Possible locations of the NMU include the Ministry of Housing Affairs and the Ministry of Planning.

Follow-up action will require meetings with Government and ESAs to determine if/how WASAMS can be integrated into existing monitoring networks. It might be feasible to introduce WASAMS in areas where UNICEF supports Government programmes.

GUATEMALA/JAMAICA: As a priority is was agreed that the 1990 WASAMS Questionnaire be completed for submission by the target date of 30 June 1991.

Other actions foreseen in both countries will be to identify with governments the steps necessary to implement the programme and to initiate training on the use of the WASAMS computer programme.

Since the first Regional Workshop is to be held in Latin America (Guatemala, December 1991), planning for this meeting is required and will probably involve CAPRE.

EGYPT: The follow-up actions include advocacy directed to Government to accept the country's role/responsibilities as a focal/referral country for WASAMS in the Middle East and North Africa.

Other planned actions include inter-agency meetings at national level, and a possible national sector census.

CHAPTER VI

OUTCOME AND FOLLOW-UP

6.1 WORKSHOP EVALUATION

At a cost of approximately US$70,000, 27 participants from seven countries converged to contribute a total of close to 100 man/days of brainstorming, discussions and practical applications to advance towards the objective of establishing WASAMS at country level.

Specifically the following was accomplished:

- Review of the Water and Sanitation sector monitoring in the 1980s.

- Conceptualization of Monitoring as a Management Tool for the 1990s.

- Review and testing of the WASAMS Questionnaire/computer programme through practical application and participatory discussions.

- Exploration of approaches to establishing and strengthening sector monitoring at country level.

- Preliminary sector-action-planning for the seven pilot countries.

- Improvements in the design of future regional workshops on WASAMS.

Each day the participants completed a simple evaluation form. The objective of this was to find out if the workshop was meeting its objectives, and to adjust the methodology, content, training materials, organization, time or any other to improve the workshop.

Likewise, on the last morning of the workshop each participant received a final evaluation form. The objective of which was to see if the workshop achieved its overall objectives and, to extract inputs for the forthcoming regional workshops.

Generally the workshop was well received as can be verified in the overall assessment presented in Appendix I.

6.2 **SPECIFIC COMMENTS BY PARTICIPANTS: INCLUDED**[1]:

- In the group work instead of "fictitious country cases", "real country situations" may be more appropriate. **(Will be carefully considered for Regional Workshops).**

- Copies of case studies by other groups should be circulated along with report. **(The outcome, in the form of recommendations has been incorporated in several parts of the report: in the general comments by participants, as well as in the country specific group work).**

- A more complete explanation of the place of WASAMS in the total WHO/UNICEF goals for sector development is required. **(Please refer to Appendices II and VII).**

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[1] **Comments in brackets were provided by the workshop secretariat.**

- A 15 minutes introduction to lap-top and keyboard would be useful. Non computer-literate participants could come a day in advance if necessary. (**Suggestion to be considered for Regional Workshops**).

- Circulate case studies, presentation and report. (**Agreed, this report should be the vehicle**).

- Problems of monitoring in each country should be discussed in relation to other countries experience. (**This was the purpose of the first groupwork session**).

- More time and French translation and send documents in French. (**Very relevant, translations in french and spanish will follow the english version**).

- Computer usage/software/training should be taken up at the end. (**The secretariat will have to consider this in Regional Workshop design**).

- The WASAMS questionnaire should have been pretested at country level prior to sending them out for filling. (**This was undertaken on a small scale with the support of some 10 UNICEF Country Offices, the results of which were incorporated into the version which was pre-tested in Geneva as one of the objectives of the workshop. On the other hand, the need for 1990 baseline data was considered of paramount importance as well**).

6.3 GENERAL COMMENTS/SUGGESTION BY PARTICIPANTS

Country Level Implementation of WASAMS[2]

- The collaboration of UNICEF and WHO Representative at the country level is of utmost importance. (**Agreed, it is hoped that the JMP will contribute to this aim**).

- Establish a sector action-plan, as priority. (**Agreed, an outline is presented in Appendix II**).

- Establish an inter-ministerial commission (Steering Committee and Task Force) to review the sector, and coordinate sector activities. (**Yes, very relevant for many countries**).

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[2] **Refers to the Water and Sanitation Monitoring System, which comprises the data collection network, surveys to support the latter, NMUs to undertake data processing /analysis/feedback and reporting, Inter-ministerial Task Force, sector promotion etc.**

- There is need for guidelines and criteria to establish NMUs. **(Agreed, follow-up action at country level includes an outline of procedures to be followed, refer to Appendices III & IV).**

- Has issue of NMUs staffing, training and equipment been discussed with the government? **(No, this is part of the country level follow-up).**

- Integrate and strengthen sector monitoring with other well established monitoring systems. **(Yes, also proposed in section 4.1).**

- Promote coordination and cooperation of sector activities among agencies, NGO's, inter-government ministries and the communities. **(Agreed, this is "a means to the objective" of the JMP).**

- Decentralize Planning, Budgeting and Management of the sector as much as possible. **(Interesting proposal, however to be pursued at country level).**

- Promote WASAMS as government monitoring system. **(This is an objective of the JMP).**

- To evaluate utilization and functioning surveys are implied, this should be accepted by governments as a regular responsibility to continuously assess sustainability. **(Yes, this should immediately be discussed and decided upon at country level).**

- Is government using system of target settings for follow-up? If so, how can WASAMS be incorporated into such a framework? **(This is exactly what WASAMS was designed to do!)**

- Provide good orientation and training of monitoring at all levels. **(Yes, to be promoted at country level).**

- Encourage and promote annual district planning for sector. **(Hopefully to be accomplished through the application of WASAMS).**

- Establish data collection networks from community level upwards. **(Good suggestion, should be determined at country level depending on local situation).**

- Integrate sector monitoring as an ongoing community management activity. **(Most relevant: embodied in the concept "management by monitoring").**

Definitions/Guidelines to be Incorporated/Improved in WASAMS Computer Programme (Version II)

- Term "definition" (on questionnaire) to be changed to guidelines/or expressions at country level. (**This is in the process of being done, refer to Appendix VI**).

- Women participation, water consumption, health education and cost per capita should be monitored (**These are very relevant country specific indicators**).

Advocacy and Promotion of WASAMS and the Sector

- Production and distribution of a WASAMS information package with the following contents might prove to be of great help:

  a) Information booklet explaining WASAMS: how it can help governments accelerate sector implementation and its establishment at country level. (**This report, if widely shared amongst sector professionals/decision makers at country level will hopefully contribute to this**).

  b) A flow chart elaborating WASAMS and its position regarding global/national level sector monitoring. (**Refer to Appendix VII**).

  c) Checklist on suggested action plan for WASAMS implementation at country level. (**Refer to Appendices II, III and IV**).

  d) Tentative time schedule of implementation, training/workshops, etc. (**See revised JMP schedule in Appendix X. Country level schedule can be planned on the basis of guidelines provided in Appendices II, III, IV**).

- Promote sector needs at political level. (**This is an objective of the JMP**).

- Promote equitable allocation of national resources to sector, with priority to the poor underserved. (**Very relevant proposal which might be accomplished by using the annual outcome of the WASAMS for sector promotion and advocacy, see Appendix II**).

- Promote use of low-cost appropriate technologies. (**Very relevant to make optimal use of scarce resources for expansion of service coverage, refer to Appendix II**).

Technical Issues

- Standardize technologies wherever possible. (**Strongly recommended, very relevant for sustainability**).

6.4 VERSION II OF WASAMS COMPUTER PROGRAMME

These following suggestion will be taken up by the secretariat in the WASAMS Computer Program modification to generate "Version II".

Screen Layout/Contents

- Screen format may be redesigned to provide more space for figures, boxes for different categories.
- Use of local language is required (e.g. Arabic for North Africa and Middle East).
- A blank space should be provided between population number and percentage field.
- Figures should be in '000 or rounded off to nearest thousand.
- An additional remark/comment field could be added (e.g. N/A, 1989 figures, unknown, etc).
- Provision to aggregate or segregate fields for core indicators.
- On page (5) of the WASAMS User Manual, it is suggested that "exclusively" be replaced by "primarily".

Data Entry/Edit Module

- Cursor should move horizontally across columns by [TAB] or [<--] [-->] keys. Moving cursor across the columns should be conditioned on pressing [TAB] key only.
- Combine 'Capital Costs' (new systems + rehab.) with one (or two) variables or proportions (by Water/Sanitation separately).

- Provision of facility to enter figures in local currencies and average annual conversion rates is required for national to global reporting.

- The principle of totals first, followed by breakdowns into components may be used in screen design.

Validations/Checks

- Programme accepts wrong numbers without validation, this should be rectified.

- Totalling should be done by computer and not user.

- Inconsistencies in totals when entering data should be flashed.

Data Merge/Backups

- Provision to merge sub-levels simultaneously should be provided.

- Normalization facility should be provided to allow for missing values and arrive at estimates on the basis of total population.

- Provision to back-up questionnaire by selection criteria may be provided (e.g. by states or districts on floppies) so that back-up floppy can be prepared for state/districts.

Computing Environment

- Software should have customization routine to install in DOS 3.2 onwards or 4.01 version and different set of hardware parameters.

- More printer drivers should be added for printing report modules.

- Unix, Xenix version should be made available for users already having different hardware.

- More interfaces should be provided for graphics/presentation packages (e.g. Harvard Graphics).

- Mapping software does not seems to interface well with WASAMS. A more general cartographic package with capabilities of depicting statistics on maps with zoom in, zoom out, point group zoom, showing bar/shades and super imposing different layers on base maps etc. should be considered.

- Base maps with country, state, district level boundary may be provided.

"Open-ended" System to meet Country Specific Requirements

Suggestions received from various participants, indicate that the success of WASAMS shall depend to a large extent on its capacity to meet country specific monitoring needs and its flexibility to add other indicators which may vary from country to country.

Therefore, the WASAMS could comprise of two basic inter-related modules.

* Core module
* Country specific module

a) Core Module

To handle specific core indicators only, as indicated in the WASAMS questionnaire - similar to what was developed and used in the pre-test workshop.

b) Country Specific Module

To cope with country specific sector monitoring requirements.

The latter should allow the user to create separate screens for data entry/editing. The information fed through these screens should be stored on a separate data base so that it does not interfere or corrupt information in the Core Module.

However, the Query/Reporting module should be modified so that, reports can be generated on the same screen using information stored from both data bases using any selection/aggregation criteria.

The country specific data base information should not be aggregated or used on a regional/global basis.

6.5 IMPROVED DESIGN OF REGIONAL WORKSHOPS

As indicated by the overall evaluation, on the whole the workshop design was relatively good. However, with some of the proposed modifications, the eight regional workshops planned for the 1991 - 93 period could become more effective.

- Time-wise the evaluation results indicate that workshop length might be increased slightly.

- Structurally it seems that the concept of sector action planning leading into a framework for monitoring should follow the general introduction and precede group work sessions, and lastly be followed by exposure to the WASAMS computer programme.

- There were indications that the secretariat should shorten its presentations and allow more time for plenary inputs and discussions.

- Arrangements should be made to facilitate multi-lingual communications.

6.6 REVISED JMP IMPLEMENTATION SCHEDULE

As a result of the workshop, the secretariat has made minor changes to the five year JMP Implementation Schedule. Refer to Appendix X.

6.7 ACTIONS FOR IMMEDIATE FOLLOW-UP AT COUNTRY LEVEL

As an immediate follow-up to the JMP Pre-Test Workshop, WHO and UNICEF will provide in-country assistance to the seven pilot countries for:

- Sector-action-planning (in collaboration with the UNDP/ World Bank RWSGs where feasible).

- The establishment of National Monitoring Units (NMUs), including the Provision of hardware and the WASAMS computer programme.

- The necessary follow through to institutionalize monitoring as an effective sector management instrument.

Refer to Appendices II, III, IV and VII for details.

APPENDIX I

WORKSHOP EVALUATION: TABLES

DAILY EVALUATIONS

Daily Evaluations	Very Good	Good	Moderate/ Little value
	(AS PERCENTAGE OF PARTICIPANTS)		
Day 1	11	79	10
Day 2	18	65	17
Day 3	37	47	16
Day 4	34	60	6

Therefore, an average 88% of the participants found the Pre-test workshop good to very good.

FINAL EVALUATION

JMP PRE-TEST WORKSHOP (APRIL 2-5, 1991)
Final Evaluation

1. Overall, how valuable was the WASAMS Training for you?

of no value	of little value	of moderate value	valuable	very valuable
			14	3

2. As a result of the Training, will you be able to explain/teach others about the WASAMS Programme?

no	somewhat	yes
	7	10

3. What constraints might hamper you being able to train others in your country?

4. Overall, was the content of the training activities appropriate?

no	somewhat	yes
	5	12

What suggestions do you have for improving the content?

5. Overall, was the Methodology of Training appropriate?

no	somewhat	yes
	3	14

What suggestions do you have for improving methodology?

6. Overall, was the Training Team Members well prepared and their sessions well made?

no	somewhat	yes
	3	14

What suggestions do you have for improving training?

7. Overall were the training materials provided, appropriate?

no	somewhat	yes
	3	14

What suggestions do you have for improving the Training Materials?

8. Organizationally, how well was the Training activity run?

very poorly	poorly	undecided/ unsure	well	very well
			13	4

What suggestions do you have for improving the organization?

9. Timewise the training activity was:

too* short	too* long	just right
8		9

APPENDIX II

PRELIMINARY ACTION PLANNING AS A FRAMEWORK FOR WATER AND SANITATION SECTOR MONITORING

1. **GENERAL OUTLINE**

This proposed framework is not a substitute to more formal and comprehensive sector planning, but it could play a relevant role at the start of this process and might even be used as an introduction or as an annex to formal sector plans. This framework aims at the following:

i. Creating awareness about the dimension of the challenge to be faced by the sector at national level during the 1990s;

ii. Initiating and facilitating the process for the establishment of detailed, sound sector policies for the future, and clearly establishing their power in influencing the magnitude of the resource base;

iii. Enhancing the process whereby an optimal mix of appropriate technologies for sector implementation is made available, thereby providing a base for the acceleration of coverage in a sustainable manner;

iv. Providing the necessary context to facilitate sector monitoring during the 1990s.

The proposed outline for this action planning is comprised of a series of activities which could be sequentially undertaken by governments, with external support from UNICEF, WHO, UNDP/World Bank and others as needed, to culminate in a framework for sector monitoring during the 1990s.

The term, framework, implies a "living" document with a high degree of flexibility to allow for changes with time.

The referred to activities are:

- Documenting the status of the water and sanitation sector for the base year, 1990;

- Outlining the challenges for the 1990s with respect to goal setting for the year 2000 and achievement of these goals;

- Listing with careful review and analysis, of all current (and required) sector policies with their respective advantages and disadvantages, followed by a recommendation of the optimal set

of future sector policies, which will provide a sound resource base for the 1990s;

- Indicating the combination of technologies which will complement the sector policies for accelerating the coverage rate in a sustainable way;

- Establishing of realistic sector goals for the year 2000 (or thereabout). Estimating the total resources required to achieve the goals, with an indication of the proportion to be provided by the government, beneficiaries/consumers and external support agencies respectively;

- Breakdown of sector goals into annual targets against which sector monitoring can be undertaken.

2. SEQUENTIAL ACTION PLANNING PROCESS

2.1 Current Status of the Sector (Year 1990 Baseline)

This should be the initial step of the planning process. As the mechanism to derive accurate sector data may not currently be in place, it is necessary to be conservative in estimating the baseline status. It becomes very difficult to verify progress in the implementation process if initial data are too optimistic.

It is advised that, at this stage, a population denominator is agreed upon at the country level (either through a census or extrapolation from the last census), and that this figure be desegregated for the country's sub-national administrative levels. If this is not undertaken there may be over-estimations of the unserved/served population.

2.2 Outline of the Challenge

This step is recommended to enable planners and decision makers to get an idea of the dimension of the sector challenges. This may include the following:

Extrapolation of the 1980s Coverage/Implementation Rates to the Year 2000.

By using the implementation rates for provision of urban and rural water and sanitation systems during the 1980s, implying the use of the current sector policies and technology package, an extrapolation should be made for the service coverage which may be attained by the year 2000.

Coverage should be estimated on the basis of "functioning systems" as outlined in the "Water and Sanitation Monitoring

System" (WASAMS). In those countries where full service coverage by the year 2000, following the approaches of the 1980s, could easily be met , it is proposed that for future extrapolation a higher level of service be applied by, for example, reducing the number of beneficiaries per water point or increasing the density of water points to reduce the distance from households.

Those countries that are unable to reach full coverage at the 1980s rates of implementation, should indicate the size of the deficit and the requirements to meet the deficit.

2.3 Sector Policies and their Implication upon the Sector Resource Base for the 1990s

The next phase of the process entails the listing of all current sector policies indicating their advantages and constraints vis a vis their national acceptability, and their potential to generate resources (internally and external).

Additionally a list of new policies can be made for consideration so that all viable options are looked at to ensure an optimal package of sector policies for the sustainability and acceleration of service coverage during the 1990s.

2.4 Technology Choice and its Implication upon Service Coverage in the 1990s

Once the major sector policies for the future have been established, the future resource base is to some extent also known, and could for practical purposes, be considered a constant. At this point, simulations could be made as to what technologies, or technology combinations, could be promoted and used, to complement these policies, taking user acceptability, consumer demand, and maximum service coverage as some elements to be considered. Thus, the technologies to be promoted and the context in which they are to be used, should be indicated.

This combination of enlightened sector policies and appropriate technologies will determine the future base and implementation rates for the sector, thereby enabling a realistic forecast of coverage for the year 2000.

A similar exercise, undertaken by UNICEF[3] with global sector data on service coverage, and unit costs, revealed that if the New Delhi Global Consultation guideline of "focus upon the unserved

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[3] **"The Decade and Beyond: At a Glance" J. Christmas and C. de Rooy. UNICEF Water and Environmental Sanitation Section, Programme Division, issued 17 August 1990.**

low-income populations" were to be strictly followed, it would be possible to reach 80% service coverage by the year 2000 with only 30% of the funding required for full coverage. This is explained by the fact that sustainable low cost technologies suited for urban slums and rural areas, where the poor are concentrated, are much less costly than conventional technologies which hitherto have taken the lion's share of sector funding.

2.5 Establishment of Realistic Sector Goals for the Year 2000

With sector policies established to provide an indication of the resource base, and an optimal package of technologies selected to provide service coverage, it is possible to establish sector goals for the future. This should take into consideration sector policies, the technology package to be adopted, the time-frame for implementation and the estimated resource base available. The referred to process would allow for the determination of realistic goals, which in turn would have a better chance of being met.

Once the goals for the year 2000 are set, the total cost of achieving these national goals should be determined. An indication should then be given regarding the source for the funds, i.e. the proportion to be generated nationally (internally) and externally.

2.6 Breakdown of Sector Goals into Annual Targets

The breakdown of these sector goals into annual targets is the final step of the process, and must be undertaken to provide a framework for sector monitoring. With annual targets to refer to, monitoring becomes a management tool.

APPENDIX III

TERMS OF REFERENCE FOR FOLLOW-UP OF JMP AT COUNTRY LEVEL[4]

Background and Purpose

As a follow-up to the WHO/UNICEF Joint Monitoring Programme, Pre-test Workshop held in Geneva 2-5 April, and in response to the mandates/recommendations put forward by the following:

- World Summit for Children, 29-30 September 1990.
- Report of the Economic and Social Council to the UN Secretary-General on the achievements of the International Drinking Water Supply and Sanitation Decade 1981-1990, and
- The New Delhi Statement of 14 September 1990.

The JMP intends to support Governments in assessing the current status of the sector in the country as of 31 December 1990, and provide planning assistance to government for the establishment of a National Monitoring Unit for the sector in the 1990s.

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[4] **For the 1990s, a new approach to sector monitoring is being proposed. This is based on the concept of management by objectives, in which monitoring becomes a management tool. To achieve this, monitoring has to be an on-going process with systematic reporting at least annually to regularly appraise management regarding the performance of the sector so that remedial action can be taken as appropriate.**

This new approach will be country focussed, with each developing country playing the lead role, ably assisted by the external support agencies (ESAs) of which UNICEF and WHO will be the focal point. Thus, it is referred to as the joint monitoring programme, reflecting the collaboration between WHO and UNICEF in assisting the country with this endeavor. Initially the focus will be to establish WASAMS in seven pilot countries, they are: India, Indonesia, Egypt, Ethiopia, Togo, Jamaica, and Guatemala. By 1995 it is hoped that most developing countries will be using this approach.

Specific Objectives

a) Be briefed by the UNICEF Representative or his/her agent on the Joint Monitoring Programme at the country level.

b) Verify the establishment of any sector monitoring workplan for the country, and how it is progressing.

c) Offer technical assistance in the execution of the Joint Monitoring Programme, including use of the WASAMS computer programme.

(See section 4.2 of Summary Report as well as Appendix II).

Consultant's Final Report

Should be generated on Word Perfect 5.1 and Harvard Graphics (if necessary)[5]. The report should be divided under the following headings:

- Table of Contents
- Executive Summary

1. Introduction

   1.1 Background
   1.2 Scope of Work (overall objectives)
   1.3 Approach and Methodology

2. Cooperation with Other External Support Agencies

   2.1 Summary, Meeting with External Support Agencies
   2.2 Conclusions and Recommendations

3. Meetings with Government

   3.1 Summary of meetings
   3.2 Recommendations for improving WASAMS Software Computer Programme
   3.3 WASAMS Institutional Arrangements
   3.4 WASAMS Policy Issues
   3.5 Action Plan for WASAMS

4. Recommendations

   4.1 Follow up details and schedule

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[5] **Laptop computers will be made available to the consultants.**

Determine what follow-up is needed
a) June - December 1991
b) January 1992 - December 1995

What needs to be done? Who needs to do it? What resources are required? And the schedule?

APPENDICES

A. Terms of Reference and Itinerary
B. List of Pertinent Sector Document and Report used
C. List of Persons Met
D. Abbreviations and Acronyms

APPENDIX IV

PREPARATORY WORK AT COUNTRY LEVEL

Preparatory work to be done at country level before consultant arrives.

1. Prepare a package containing all pertinent sector information. If there is any relevant information that can be faxed to the consultants prior to their departure proceed as follows:

   a) Togo, Egypt and Ethiopia, please forward all information for attention of:

      Dr. Gregor Watters
      World Health Organization
      Community Water Supply and Sanitation
      1211 Geneva 27
      Switzerland
      FAX 41-22-791-0746

      (with copy to Dr. J. Christmas, Chief, Water and Environmental Sanitation Section, UNICEF, New York - see address below).

   b) Guatemala and Jamaica, please forward all information for attention of:

      Mr. Ingvar Ahman
      World Health Organization
      Community Water Supply and Sanitation
      1211 Geneva 27
      Switzerland
      FAX 41-22-791-0746

      (with copy to Dr. J. Christmas, Chief, Water and Environmental Sanitation Section, UNICEF, New York - see address below).

   c) India and Indonesia, please forward all information for attention of:

      Mr. Brendan Doyle
      UNICEF House (H-11F)
      3 UN Plaza
      New York, NY 10017
      U.S.A.
      FAX (212) 326-7438

2. Arrange Meetings:

   a) With sector representatives of External Support Agencies including WHO and UNICEF (to coincide with consultant's arrival).

   b) With government and sector representatives from WHO and UNICEF (the following day after above meeting).

3. Arrange Temporary Office Space.

4. Arrange Transport for Duration of Visit.

Tentative Travel Schedule

Country	Consultant's Name	Arrival Date	Departure Date
TOGO	Gregor WATTERS	Sun. 06.02.91	Sat. 06.08.91
EGYPT	Ditto	Tue. 06.11.91	Wed. 06.19.91
ETHIOPIA	Ditto	Wed. 06.19.91	Wed. 06.26.91
GUATEMALA	Ingvar AHMAN	Sun. 06.02.91	Sat. 06.08.91
JAMAICA	Ditto	Sun. 06.09.91	Sat. 06.15.91
INDIA	Brendan DOYLE/ Ian MAZURANIC	Sun. 06.02.91	Sat. 06.08.91
INDONESIA	Ditto	Sun. 06.09.91	Sat. 06.15.91

APPENDIX V

HARDWARE REQUIREMENT TO RUN WASAMS MICROCOMPUTER PROGRAMME AT NATIONAL LEVEL

The WASAMS Microcomputer programme uses FOXBASE and IBM Compatible hardware standards. The DOS to be used is IBM-PC DOS 3.3.

The hard disk space needed, the RAM size and the CPU capacity of the microcomputer to be chosen will be determined by several factors:

- The WASAMS programme requires in the initial version 2.5 MB hard disk space.

- Each questionnaire, which forms the basis for data collection and data input into the programme, requires 2.5 K space.

- It is recommended that users install a graphic programme, a spreadsheet programme and a work processing package to be used in connection with monitoring reporting. This would require approximately 10 MB space.

- As the system develops improvements and enhancements will take place. One such imminent improvement is linking the WASAMS programme to an geographic information presentation programme. With this facility geographic information will be combined with statistical information. Maps of provinces, districts etc. will all require substantial hard disk space. Some 10-20 MB should be reserved for this purpose.

The hard disk space required to accommodate the data from questionnaires can grow to a substantial size. If Uganda, representing a middle sized country is taken as an example, there will be 5 different levels recognized as far as WASAMS is concerned: national, regional, district, counties and subcounties. In all there are 640 subcounties in this particular case. The storage of one year's information for Uganda would amount to approximately 2 MB counting the different levels for which data will have to be available.

An accumulation over 10 Years of data would amount to 20 MB. It is recommended that all the data is kept on the hard disk since trend analysis requires that all the historical file accessible. All data should obviously and always be backed up on floppies in the usual manner.

Depending of the size of the country (here, for simplicity equated with the total number of administrative entities of the lowest hierarchical level), the following microcomputer hardware is recommended[6]:

Category I: Countries with populations up to 5 million inhabitants

IBM PS/2 Model 55 (16MHz 80386sx CPU, 4MB RAM, 1.44MB 3 1/2 inch Floppy Disk Drive, 60 MB 27ms fixed disk,
Keyboard/Video (VGA)/Serial/Parallel/Mouse Adapters,
IBM PS/2 Enhanced Keyboard
Microsoft Mouse for PS/2
IBM Colour Display 8513 for PS/2 (12 inch diagonal, 640x480)

Category II: Countries with populations up to 10 million inhabitants

IBM PS/2 Model 70 (25MHz 80386 CPU, 4 MB RAM, 1.44MB 3 1/2 inch Floppy Disk Drive, 120 MB 23 ms Fixed Disk,
Keyboard/Video (VGA)/Serial/Parallel/Mouse Adapters,
IBM PS/2 Enhanced Keyboard,
Microsoft Mouse for PS/2,
IBM Colour Display 8513 for PS/2 (12 inch diagonal, 640x480)

Category III: Countries with populations over 100 million inhabitants

IBM PS/2 Model 80-A31 (25 MHz 80386 CPU, 4 MB RAM, 1.44 MB 3 1/2 inch Floppy Disk Drive, 320 MB, 12,5 ms Fixed Disk,
Keyboard/Video (VGA)/Serial/Mouse Adapters,
IBM Enhanced Keyboard,
Microsoft Mouse for PS/2,
IBM Colour Display 8514 for PS/2 (16 inch diagonal, 1024x768)

The above specifications refer to IBM microcomputers. IBM compatible microcomputers are available with similar specifications. Depending on existing purchasing agreements, services arrangements, prices offered and availability of different makes in countries choices of equivalent hardware in other makes has to be made. Below is a list of three equivalent types of Dell Computers as an example:

---

[6] **It should be noted that this criterion is only indicative as a small country may ultimately need a larger computer capacity than a large one if its administrative structure is more complex.**

Category I: DELL 316SX (16 MHz CPU 40 or 100 MB HD, 4MB RAM)

Category II: DELL 325-D (25 MHz CPU 100 or 190 MB HD, 4MB RAM)

Category III: DELL 333-D (33 MHz CPU 338 or 660 MB HD, 4MB RAM)

Prices on the European Market (for the higher alternative of hard disk capacity) are approximately US$ 3800, 5700 and 8000 respectively. Prices in US tends to be 20-25% lower in average. Warranties, service arrangements and many other factors have to be taken into account when comparisons are being made.

The printer recommendation for operating the WASAMS programme in most developing countries is a dotmatrix printer EPSON 1050 or equivalent with paper feed, parallel printing cable and print ribbons.

MINIMUM HARDWARE REQUIRED TO RUN WASAMS COMPUTER PROGRAM

* IBM PC/AT or PS/2 model 50 (or compatible)
* Hard disk
* 640 K of RAM

MINIMUM DISK SPACE REQUIRED

To install and run WASAMS computer program minimum of 2.5 MB of hard disk space is required.

RECOMMENDED HARDWARE CONFIGURATION

* **IBM PS/2 55 SX** or above (or compatible)

  The specifications of a standard IBM PS/2 55 SX are:

  1 MB of RAM, 20 MB of hard disk, 16 MHz, 80386 SX processor, VGA colour monitor.

  Note.- IBM PS/2 SX could optionally have maximum 60 MB of hard disk. For that reason PS/2 70 or PS/2 80 which could optionally have 4 MB of RAM and 120 MB of hard disk is also recommended.

* **DELL 316 SX**

  The specifications of a standard DELL 316 SX are:

  1 MB of RAM, 40 MB of hard disk, 5 1/4" 1.2 MB drive, 16 MHz, 386 SX processor and VGA colour monitor.

This machine could optionally have maximum 190 MB of hard disk, 3 1/2" disk drive and 2 MB of RAM.

It would cost approximately 4,200 US$.

* **EPSON LQ 1050 Dotmatrix printer** with paper feeder US$ 1,000

Laserjet printer HP LJ series III with the 1 MB of memory.

It costs approximately US$ 2,500 and should be considered for some countries.

UPGRADING POSSIBILITIES

Both the RAM and the hard disk could be upgraded, the processor also.

Although upgrading is inexpensive, it is strongly suggested not to opt for it if new equipment can be purchased. With upgrading there is a higher risk of running into difficulties and having problems in which case country offices without qualified computer staff would have to entirely rely on external support.

WHO, EHE/CWS, 1 March 1991

APPENDIX VI

REVISED WASAMS QUESTIONNAIRE GUIDELINES[7]

To enable regional and global promotion and advocacy on behalf of the sector there is need for standardization in the **broadest sense** of the term for guidelines used by the sector, this is of paramount importance. Therefore, the guidelines provided hereafter relate to the "core indicators" and must be considered as **indicative** only.

It is painfully obvious that global and/or regional standard definitions cannot be accurately applied to all countries. The mere fact, that countries differ greatly in their perception of socio, economic and technical standards highlights the real difficulty in trying to impose regional or global standardization of definitions with any degree of accuracy. For example, when **applying the definition of appropriate low-cost technology** the variation might be such:

In Egypt accepted standards:

a) for Rural Water Supply might be: **a handpump-equipped borehole**

b) for Urban Water Supply possibly: **a house connection**

In contrast, in Equatorial Guinea accepted standards:

a) for Rural Water Supply might be: **a protected hand-dug well**

b) for Urban Water Supply possibly: **a public standpipe**

One may conclude from this hypothetical example that Egypt may not consider the protected hand dug well an acceptable low cost technology whereas in Equatorial Guinea it may be acceptable at this stage of that country's development.

At the JMP Pre-test workshop held in Geneva, April 2 - 5, 1991, one of the most time-consuming exercises that arose was the issue of definitions used in WASAMS. The search to clarify these issues and to come up with acceptable broad definitions (for some of the sub-sectors) went unresolved by the end of the workshop. Bearing this very pertinent constraint in mind, an attempt is made here to clarify the issue. To achieve this, the following

---

[7] **The questionnaire itself is being modified into an upgraded version (WASAMS Computer Program Version II).**

questions regarding definitions must always be at the forefront of one's mind when completing the WASAMS questionnaire.

1) For water supply,

Does the community or household have access to:

a) **Safe water?** (by local[8] definition)

Is it:

b) **Low-cost technology?** (by local definition)

Or is it:

c) **High-cost technology?** (by local definition)

2) For Sanitation (excreta disposal)

Does the community or household have access to:

a) **A sanitary means of excreta disposal** (by local definition)

Is it:

b) **Low-cost technol** (by local definition)

Or is it:

c) **High-cost technology?** (by local definition)

In recognition of these difficulties which confront monitoring of the sector at regional and global levels, WHO and UNICEF request that countries complete the WASAMS questionnaire - using the broad indicative definitions outlined later.

This does not preclude governments from applying their own local definitions or additional indicators when using the country specific portion of WASAMS.

---

[8] **Local definition, refers to the definition used within the pertinent country.**

Guidelines to Definitions:

It is important to note that the "broad indicative definitions" described herein apply to the WASAMS "**core indicators**" which will be used at regional and global levels only.

GEOGRAPHIC CATEGORIZATIONS:

Urban medium to high income areas: are these whose populations are perceived locally to have good access to safe water supply; sanitation; a good physical standard of dwelling and; have good access to other services such as health and public transport.

Urban low-income areas: are those whose populations do not fit into the previous category, and have minimum access to services enjoyed by the afore-mentioned group, for example, without reasonable access to safe water supply, sanitation and/or other social services.

Rural areas: are those populations perceived by local definition to reside outside urban centers and being generally dispersed populations. As defined in the local population census.

WATER SUPPLY SYSTEMS:

House Connection: are taps installed within the individual house, normally more than one tap, irrespective of the source and extraction method.

Yard Tap: generally a single tap installed within a private plot of land, but is positioned outside the house **structure,** irrespective of the source or extraction method.

Public Standpipes: taps installed on public grounds and accessible to the general public/community, irrespective of the source or extraction method.

Boreholes with handpumps: these are drilled boreholes with a final diameter (cased or uncased), generally smaller than 6 inches and with static water levels (SWL) of usually less than eighty (80) meters depth. Equipped with a handpump which is manually operated and, which is rarely able to lift water from depths greater than 80 meters.

Protected dug wells: are those which are adequately protected (guarded) against surface or outside contamination through the use of lining or covering, with a rim sufficiently raised above ground level, and may be equipped with a pump (any

APPENDIX VI

REVISED WASAMS QUESTIONNAIRE GUIDELINES[7]

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Public Standpipes: taps installed on public grounds and accessible to the general public/community, irrespective of the source or extraction method.

Boreholes with handpumps: these are drilled boreholes with a final diameter (cased or uncased), generally smaller than 6 inches and with static water levels (SWL) of usually less than eighty (80) meters depth. Equipped with a handpump which is manually operated and, which is rarely able to lift water from depths greater than 80 meters.

Protected dug wells: are those which are adequately protected (guarded) against surface or outside contamination through the use of lining or covering, with a rim sufficiently raised above ground level, and may be equipped with a pump (any

type). In completing the WASAMS Questionnaire specify if the pump is high-cost or low-cost technology (by local definition).

Rainwater collection system: these are individual household or communal rainwater harvesting systems. The system normally consists of a catchment area (roof or other type of preferably impermeable or almost impermeable surface), and a storage system consisting of a cistern, drums, clay pots or other such container. Sometimes the system is fitted with a filter usually located between the catchment and storage components. The water must be rendered safe to drink as an end product.

Other (specify): this refers to any other safe water supply system not previously mentioned. It is **very important** when specifying the safe water system that falls under the general category of "other", to indicate if it is considered low-cost technology (LCT) or high-cost technology (HCT) (by local definition).

SANITATION SYSTEMS:

Household connections to conventional public sewers: this refers to a pipeline outlet from the household to the public sewerage system. Its function is to conduct and discharge human excreta and wastewater from the household to a sewerage treatment system.

Septic tank: this refers to an on-site (generally on the household or institutions plot) human excreta and wastewater collection system. The system implies the use of a water closet and therefore a household water connection. Septic tanks periodically require emptying.

Shallow small-bore public sewer: refers to unconventional sewerage systems, suitable for areas where water supply is low i.e. where consumption is normally less than 30 liters/capita/day, (which implies dwellings where public standpipes are used, usually). These small-bore sewers are normally of 4 to 6 inches in diameter and are buried at shallow depths (less than 1 meter) below the surface. Such systems are usually designed for low-income populations in unplanned settlements where the population density usually exceeds 200 persons per hectare.

Pour-flush latrine: refers to on-site latrine system which uses a small amount of water (1-3 liters) for hand-flushing the human excreta, and has single or double pits for excreta and wastewater collection. Therefore, it may or may not be connected up to a small-bore or conventional sewerage system.

Ventilated Improved Pit (VIP) latrine: refers to an on-site improved "dry pit" latrine comprising of a vent pipe with a fly screen used to trap flies in the pit and, also allows evacuation of foul air into the atmosphere above the latrine roof. Thereby, minimizing smells within the latrine super-structure and trapping flies that could spread diseases through faecal contamination.

Simple pit latrine: refers to a conventional "dry" pit latrine without any improvements such as vent pipes and fly screen (as fitted to the VIP). This type of latrine is often foul smelling and also allows flies to escape resulting in the risk of food contamination etc.

INDICATIVE EXAMPLES: DEFINITION OF "FUNCTIONING"

Emphasis is stressed on the following definitions as examples only. Therefore these examples should be elaborated upon at country level to suit specific needs.

Water Systems:

i. For reticulated systems leading to household connections, yard taps or standpipes. For these systems to be considered **"functioning"** they should operate above 50 per cent of design capacity on a daily basis.

ii. For handpumps, **"functioning"** will mean those operating at over 70 percent of the time, and where the time-lag between breakdown and repair does not exceed two weeks.

iii. For sanitation:, **"functioning"** will mean that the facility is structurally and operationally sound and it is attractive for and encourages use.

OTHER DEFINITIONS

"External Support Agency" (ESA), refers to an external donor be it a multilateral or international organization such as UNICEF or UNDP, a bilateral such as USAID, or an external non-governmental organization (NGO) such as OXFAM.

"Other Local" refers to national non-governmental organizations (as opposed to external NGOs).

"Access"[9] as a broad indicative definition refers to:

---

[9] **Should be specifically defined at the Country level.**

i. Access to water supply: the availability of at least 20 liters of safe water per person per day, located within one kilometer from the user's dwelling.

ii. Access to sanitation: the availability of a sanitary facility for human excreta/waste disposal within a convenient distance from the user's dwelling i.e. not too far away to discourage its use.

Excreta Disposal System: implies a satisfactory sanitary means of excreta disposal indicating that it hygienically separates excreta from human contact.

Operation and Maintenance of Systems: implies on-going, regular or recurrent upkeep including repairs.

Rehabilitation: implies a substantial capital investment which may or may not increase the level of service (e.g. from a public standpipe to a house connection for convenience), but does not contribute towards expansion of service coverage.

APPENDIX VII

RELATIONSHIP BETWEEN WASAMS AND CESI Plus

Past Experience

The World Health Organization (WHO) has been engaged in water and sanitation sector monitoring since the 1960s, initially surveying the status in urban areas, and later expanding this effort to include rural areas as well. During the 1980s global sector monitoring of a large number of topics ranging from institutional aspects to coverage was conducted by WHO every two years on average. Since 1985 WHO has been developing a comprehensive sector information management system named CESI.

Future Thrust

The need to improve and strengthen sector monitoring and information management was put forward and documented on different occasions towards the end of the International Drinking Water Supply and Sanitation Decade (IDWSSD) 1981-90. These included the New Delhi Consultation and the World Summit for Children, both in September 1990, and the Report of the Secretary-General" on the "Achievements of the IDWSSD 1981 - 1990," which was presented to the General Assembly in October 1990.

With the demand for improved sector monitoring clearly established, the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) widened their collaborative efforts to incorporate the strengthening of sector monitoring. This collaboration is being undertaken via a Joint Monitoring Programme for the water and sanitation sector, between the two agencies.

The Joint Monitoring Programme's support to developing countries is based on enhancing monitoring capacity at country level through establishment of WASAMS (Water and Sanitation Monitoring System) to facilitate sustainable acceleration of service coverage during the 1990s.

Sector monitoring itself, which includes the strengthening of national data collection processes and networks, and also systematic assessment, analysis and responsive action, is thus seen within the context of a broader framework involving management capacity building at the country level. The evolving CESI relates to this broader framework. The WASAMS is tailored to country specific needs and, at the same time, is focused on a few carefully selected core indicators for regional and global monitoring.

WASAMS and CESI plus

The CESI system is currently being upgraded. CESI plus, which is a comprehensive sector information management system, will consist of several data bases.

WASAMS, a simplified sector monitoring system being used as one of the tools to implement the Joint Monitoring Programme, is the forerunner to more comprehensive sector monitoring endeavors among developing countries.

Relationship Between WASAMS and CESI plus

Linkages

WASAMS is a simplified sector monitoring tool for the 1990s, focusing on a few select performance indicators.

CESI is a comprehensive system for sector information management.

The two complement each other in that generally, WASAMS is considered as the entry point or forerunner in building country level monitoring capacity to the position where a more comprehensive system can be accommodated.

Procedural Arrangement

To monitor the water and sanitation sector in the 1990s all developing countries should utilize WASAMS.

In countries where CESI plus is already established, WHO and UNICEF will promote and encourage the use of WASAMS for sector monitoring.

For countries requesting CESI plus, WHO and UNICEF will advise such countries to first establish WASAMS for sector monitoring.

For countries without either WASAMS or CESI plus, WHO and UNICEF via their Joint Monitoring Programme, will promote WASAMS and assist its implementation.

Time Frame

In general, WASAMS may take at least the first half of the 1990s to properly establish monitoring capacity at country level. CESI plus which is a more comprehensive management information system can benefit from the base established by WASAMS.

APPENDIX VIII

LIST OF JMP PRE-TEST WORKSHOP PARTICIPANTS

GENEVA 2-5 APRIL, 1991

Institution		Name	Region	Country
WHO	1.	Mihail Koussitassev	AFRO	Congo
	2.	K. Khosh - Chasm	EMRO	Egypt
	3.	Mohal Lal Gupta	SEARO	India
	4.	Raymond Reid	(PAHO)	USA
	5.	Kassa Kinde	AFRO	Ethiopia
	6.	Skouloum Aye Marfa	AFRO	Togo
	7.	Silva Serrano Homero	(PAHO)	Jamaica
WORLD BANK	8.	G. Schultzberg	RWSG/EA	Kenya
UNICEF	1.	Rupert Talbot	ESARO	Ethiopia
	2.	Magdi Zaki	MENA	Egypt
	3.	David Delienne	WCARO	Togo
	4.	Raul Niño	TACRO	Guatemal
	5.	Pradeep Kumar	ROSCA	India
	6.	David Williams	EAPRO	Indonesia
GOVERNMENT	1.	Tesfaye Gemechu		Ethiopia
	2.	Samira Nicola Rezk		Egypt
	3.	Ativon Kodjo		Togo
	4.	A. N. Asthana		India
	5.	Vernon Barrett		Jamaica
CWS/WHO	1.	Dennis Warner	Resource Persons - JMP	
"	2.	Gregor Watters		
"	3.	Anthony Thomas		
"	4.	Ingvar Ahman		
"	5.	Ivan Mazuranic		
WET/UNICEF	6.	Joseph Christmas		
"	7.	Carel de Rooy		
"	8.	Brendan Doyle		

LIST OF GROUP WORK PARTICIPANTS: Three country-specific scenarios

Group I	Group II	Group III
V. Barret	R. Talbot	K. Kinde
R. Reid	H. Silva	D. Delienne
T. Gemechu	M. L. Gupta	A. N. Asthana
A. Kodjo	M. Zaki	R. Niño
D. Williams	A. Thomas	G. Schultzberg
P. Kumar	M. Kosh-Chasm	M. Kossitassev
S. Necola	M. Simpson	S. A. Marfa

Case Study: A Case Study: B Case Study: C

APPENDIX IX

ACRONYMS

AFRO	Regional Office for Africa (WHO)
CESI	Country External Support Information System
CWS	Community Water Supply (WHO Unit)
DEMOS	Decade Monitoring System
DOS	Disk Operating System
EA	East Africa
EAPRO	East Asia and Pakistan Regional Office (UNICEF)
EMRO	Regional Office for Eastern Mediterranean (WHO)
ESA	External Support Agency
ESARO	Eastern and Southern Africa Regional Office (UNICEF)
IBM	International Business Machines
IDWSSD	International Drinking Water Supply and Sanitation Decade
JMP	Joint Monitoring Programme (WHO/UNICEF)
K	Kilo - (1000), Kilobyte
MB	Megabyte
MENA	Middle East and North Africa
MHz	Mega Hertz
NGO	Non-Government Organisation
NMU	National Monitoring Unit
PAHO	Pan American Health Office
RAM	Random Access Memory
ROSCA	Regional Office for South Central Asia (UNICEF)
RWSG	Rural Water & Sanitation Group
SEARO	Regional Office for South East Asia
TACRO	The Americas and Caribbean Regional Office (UNICEF)
UCI	Universal Child Immunization
UNDP	United National Development Programme
UNICEF	United Nations Children's Fund

WASAMS	Water and Sanitation Monitoring System
WCARO	West and Central Africa Regional Office (UNICEF)
WHO	World Health Organisation

WATER AND SANITATION MONITORING SYSTEM

* W A S A M S *

Status as at 31 December 199__

COUNTRY NAME: _____

SOURCE OF INFORMATION

The statistics provided in this questionnaire are issued by:
(name and address of the issuing institution)

_____

_____

_____

_____

WHAT TO DO WITH THIS DATA

If WASAMS is computerized, please do the following:

* down-load the collected data to the 3 1/2" or 5 1/4" diskette

alternatively, if WASAMS is not computerized:

* enter the collected data on this hard copy of WASAMS questionnaire

WHERE TO SEND THIS DATA

To: The Chief
Water and Environmental Sanitation Section
Unicef, United Nations Children's Fund
3, United Nations Plaza
New York, N.Y. 10017
U.S.A.

NOTE:
Before completing this questionnaire please refer to the "indicative definitions" by pressing function key F1 or, if using a hard copy, see attached definitions.

WATER AND SANITATION MONITORING SYSTEM

* W A S A M S *

Status as at 31 December 199__

LOCALITY CODE | ... /... /... /... /... /... |

Country : ..... Sub-level 3.: .....

Sub-level 1.: ..... Sub-level 4.: .....

Sub-level 2.: ..... Sub-level 5.: .....

PART I. SERVICE COVERAGE

I. P O P U L A T I O N

1. Estimated population (in thousands)

Urban 1) ..... Rural 2) ..... Total 3) .....

..... % ..... %

1.1 Disaggregate the above urban data into following two categories (if practicable)

High-income 4) ..... Low-income 5) .....

..... % ..... %

WATER AND SANITATION MONITORING SYSTEM

* W A S A M S *

Status as at 31 December 199__

LOCALITY CODE | ... /... /... /... /... /... |

PART I. SERVICE COVERAGE (continued)

II. S A F E W A T E R S U P P L Y

Population with access to functioning systems (in thousands)

	Urban		Rural	
House Connections	6).....	..... %	7).....	..... %
Yard taps	8).....	..... %	9).....	..... %
Public standpipes	10).....	..... %	11).....	..... %
Boreholes with handpumps	12).....	..... %	13).....	..... %
Protected dug wells	14).....	..... %	15).....	..... %
Rainwater collection systems	16).....	..... %	17).....	..... %
Other high-cost technologies	18).....	..... %	19).....	..... %
Other low-cost technologies	20).....	..... %	21).....	..... %
Total served	22).....	..... %	23).....	..... %
Total unserved	24).....	..... %	25).....	..... %

Disaggregate the above urban data into following two categories (if practicable)

	Urban high-income		Urban low-income	
House Connections	26).....	..... %	27).....	..... %
Yard taps	28).....	..... %	29).....	..... %
Public standpipes	30).....	..... %	31).....	..... %
Boreholes with handpumps	32).....	..... %	33).....	..... %
Protected dug wells	34).....	..... %	35).....	..... %
Rainwater collection systems	36).....	..... %	37).....	..... %
Other high-cost technologies	38).....	..... %	39).....	..... %
Other low-cost technologies	40).....	..... %	41).....	..... %
Total served	42).....	..... %	43).....	..... %
Total unserved	44).....	..... %	45).....	..... %

WATER AND SANITATION MONITORING SYSTEM

* W A S A M S *

Status as at 31 December 199__

LOCALITY CODE | ... /... /... /... /... /... |

PART I. SERVICE COVERAGE (continued)

III. S A N I T A T I O N (sanitary means of excreta disposal)

Population with access to adequate excreta disposal facilities (in thousands)

	Urban		Rural	
Household connections to conventional public sewers	46).....	..... %	47).....	..... %
Household connections to small-bore public sewers	48).....	..... %	49).....	..... %
Household connections to septic systems	50).....	..... %	51).....	..... %
Latrines, wet (pour flush etc.)	52).....	..... %	53).....	..... %
Latrines, dry (ventilated improved pit)	54).....	..... %	55).....	..... %
Latrines, dry (simple pit etc.)	56).....	..... %	57).....	....
Other high-cost technologies	58).....	..... %	59).....	..... %
Other low-cost technologies	60).....	..... %	61).....	..... %
Total served	62).....	..... %	63).....	..... %
Total unserved	64).....	..... %	65).....	..... %

Disaggregate the above urban data into following two categories (if practicable)

	Urban high-income		Urban low-income	
Household connections to conventional public sewers	66).....	..... %	67).....	..... %
Household connections to small-bore public sewers	68).....	..... %	69).....	..... %
Household connections to septic systems	70).....	..... %	71).....	..... %
Latrines, wet (pour flush etc.)	72).....	..... %	73).....	..... %
Latrines, dry (ventilated improved pit)	74).....	..... %	75).....	..... %
Latrines, dry (simple pit etc.)	76).....	..... %	77).....	..... %
Other high-cost technologies	78).....	..... %	79).....	..... %
Other low-cost technologies	80).....	..... %	81).....	....
Total served	82).....	..... %	83).....	..... %
Total unserved	84).....	..... %	85).....	..... %

WATER AND SANITATION MONITORING SYSTEM

* W A S A M S *

Status as at 31 December 199__

LOCALITY CODE | ... /... /... /... /... /... |

PART I. SERVICE COVERAGE (continued)

IV. S Y S T E M U T I L I Z A T I O N

1. Percentage of population using drinking water primarily from a safe source:

Urban 86) ..... % Rural 87) ..... %

1.1 Disaggregate the above urban data into following two categories (if practicable)

High-income 88) ..... % Low-income 89) ..... %

2. Percentage of population using sanitary excreta disposal facilities:

Urban 90) ..... % Rural 91) ..... %

2.1 Disaggregate the above urban data into following two categories (if practicable)

High-income 92) ..... % Low-income 93) ..... %

Comment : _____

WATER AND SANITATION MONITORING SYSTEM

* W A S A M S *

Status as at 31 December 199__

LOCALITY CODE | ... /... /... /... /... /... |

PART II. SYSTEMS MANAGEMENT

1. Participants' Contribution to Operation and Maintenance Costs (in 1,000 USD)

1.1 Safe Water Supply	GOV'T	ESAs	COMMUNITY	OTHER LOCAL	TOTAL
a) Urban	94).....	95).....	96).....	97).....	98).....
	..... %	..... %	..... %	..... %	..... %
Disaggregate the above urban data into following two categories (if practicable)					
b) Urban high-income	99).....	100).....	101).....	102).....	103).....
	..... %	..... %	..... %	..... %	..... %
c) Urban low-income	104).....	105).....	106).....	107).....	108).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	109).....	110).....	111).....	112).....	113).....
	..... %	..... %	..... %	..... %	..... %
Water Total	114).....	115).....	116).....	117).....	118).....
	..... %	..... %	..... %	..... %	..... %

1.2 Sanitation					
a) Urban	119).....	120).....	121).....	122).....	123).....
	..... %	..... %	..... %	..... %	..... %
Disaggregate the above urban data into following two categories (if practicable)					
b) Urban high-income	124).....	125).....	126).....	127).....	128).....
	..... %	..... %	..... %	..... %	..... %
c) Urban low-income	129).....	130).....	131).....	132).....	133).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	134).....	135).....	136).....	137).....	138).....
	..... %	..... %	..... %	..... %	..... %
Sanitation Total	139).....	140).....	141).....	142).....	143).....
	..... %	..... %	..... %	..... %	..... %
SECTOR TOTAL	144).....	145).....	146).....	147).....	148).....
	..... %	..... %	..... %	..... %	

WATER AND SANITATION MONITORING SYSTEM

* W A S A M S *

Status as at 31 December 199__

LOCALITY CODE | .../.../.../.../.../...

PART II. SYSTEMS MANAGEMENT (continued)

2. Number of safe water systems managed by

	GOV'T	PRIVATE	COMMUNITY	OTHER LOCAL	TOTAL
a) Urban	149).....	150).....	151).....	152).....	153).....
	..... %	..... %	..... %	..... %	..... %
Disaggregate the above urban data into following two categories (if practicable)					
b) Urban high-income	154).....	155).....	156).....	157).....	158).....
	..... %	..... %	..... %	..... %	..... %
c) Urban low-income	159).....	160).....	161).....	162).....	163).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	164).....	165).....	166).....	167).....	168).....
	..... %	..... %	..... %	..... %	..... %
SECTOR TOTAL	169).....	170).....	171).....	172).....	173).....
	..... %	..... %	..... %	..... %	

Comment : _____

WATER AND SANITATION MONITORING SYSTEM

* W A S A M S *

Status as at 31 December 199__

LOCALITY CODE | ... /... /... /... /... /... |

PART III. FUNDING

174) Average annual exchange rate : 1 US$ = ... national currency units.

1. Participants' Contribution to Capital Costs for NEW SYSTEMS (in 1,000 USD)

1.1 Safe Water Supply	GOV'T	ESAs	COMMUNITY	OTHER LOCAL	TOTAL
a) Urban	175).....	176).....	177).....	178).....	179).....
	..... %	..... %	..... %	..... %	..... %
Disaggregate the above urban data into following two categories (if practicable)					
b) Urban high-income	180).....	181).....	182).....	183).....	184).....
	..... %	..... %	..... %	..... %	..... %
c) Urban low-income	185).....	186).....	187).....	188).....	189).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	190).....	191).....	192).....	193).....	194).....
	..... %	..... %	..... %	..... %	..... %
Water Total	195).....	196).....	197).....	198).....	199).....
	..... %	..... %	..... %	..... %	..... %

1.2 Sanitation					
a) Urban	200).....	201).....	202).....	203).....	204).....
	..... %	..... %	..... %	..... %	..... %
Disaggregate the above urban data into following two categories (if practicable)					
b) Urban high-income	205).....	206).....	207).....	208).....	209).....
	..... %	..... %	..... %	..... %	..... %
c) Urban low-income	210).....	211).....	212).....	213).....	214).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	215).....	216).....	217).....	218).....	219).....
	..... %	..... %	..... %	..... %	..... %
Sanitation Total	220).....	221).....	222).....	223).....	224).....
	..... %	..... %	..... %	..... %	..... %
SECTOR TOTAL	225).....	226).....	227).....	228).....	229).....
	..... %	..... %	..... %	..... %	

WATER AND SANITATION MONITORING SYSTEM

* W A S A M S *

Status as at 31 December 199__

LOCALITY CODE | ... /... /... /... /... /...

PART III. FUNDING (continued)

2. Participants' Contribution to Capital Costs for REHABILITATED SYSTEMS (in 1,000 USD)

2.1 Safe Water Supply	GOV'T	ESAs	COMMUNITY	OTHER LOCAL	TOTAL
a) Urban	230).....	231).....	232).....	233).....	234).....
	..... %	..... %	..... %	..... %	..... %
Disaggregate the above urban data into following two categories (if practicable)					
b) Urban high-income	235).....	236).....	237).....	238).....	239).....
	..... %	..... %	..... %	..... %	..... %
c) Urban low-income	240).....	241).....	242).....	243).....	244).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	245).....	246).....	247).....	248).....	249).....
	..... %	..... %	..... %	..... %	..... %
Water Total	250).....	251).....	252).....	253).....	254).....
	..... %	..... %	..... %	..... %	..... %

2.2 Sanitation					
a) Urban	255).....	256).....	257).....	258).....	259).....
	..... %	..... %	..... %	..... %	..... %
Disaggregate the above urban data into following two categories (if practicable)					
b) Urban high-income	260).....	261).....	262).....	263).....	264).....
	..... %	..... %	..... %	..... %	..... %
c) Urban low-income	265).....	266).....	267).....	268).....	269).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	270).....	271).....	272).....	273).....	274).....
	..... %	..... %	..... %	..... %	..... %
Sanitation Total	275).....	276).....	277).....	278).....	279).....
	..... %	..... %	..... %	..... %	..... %
SECTOR TOTAL	280).....	281).....	282).....	283).....	284).....
	..... %	..... %	..... %	..... %	

Comment : _____

WATER AND SANITATION MONITORING SYSTEM

* W A S A M S *

Status as at 31 December 199__

LOCALITY CODE | ... /... /... /... /... /... |

PART IV. GENERAL COMMENTS

1. Quality of Data Reported

Please comment on the quality of data.

_____

_____

_____

_____

_____

_____

2. Definitions Used

Please comment on the local definitions used if different from the indicative ones (1).

_____

_____

_____

_____

_____

_____

use extra sheet if necessary

3. Decentralization of Monitoring

What is the lowest administrative level from which data was obtained this year ?

(Tick appropriate box)

National	☐	Sub-level 1.	☐	Sub-level 2.	☐
Sub-level 3.	☐	Sub-level 4.	☐	Sub-level 5.	☐

(1) i.e. the broad indicative definitions for the "core indicators" as seen when function key F1 is pressed when running the WASAMS computer system or , the attached indicative definitions.

WASAMS QUESTIONNAIRE GUIDELINES (1)

To enable regional and global promotion and advocacy on behalf of the sector, there is need for standardization in the broadest sense of the terms used to define elements of the sector. This is of paramount importance. Therefore, the guidelines provided hereafter relate to the "core indicators" and must be considered as indicative only.

Guidelines to Definitions:

It is important to note that the "broad indicative definitions" described herein apply to the WASAMS "core indicators" which will be the only ones to be channelled upwards from national level for use at regional and global levels for advocacy and fund raising purposes.

GEOGRAPHIC CATEGORIZATIONS

URBAN HIGH-INCOME AREAS :

are those whose populations are perceived locally to have good access to safe water supply and sanitation, a good physical standard of dwelling and have good access to other services such as health and public transport.

URBAN LOW-INCOME AREAS :

are those whose populations do not fit into the previous category, and have minimum access to services enjoyed by the afore-mentioned group, for example, with limited access to safe water supply, sanitation and/or other social services.

RURAL AREAS :

are those populations perceived by local definition to reside outside urban centers and being generally dispersed populations. As defined in the local population census.

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(1) The questionnaire itself is being modified into an upgraded version (WASAMS Computer Programme Version 1.2).

HOUSE CONNECTIONS :

are taps installed within the individual house, normally more than one tap, irrespective of the source and extraction method.

YARD TAP :

generally a single tap installed within a private plot of land, but is positioned outside the house structure, irrespective of the source or extraction method.

PUBLIC STANDPIPES :

taps installed on public grounds and accessible to the general public/community, irrespective of the source or extraction method.

BOREHOLES WITH HANDPUMPS :

these are drilled boreholes with a final diameter (cased or uncased), generally smaller than 6 inches and with static water levels (SWL) of usually less than eighty (80) meters depth. Equipped with a handpump which is manually operated and, which is rarely able to lift water from depths greater than 80 meters.

PROTECTED DUG WELLS :

are those which are adequately protected (guarded) against surface or outside contamination through the use of lining or covering, with a rim sufficiently raised above ground level, and may be equipped with a pump (any type). In completing the WASAMS Questionnaire specify if the pump is high-cost or low-cost technology (by local definition).

RAINWATER COLLECTION SYSTEMS :

these are individual household or communal rainwater harvesting systmes. The system normally consists of a catchment area (roof or other type of preferably impermeable or almost impermeable surface), and a storage system consisting of a cistern, drums, clay pots or other such container. Sometimes the system is fitted with a filter usually located between the catchment and storage components. The water must be rendered safe to drink as an end product.

OTHER HIGH-COST TECHNOLOGIES :

as defined and perceived at the country level.

OTHER LOW-COST TECHNOLOGIES :

as defined and perceived at the country level.

HOUSEHOLD CONNECTIONS TO CONVENTIONAL PUBLIC SEWERS :

this refers to a pipeline outlet from the household to the public sewerage system. Its function is to conduct and discharge human excreta and wastewater from the household to a sewerage treatment system.

HOUSEHOLD CONNECTIONS TO SMALL-BORE PUBLIC SEWERS :

refers to unconventional sewerage system suitable for areas where water supply is low i.e. where consumption is normally less than 30 liters/capita/day (which implies dwellings where public standpipes are used, usually). These small-bore sewers are normally of 4 to 6 inches in diameter and are buried at shallow depths (less than 1 meter) below the surface. Such systems are usually designed for low-income populations in unplanned settlements where the population density usually exceeds 200 persons per hectare.

HOUSEHOLD CONNECTIONS TO SEPTIC SYSTEM :

this refers to all on-site water carriage sanitation systems discharging to a septic tank, a case pool or other means into the soil.

LATRINES, WET (POUR-FLUSH ETC.) :

refers to on-site latrine system which uses a small amount of water (1-3 liters) for hand-flushing the human excreta and has single or double pits for excreta and wastewater collection. Therefore, it may or may not be connected up to a small-bore or conventional sewerage system.

LATRINES, DRY (VENTILATED IMPROVED PIT) :

refers to an on-site improved "dry pit" latrine comprising a vent pipe with a fly screen used to trap flies in the pit and, also allows evacuation of foul air into the atmosphere above the latrine roof. This minimizes foul odour within the latrine super-structure and traps flies that could spread diseases through faecal contamination.

LATRINES, DRY (SIMPLE PIT) :

refers to a conventional "dry" pit latrine without any improvements such as vent pipes and fly screen (as fitted to the VIP). This type of latrine is often foul smelling and also allows flies to escape resulting in the risk of food contamination etc.

OTHER HIGH-COST TECHNOLOGIES :

as defined and perceived at the country level.

OTHER LOW-COST TECHNOLOGIES :

as defined and perceived at the country level.

Emphasis is stressed on the following definitions as examples only. Therefore these examples should be elaborated upon at country level to suit specific needs.

Water systems:

i. For reticulated systems leading to household connections, yard taps or standpipes. For those systems to be considered "functioning" they should operate above 50 percent of design capacity on a daily basis.

ii. For handpumps, "functioning" will mean those operating at over 70 percent of the time, and where the time-lag between breakdown and repair does not exceed two weeks.

Sanitation:

i. "Functioning" will mean that the facility is structurally and operationally sound and it is attractive for and encourages use.

EXTERNAL SUPPORT AGENCY (ESA)

refers to an external donor be it a multilateral or international organization such as UNICEF or UNDP, a bilateral such as USAID, an external nongovernmental organization (NGO) such as OXFAM, or intergovernmental organization (IGO) such as EEC or African D.B.

OTHER LOCAL

refers to national non-governmental organizations (as opposed to external NGOs).

"ACCESS" (2)

as a broad indicative definition refers to:

i. Access to water supply: the availability of at least 20 liters of safe water per person per day, located within one kilometer from the user's dwelling.

ii. Access to sanitation: the availability of a sanitary facility for human excreta/waste disposal within a convenient distance from the user's dwelling i.e. not too far away to discourage its use.

EXCRETA DISPOSAL SYSTEM :

implies a satisfactory sanitory means of excreta disposal indicating that it hygienically separates excreta from human contact.

OPERATION AND MAINTENANCE OF SYSTEMS :

implies on-going, regular or recurrent upkeep including repairs.

NEW SYSTEMS :

implies new capital investment for expansion of service coverage, but not for the rehabilitation of existing systems which may result in improvement of service level (from standpipe to yard tap).

REHABILITATION :

implies a substantial capital investment which may or may not increase the level of service (e.g. from a standpipe to a house connection for convenience), but does not contribute towards expansion of service coverage.

(2) Should be specifically defined at the country level.

SYSTEME DE SURVEILLANCE EN MATIERE D'EAU ET ASSAINISSEMENT

* W A S A M S *

Etat au 31 Décembre 199__

NOM DU PAYS: [ ]

PROVENANCE DES INFORMATIONS

Les statistiques fournies dans ce questionnaire proviennent de:
(nom et adresse de l'institution source)

_____

_____

_____

_____

CE QU'IL CONVIENT DE FAIRE DE CES DONNEES

Si WASAMS est informatisé, veuillez:

* transférer les données sur une disquette 3 I/2" ou 5 1/4".

Si WASAMS n'est pas informatisé, veuillez:

* reporter les données recueillies sur le présent questionnaire WASAMS

OU ENVOYER CES DONNEES

The Chief
Water and Environmental Sanitation Section
Unicef, United Nations Children's Fund
3, United Nations Plaza
New York, N.Y. 10017
U.S.A.

N.B.
Avant de remplir le questionnaire, veuillez vous reporter aux "définitions indicatives" en appuyant sur la touche de fonction F1 ou, si vous utilisez le présent questionnaire, en consultant les définitions ci-jointes.

SYSTEME DE SURVEILLANCE EN MATIERE D'EAU ET ASSAINISSEMENT

* W A S A M S *

Etat au 31 Décembre 199__

CODE DE LOCALITE | ... /... /... /... /... /...

Pays : ..... Sous-niveau 3.: .....

Sous-niveau 1.: ..... Sous-niveau 4.: .....

Sous-niveau 2.: ..... Sous-niveau 5.: .....

PARTIE I. COUVERTURE DU SERVICE

I. P O P U L A T I O N

1. Population estimée (en milliers)

Urbaine 1) ..... Rurale 2) ..... Totale 3) .....

..... % ..... %

1.1 Répartir les données urbaines ci-dessus selon les deux catégories suivantes (si possible)

Haut revenu 4) ..... Revenu bas 5) .....

..... % ..... %

SYSTEME DE SURVEILLANCE EN MATIERE D'EAU ET ASSAINISSEMENT

* W A S A M S *

Etat au 31 Décembre 199__

CODE DE LOCALITE | ... /... /... /... /... /... |

PARTIE I. COUVERTURE DU SERVICE (suite)

II. A P P R O V I S I O N N E M E N T E N E A U S A I N E

Population ayant accès aux systèmes en état de fonctionnement (en milliers)

	Urbaine		Rurale	
Branchement à domicile	6).....	..... %	7).....	..... %
Robinets extérieurs	8).....	..... %	9).....	..... %
Bornes fontaines publiques	10).....	..... %	11).....	..... %
Forages équipés de pompes à main	12).....	..... %	13).....	..... %
Puits protégés	14).....	..... %	15).....	..... %
Systèmes de récupération des eaux de pluie	16).....	..... %	17).....	..... %
Autres technologies de pointe	18).....	..... %	19).....	..... %
Autres technologies à faible coût	20).....	..... %	21).....	..... %
Totale desservie	22).....	..... %	23).....	..... %
Totale non desservie	24).....	..... %	25).....	..... %

Répartir les données urbaines ci-dessus selon les deux catégories suivantes (si possible)

	Haut revenu		Revenu bas	
Branchement à domicile	26).....	..... %	27).....	..... %
Robinets extérieurs	28).....	..... %	29).....	..... %
Bornes fontaines publiques	30).....	..... %	31).....	..... %
Forages équipés de pompes à main	32).....	..... %	33).....	..... %
Puits protégés	34).....	..... %	35).....	..... %
Systèmes de récupération des eaux de pluie	36).....	..... %	37).....	..... %
Autres technologies de pointe	38).....	..... %	39).....	..... %
Autres technologies à faible coût	40).....	..... %	41).....	..... %
Totale desservie	42).....	..... %	43).....	..... %
Totale non desservie	44).....	..... %	45).....	..... %

SYSTEME DE SURVEILLANCE EN MATIERE D'EAU ET ASSAINISSEMENT

* W A S A M S *

Etat au 31 Décembre 199__

CODE DE LOCALITE | ... /... /... /... /... /... |

PARTIE I. COUVERTURE DU SERVICE (suite)

III. A S S A I N I S S E M E N T (moyens hygiéniques d'évacuation des excréments)

Population bénéficiant d'installations adéquates d'évacuation (en milliers)

	Urbaine		Rurale	
Branchement du domicile aux égouts publics	46).....	..... %	47).....	..... %
Branchement du domicile aux égouts publics à faible profondeur	48).....	..... %	49).....	..... %
Branchement du domicile aux fosses septiques	50).....	..... %	51).....	..... %
Latrines à chasse d'eau	52).....	..... %	53).....	..... %
Latrines à fosse vent. et améliorée	54).....	..... %	55).....	..... %
Latrines à fosse simple	56).....	..... %	57).....	..... %
Autres technologies de pointe	58).....	..... %	59).....	..... %
Autres technologies à faible coût	60).....	..... %	61).....	..... %
Totale desservie	62).....	..... %	63).....	..... %
Totale non desservie	64).....	..... %	65).....	..... %

Répartir les données urbaines ci-dessus selon les deux catégories suivantes (si possible)

	Haut revenu		Revenu bas	
Branchement du domicile aux égouts publics	66).....	..... %	67).....	..... %
Branchement du domicile aux egouts publics à faible profondeur	68).....	..... %	69).....	..... %
Branchement du domicile aux fosses septiques	70).....	..... %	71).....	..... %
Latrines à chasse d'eau	72).....	..... %	73).....	..... %
Latrines à fosse vent. et améliorée	74).....	..... %	75).....	..... %
Latrines à fosse simple	76).....	..... %	77).....	..... %
Autres technologies de pointe	78).....	..... %	79).....	..... %
Autres technologies à faible coût	80).....	..... %	81).....	..... %
Totale desservie	82).....	..... %	83).....	..... %
Totale non desservie	84).....	..... %	85).....	..... %

SYSTEME DE SURVEILLANCE EN MATIERE D'EAU ET ASSAINISSEMENT

* W A S A M S *

Etat au 31 Décembre 199__

CODE DE LOCALITE | ... /... /... /... /... /...

PARTIE I. COUVERTURE DU SERVICE (suite)

IV. U T I L I S A T I O N D E S S Y S T E M E S

1. Pourcentage de la population utilisant l'eau de boisson venant principalement de sources sures:

Urbaine 86) ..... % Rurale 87) ..... %

1.1 Répartir les données urbaines ci-dessus selon les deux catégories suivantes (si possible)

Haut revenu 88) ..... % Revenu bas 89) ..... %

2. Pourcentage de la population utilisant les installations adéquates d'évacuation

Urbaine 90) ..... % Rurale 9I) ..... %

2.1 Répartir les données urbaines ci-dessus selon les deux catégories suivantes (si possible)

Haut revenu 92) ..... % Revenu bas 93) ..... %

Observations : _____

SYSTEME DE SURVEILLANCE EN MATIERE D'EAU ET ASSAINISSEMENT

* W A S A M S *

Etat au 31 Décembre 199__

CODE DE LOCALITE | ... /... /... /... /... /...

PARTIE II. GESTION DES SYSTEMES

1. Contribution des Participants aux Coûts d'Exploitation et d'Entretien

(en 1,000 USD)

	GOUVERNEMENT	OSEs	COMMUNAUTE	AUTRE LOCALE	TOTALE
I.1 Approvisionnement en eau					
a) Urbaine	94).....	95).....	96).....	97).....	98).....
	..... %	..... %	..... %	..... %	..... %
Répartir les données urbaines ci-dessus selon les deux catégories suivantes (si possible)					
b) Haut revenu	99).....	100).....	101).....	102).....	103).....
	..... %	..... %	..... %	..... %	..... %
c) Revenu bas	104).....	105).....	106).....	107).....	108).....
	..... %	..... %	..... %	..... %	..... %
d) Rurale	109).....	110).....	111).....	112).....	113).....
	..... %	..... %	..... %	..... %	..... %
Total Eau	114).....	115).....	116).....	117).....	118).....
	..... %	..... %	..... %	..... %	..... %
1.2 Assainissement					
a) Urbaine	119).....	120).....	121).....	122).....	123).....
	..... %	..... %	..... %	..... %	..... %
Répartir les données urbaines ci-dessus selon les deux catégories suivantes (si possible)					
b) Haut revenu	124).....	125).....	126).....	127).....	128).....
	..... %	..... %	..... %	..... %	..... %
c) Revenu bas	129).....	130).....	131).....	132).....	133).....
	..... %	..... %	..... %	..... %	..... %
d) Rurale	134).....	135).....	136).....	137).....	138).....
	..... %	..... %	..... %	..... %	..... %
Total Assainissement	139).....	140).....	141).....	142).....	143).....
	..... %	..... %	..... %	..... %	..... %
TOTAL SECTEUR	144).....	145).....	146).....	147).....	148).....

SYSTEME DE SURVEILLANCE EN MATIERE D'EAU ET ASSAINISSEMENT

* W A S A M S *

Etat au 31 Décembre 199__

CODE DE LOCALITE | ... /... /... /... /... /... |

PARTIE II. GESTION DES SYSTEMES (suite)

2. Nombre de systèmes d'approvisionnement en eau saine gérés par

	GOUVERNEMENT	PRIVE	COMMUNAUTE	AUTRE LOCALE	TOTAL
a) Urbaine	149).....	150).....	151).....	152).....	153).....
	..... %	..... %	..... %	..... %	..... %
Répartir les données urbaines ci-dessus selon les deux catégories suivantes (si possible)					
b) Haut revenu	154).....	155).....	156).....	157).....	158).....
	..... %	..... %	..... %	..... %	..... %
c) Revenu bas	159).....	160).....	161).....	162).....	163).....
	..... %	..... %	..... %	..... %	..... %
d) Rurale	164).....	165).....	166).....	167).....	168).....
	..... %	..... %	..... %	..... %	..... %
TOTAL SECTEUR	169).....	170).....	171).....	172).....	173).....
	..... %	..... %	..... %	..... %	

Observations : _____

SYSTEME DE SURVEILLANCE EN MATIERE D'EAU ET ASSAINISSEMENT

* W A S A M S *

Etat au 31 Décembre 199__

CODE DE LOCALITE | ... /... /... /... /... /... |

PART III. FINANCEMENT

174) Moyenne annuelle du taux de change : ..... = 1 USD.

1. Contribution des participants à l'investissement initial des NOUVEAUX SYSTEMES

(en 1,000 USD)

	GOUVERNEMENT	OSEs	COMMUNAUTE	AUTRE LOCALE	TOTALE
1.1 Approvisionnement en eau saine					
a) Urbaine	175).....	176).....	177).....	178).....	179).....
	..... %	..... %	..... %	..... %	..... %
Répartir les données urbaines ci-dessus selon les deux catégories suivantes (si possible)					
b) Haut revenu	180).....	181).....	182).....	183).....	184).....
	..... %	..... %	..... %	..... %	..... %
c) Revenu bas	185).....	186).....	187).....	188).....	189).....
	..... %	..... %	..... %	..... %	..... %
d) Rurale	190).....	191).....	192).....	193).....	194).....
	..... %	..... %	..... %	..... %	..... %
Total Eau	195).....	196).....	197).....	198).....	199).....
	..... %	..... %	..... %	..... %	..... %
1.2 Assainissement					
a) Urbaine	200).....	201).....	202).....	203).....	204).....
	..... %	..... %	..... %	..... %	..... %
Répartir les données urbaines ci-dessus selon les deux catégories suivantes (si possible)					
b) Haut revenu	205).....	206).....	207).....	208).....	209).....
	..... %	..... %	..... %	..... %	..... %
c) Revenu bas	210).....	211).....	212).....	213).....	214).....
	..... %	..... %	..... %	..... %	..... %
d) Rurale	215).....	216).....	217).....	218).....	219).....
	..... %	..... %	..... %	..... %	..... %
Total Assainissement	220).....	221).....	222).....	223).....	224).....
	..... %	..... %	..... %	..... %	..... %

SYSTEME DE SURVEILLANCE EN MATIERE D'EAU ET ASSAINISSEMENT

* W A S A M S *

Etat au 31 Décembre 199__

CODE DE LOCALITE | ... /... /... /... /... /... |

PART III. FINANCEMENT (suite)

2. Contribution des participants à l'investissement initial des SYSTEMES REMIS EN ETAT (en 1,000 USD)

	GOUVERNEMENT	OSEs	COMMUNAUTE	AUTRE LOCALE	TOTALE
2.1 Approvisionnement en eau saine					
a) Urbaine	230).....	231).....	232).....	233).....	234).....
	..... %	..... %	..... %	..... %	..... %
Répartir les données urbaines ci-dessus selon les deux catégories suivantes (si possible)					
b) Haut revenu	235).....	236).....	237).....	238).....	239).....
	..... %	..... %	..... %	..... %	..... %
c) Revenu bas	240).....	241).....	242).....	243).....	244).....
	..... %	..... %	..... %	..... %	..... %
d) Rurale	245).....	246).....	247).....	248).....	249).....
	..... %	..... %	..... %	..... %	..... %
Total Eau	250).....	251).....	252).....	253).....	254).....
	..... %	..... %	..... %	..... %	..... %
2.2 Assainissement					
a) Urbaine	255).....	256).....	257).....	258).....	259).....
	..... %	..... %	..... %	..... %	..... %
Répartir les données urbaines ci-dessus selon les deux catégories suivantes (si possible)					
b) Haut revenu	260).....	261).....	262).....	263).....	264).....
	..... %	..... %	..... %	..... %	..... %
c) Revenu bas	265).....	266).....	267).....	268).....	269).....
	..... %	..... %	..... %	..... %	..... %
d) Rurale	270).....	271).....	272).....	273).....	274).....
	..... %	..... %	..... %	..... %	..... %
Total Assainissement	275).....	276).....	277).....	278).....	279).....
	..... %	..... %	..... %	..... %	..... %
TOTAL SECTEUR	280).....	281).....	282).....	283).....	284).....
	..... %	..... %	..... %	..... %	

SYSTEME DE SURVEILLANCE EN MATIERE D'EAU ET ASSAINISSEMENT

* W A S A M S *

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PARTIE IV. OBSERVATIONS GENERALES

1. Qualité des données fournies

Veuillez donner vos observations sur la qualité des données.

2. Définitions utilisées

Veuillez indiquer les définitions utilisées si elles sont différentes des définitions indicatives (1).

utiliser une feuille supplémentaire si nécessaire

3. Décentralisation de la surveillance

Quel est le niveau administratif le plus bas duquel les données ont été obtenues cette année?

(Cocher la case appropriée)

National	☐	Sous-niveau 1.	☐	Sous-niveau 2.	☐
Sous-niveau 3.	☐	Sous-niveau 4.	☐	Sous-niveau 5.	☐

(1) c'est-à-dire les définitions générales indicatives données pour les "indicateurs de base" telles qu'elles apparaissent lorsque l'on appuie sur la touche F1 pendant l'utilisation du système informatisé WASAMS, ou dans

CLARIFICATIONS POUR L'UTILISATION DU QUESTIONNAIRE WASAMS

Pour rendre possible la promotion et le soutien au secteur de l'eau et de l'assainissement, il est nécessaire de standardiser au sens le plus large les termes utilisés pour en définir les éléments. Ceci est d'une importance primordiale. Aussi, les lignes directrices ci-après s'appliquent-elles aux "indicateurs de base" et sont-elles données à titre indicatif seulement.

Lignes directrices relatives aux définitions :

Il est important de noter que les "définitions indicatives générales" décrites ici s'appliquent aux "indicateurs de base" de WASAMS qui seront les seuls à être transmis du niveau national pour être utilisés aux niveaux régional ou global à des fins d'appui et de recherche de financements.

CATEGORIES GEOGRAPHIQUES

LES ZONES URBAINES A HAUT REVENU :

sont celles dont les habitants sont perçus, au niveau local, comme une catégorie ayant un accès satisfaisant aux services d'approvisionnement en eau potable et d'assainissement, un bon niveau de vie du point de vue du logement et un bon accès aux autres services tels que la santé et les transports publics.

LES ZONES URBAINES A REVENU BAS :

sont celles dont les habitants n'entrent pas dans la catégorie ci-dessus et ont un accès très limité aux services dont bénéficie celle-ci, par exemple, l'approvisionnement en eau potable, l'assainissement et/ou d'autres services sociaux.

LES ZONES RURALES :

sont celles dont les habitants sont perçus, au niveau local, comme résidant à l'extérieur des centres urbains et de manière générale comme des populations dispersées. La définition locale du recensement de population doit être appliquée ici.

(1) Le questionnaire lui-même est en cours d'amélioration (Version

BRANCHEMENTS A DOMICILE :

robinets dans les maisons, normalement pas plus d'un, indépendamment de la source ou de la méthode d'extraction.

ROBINETS EXTERIEURS :

généralement un seul robinet installé dans une propriété privée, mais à l'extérieur de la maison, indépendamment de la source ou de la méthode d'extraction.

BORNES FONTAINES PUBLIQUES :

robinets installés dans des concessions publiques et accessibles au public en général, indépendamment de la source ou de la méthode d'extraction.

FORAGES EQUIPES DE POMPES A MAIN :

il s'agit de forages dont le diamètre final, avec ou sans tubage, ne dépasse généralement pas 15 centimètres, avec des niveaux statiques de l'eau ayant souvent moins de 80 mètres de profondeur et équipés de pompes à main ne pouvant monter l'eau de profondeurs excédant 80 mètres.

PUITS PROTEGES :

il s'agit de puits qui sont bien protégés de la contamination extérieure ou de surface par une doublure ou un couvercle et un rebord suffisamment surelevé par rapport à la surface du sol; ils peuvent être équipés d'une pompe (quel que soit le type). En remplissant le questionnaire WASAMS, préciser si la pompe appartient à une technologie de pointe ou à une technologie à faible coût (selon la définition locale).

SYSTEMES DE RECUPERATION DES EAUX DE PLUIE :

systèmes individuels ou communaux d'interception des eaux de pluie. Le système consiste normalement en une zone de récupération (toit ou autre type de surface de préférence imperméable ou presque), et d'un système de stockage (citerne, fûts, vases en argile, etc). Quelquefois le système est muni d'un filtre entre la zone de récupération et l'élément de stockage. L'eau, comme produit final, doit être saine.

AUTRES TECHNOLOGIES DE POINTE :

telles qu'elles sont appréciées localement.

AUTRES TECHNOLOGIES A FAIBLE COUT :

telles qu'elles sont appréciées localement.

BRANCHEMENT DU DOMICILE AUX EGOUTS PUBLICS :

ceci s'applique à une canalisation reliant le domicile au système d'égout public, dont la fonction est de conduire et de déverser les déchets humains et les eaux usées du domicile jusqu'à une station de traitement.

BRANCHEMENT AUX EGOUTS PUBLICS A FAIBLE PROFONDEUR :

il s'agit de systèmes non conventionnels d'égouts pour des zones où la consommation d'eau est normalement de moins de 30 litres/par personne/par jour (ce qui implique une alimentation des logements par bornes fontaines). Ces égouts ont généralement des diamètres de l'ordre de 10 à 15 centimètres et sont enterrés à faible profondeur (moins d'un mètre de la surface du sol). Ces systèmes sont généralement destinés à des agglomérations non planifiées, à population dense (plus de 200 personnes par hectare) et à bas revenu.

FOSSES SEPTIQUES :

il s'agit de tous systèmes d'assainissement individuel se déversant dans le sol au travers d'une fosse septique, d'un puisard ou autre moyen.

LATRINES A CHASSE D'EAU :

il s'agit de latrines à chasse manuelle qui utilisent une petite quantité d'eau (1 à 3 litres) pour évacuer les déchets; elles peuvent être à fosse simple ou double pour l'évacuation des déchets et des eaux usées. Elles peuvent donc être ou ne pas être connectées à un système d'égouts conventionnels ou d'égouts à faible profondeur.

LATRINES A FOSSE VENTILEE ET AMELIOREE :

latrines à "fosse sèche" améliorée comprenant un tuyau de ventilation muni d'une grille permettant la circulation de l'air au-dessus du toit et emprisonnant les mouches dans la fosse. Ce procédé réduit au minimum les odeurs dans la latrine et retient les mouches qui contribuent à répandre des maladies par contamination fécale.

LATRINE A FOSSE SIMPLE :

latrines à fosse conventionnelle "sèche" sans aucune amélioration telle que tuyau d'aération ou écran à mouches.

AUTRES TECHNOLOGIES DE POINTE :

telles qu'elles sont appréciées localement.

AUTRES TECHNOLOGIES A FAIBLE COUT :

telles qu'elles sont appréciées localement.

Les exemples suivants sont donnés à titre indicatif seulement. Aussi, il conviendra qu'ils soient adaptés aux besoins spécifiques de chaque pays.

Systèmes d'approvisionnement en eau :

i. Système de réseau conduisant à des branchements à domicile, aux robinets extérieurs et aux bornes fontaines publiques. Pour que ces systèmes soient considérés comme "en fonctionnement", ils doivent fonctionner quotidiennement à plus de 50 % de leur capacité.

ii. Les pompes à main "en fonctionnement" sont celles qui sont utilisées plus de 70 % du temps et pour lesquelles le temps d'interruption entre la panne et la réparation n'excède pas deux semaines.

Assainissement :

i. "En fonctionnement" signifiera que les équipements sont sains tant sur le plan de la structure que sur le plan de l'utilisation qui en est faite et que celle-ci est encouragée.

ORGANISMES DE SUPPORT EXTERIEUR (OSE) :

il s'agit d'une agence de financement extérieure qui peut être une organisation multilatérale ou internationale telle que l'UNICEF ou le PNUD, bilatérale telle que l'USAID, une organisation non gouvernementale (ONG) telle que l'OXFAM ou une organisation intergouvernementale (OI) telle que la CEE ou le Fonds de Développement Africain.

AUTRES ORGANISATIONS LOCALES :

s'applique aux autres organisations non gouvernementales locales (par opposition aux ONG extérieures).

"ACCES" (2)

en tant que définition générale indicative, s'applique à :

i. pour l'eau potable : accès à au moins 20 litres d'eau potable par personne et par jour, à moins d'un kilomètre de l'habitation de l'utilisateur;

ii. pour l'assainissement : accés à un équipement hygiénique pour l'évacuation des excréments et déchets situé à distance convenable de l'habitation de l'utilisateur, à savoir, dans des limites qui n'en découragent pas l'utilisation.

SYSTEME D'EVACUATION DES EXCREMENTS :

s'applique à des équipements hygiéniques satisfaisants qui permettent d'éviter les contacts entre les excréments et les humains.

EXPLOITATION ET ENTRETIEN DES SYSTEMES :

s'applique à l'entretien régulier des systèmes, y compris les réparations.

NOUVEAUX SYSTEMES:

implique de nouveaux investissements en capital, destinés à l'extension des services, mais pas à la remise en état des systèmes existants, qui peut résulter de l'amélioration du niveau de service (passage des bornes fontaines aux robinets extérieurs par exemple).

REMISE EN ETAT :

implique un important investissement en capital qui peut ou non accroître le niveau de service (par exemple passage d'une borne fontaine à un branchement à domicile), mais ne contribue pas à l'extension des services.

(2) Doit être défini localement.

SISTEMA DE MONITOREO DE AGUA Y SANEAMIENTO

* W A S A M S *

Estado al 31 de diciembre de 199__

NOMBRE DEL PAIS: _____

FUENTE DE INFORMACION

Las cifras comunicadas en este cuestionario proceden de:
(nombre y dirección de la institución responsable)

_____

_____

_____

_____

QUE HACER CON ESTOS DATOS

Si el WASAMS está computarizado, proceda como sigue:

* cargue los datos recogidos en un disquete de 3 1/2" o 5 1/4"

si el WASAMS no está computarizado,

* anote los datos recogidos en el presente cuestionario WASAMS

DONDE ENVIAR ESTOS DATOS

A: The Chief
Water and Environmental Sanitation Section
Unicef, United Nations Children's Fund
3, United Nations Plaza
New York, N.Y. 10017
U.S.A.

NOTA:
Antes de llenar este cuestionario, lea por favor las "definiciones orientativas" pulsando la tecla F1; si utiliza una copia en papel, vea las definiciones adjuntas.

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CODIGO DE LOCALIDAD | ... /... /... /... /... /...

País : ..... Subnivel 3. : .....

Subnivel 1. : ..... Subnivel 4. : .....

Subnivel 2. : ..... Subnivel 5. : .....

PARTE I. COBERTURA DE SERVICIO

I. P O B L A C I O N

1. Población estimada (en miles)

Urbana 1) ..... Rural 2) ..... Total 3) .....

..... % ..... %

1.1 Desglose los datos de población urbana en las dos categorías siguientes (si es posible)

Ingresos altos 4) ..... Ingresos bajos 5) .....

..... % ..... %

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PARTE I. COBERTURA DE SERVICIO (continuación)

II. A B A S T E C I M I E N T O D E A G U A

Población con acceso a los siguientes sistemas en funcionamiento (en miles)

	Urbana		Rural	
conexiones domiciliarias	6).....	..... %	7).....	..... %
grifos de patio	8).....	..... %	9).....	..... %
fuentes públicas	10).....	..... %	11).....	..... %
perforación con bomba de mano	12).....	..... %	13).....	..... %
pozo excavado protegido	14).....	..... %	15).....	..... %
sistemas de recolección de aguas pluviales	16).....	..... %	17).....	..... %
otros (tecnología de alto costo)	18).....	..... %	19).....	..... %
otros (tecnología de bajo costo)	20).....	..... %	21).....	..... %
total atendida	22).....	..... %	23).....	..... %
total no atendida	24).....	..... %	25).....	..... %

Desglose los datos de población urbana en las dos categorías siguientes (si es posible)

	Ingresos altos		Ingresos bajos	
conexiones domiciliarias	26).....	..... %	27).....	..... %
grifos de patio	28).....	..... %	29).....	..... %
fuentes públicas	30).....	..... %	31).....	..... %
perforación con bomba de mano	32).....	..... %	33).....	..... %
pozo excavado protegido	34).....	..... %	35).....	..... %
sistemas de recolección de aguas pluviales	36).....	..... %	37).....	..... %
otros (tecnología de alto costo)	38).....	..... %	39).....	..... %
otros (tecnología de bajo costo)	40).....	..... %	41).....	..... %
total atendida	42).....	..... %	43).....	..... %
total no atendida	44).....	..... %	45).....	..... %

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PARTE I. COBERTURA DE SERVICIO (continuación)

III. S A N E A M I E N T O (medios higiénicos de evacuación de excretas)

Población con acceso a instalaciones adecuadas para la evacuación de excretas (en miles)

	Urbana		Rural	
conexiones domiciliarias directas a alcantarillas públicas convencionales	46).....	..... %	47).....	..... %
conexiones domiciliarias directas a alcantarillas públicas de diámetro pequeño	48).....	..... %	49).....	..... %
conexiones domiciliarias directas a sistemas sépticos	50).....	..... %	51).....	..... %
letrinas con vertido de agua	52).....	..... %	53).....	..... %
letrinas secas (de foso de ventilación mejorada)	54).....	..... %	55).....	..... %
letrinas secas (de foso simple etc.)	56).....	..... %	57).....	..... %
otros (tecnología de alto costo)	58).....	..... %	59).....	..... %
otros (tecnología de bajo costo)	60).....	..... %	61).....	..... %
total atendida	62).....	..... %	63).....	..... %
total no atendida	64).....	..... %	65).....	..... %

Desglose los datos de población urbana en las dos categorías siguientes (si es posible)

	Ingresos altos		Ingresos bajos	
conexiones domiciliarias directas a alcantarillas públicas convencionales	66).....	..... %	67).....	..... %
conexiones domiciliarias directas a alcantarillas públicas de diámetro pequeño	68).....	..... %	69).....	..... %
conexiones domiciliarias directas a sistemas sépticos	70).....	..... %	71).....	..... %
letrinas con vertido de agua	72).....	..... %	73).....	..... %
letrinas secas (de foso de ventilación mejorada)	74).....	..... %	75).....	..... %
letrinas secas (de foso simple etc.)	76).....	..... %	77).....	..... %
otros (tecnología de alto costo)	78).....	..... %	79).....	..... %
otros (tecnología de bajo costo)	80).....	..... %	81).....	..... %
total atendida	82).....	..... %	83).....	..... %
total no atendida	84).....	..... %	85).....	..... %

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PARTE I. COBERTURA DE SERVICIO (continuación)

IV. U T I L I Z A C I O N D E L O S S I S T E M A S

1. Porcentaje de la población que utiliza agua potable preferencialmente de la fuente mejorada

Urbana 86) ..... % Rural 87) ..... %

1.1 Desglose los datos de población urbana en las dos categorías siguientes (si es posible)

Ingresos altos 88) ..... % Ingresos bajos 89) ..... %

2. Porcentaje de la población que utiliza instalaciones mejoradas para la eliminación de excretas

Urbana 90) ..... % Rural 91) ..... %

2.1 Desglose los datos de población urbana en las dos categorías siguientes (si es posible)

Ingresos altos 92) ..... % Ingresos bajos 93) ..... %

Observaciones : _____

SISTEMA DE MONITOREO DE AGUA Y SANEAMIENTO

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PARTE II. GESTION DE SISTEMAS

1. Contribución de los participantes a los costos de operación y mantenimiento (en 1,000 USD

1.1 Abastecimiento de agua	GOB.	OAE	COMUNIDAD	OTRO LOCAL	TOTAL
a) Urbana	94).....	95).....	96).....	97).....	98).....
	..... %	..... %	..... %	..... %	..... %
Desglose los datos de población urbana en las dos categorías siguientes (si es posible)					
b) Ingresos altos	99).....	100).....	101).....	102).....	103).....
	..... %	..... %	..... %	..... %	..... %
c) Ingresos bajos	104).....	105).....	106).....	107).....	108).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	109).....	110).....	111).....	112).....	113).....
	..... %	..... %	..... %	..... %	..... %
Total Agua	114).....	115).....	116).....	117).....	118).....
	..... %	..... %	..... %	..... %	..... %

1.2 Saneamiento					
a) Urbana	119).....	120).....	121).....	122).....	123).....
	..... %	..... %	..... %	..... %	..... %
Desglose los datos de población urbana en las dos categorías siguientes (si es posible)					
b) Ingresos altos	124).....	125).....	126).....	127).....	128).....
	..... %	..... %	..... %	..... %	..... %
c) Ingresos bajos	129).....	130).....	131).....	132).....	133).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	134).....	135).....	136).....	137).....	138).....
	..... %	..... %	..... %	..... %	..... %
Total Saneamiento	139).....	140).....	141).....	142).....	143).....
	..... %	..... %	..... %	..... %	.....
TOTAL SECTOR	144).....	145).....	146).....	147).....	148).....
	..... %	..... %	..... %	..... %	

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CODIGO DE LOCALIDAD ... /... /... /... /... /...

PARTE II. GESTION DE SISTEMAS (continuación)

2. Número de sistemas de abastecimiemto de agua administrados por

	GOB.	PRIVADO	COMUNIDAD	OTRO LOCAL	TOTAL
a) Urbana	149).....	150).....	151).....	152).....	153).....
	..... %	..... %	..... %	..... %	..... %
Desglose los datos de población urbana en las dos categorías siguientes (si es posible)					
b) Ingresos altos	154).....	155).....	156).....	157).....	158).....
	..... %	..... %	..... %	..... %	..... %
c) Ingresos bajos	159).....	160).....	161).....	162).....	163).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	164).....	165).....	166).....	167).....	168).....
	..... %	..... %	..... %	..... %	..... %
TOTAL SECTOR	169	170).....	171).....	172).....	173).....
	..... %	..... %	..... %	..... %	

Observaciones : _____

SISTEMA DE MONITOREO DE AGUA Y SANEAMIENTO

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PARTE III. FINANCIACION DEL SECTOR

174) Promedio anual de la tasa de cambio: 1 US$ = ... unidades de moneda nacional

1. Contribución de los participantes a los costos de capital para NUEVOS SISTEMAS (en 1,000 USD)

1.1 Abastecimiento de agua	GOB.	OAE	COMUNIDAD	OTRO LOCAL	TOTAL
a) Urbana	175).....	176).....	177).....	178).....	179).....
	..... %	..... %	..... %	..... %	..... %
Desglose los datos de población urbana en las dos categorías siguientes (si es posible)					
b) Ingresos altos	180).....	181).....	182).....	183).....	184).....
	..... %	..... %	..... %	..... %	..... %
c) Ingresos bajos	185).....	186).....	187).....	188).....	189).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	190).....	191).....	192).....	193).....	194).....
	..... %	..... %	..... %	..... %	..... %
Total Agua	195).....	196).....	197).....	198).....	199).....
	..... %	..... %	..... %	..... %	..... %

1.2 Saneamiento					
a) Urbana	200).....	201).....	202).....	203).....	204).....
	..... %	..... %	..... %	..... %	..... %
Desglose los datos de población urbana en las dos categorías siguientes (si es posible)					
b) Ingresos altos	205).....	206).....	207).....	208).....	209).....
	..... %	..... %	..... %	..... %	..... %
c) Ingresos bajos	210).....	211).....	212).....	213).....	214).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	215).....	216).....	217).....	218).....	219).....
	..... %	..... %	..... %	..... %	..... %
Total Saneamiento	220).....	221).....	222).....	223).....	224).....
	..... %	..... %	..... %	..... %	..... %
TOTAL SECTOR	225).....	226).....	227).....	228).....	229).....
	..... %	..... %	..... %	..... %	

SISTEMA DE MONITOREO DE AGUA Y SANEAMIENTO

* W A S A M S *

Estado al 31 de diciembre de 199__

CODIGO DE LOCALIDAD | ... /... /... /... /... /... |

PARTE III. FINANCIACION DE SECTOR (continuación)

2. Contribución de los participantes a los costos de capital para SISTEMAS REHABILITADOS (en 1,000 USD)

2.1 Abastecimiento de agua	GOB.	OAE	COMUNIDAD	OTRO LOCAL	TOTAL
a) Urbana	230).....	231).....	232).....	233).....	234).....
	..... %	..... %	..... %	..... %	..... %
Desglose los datos de población urbana en las dos categorías siguientes (si es posible)					
b) Ingresos altos	235).....	236).....	237).....	238).....	239).....
	..... %	..... %	..... %	..... %	..... %
c) Ingresos bajos	240).....	241).....	242).....	243).....	244).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	245).....	246).....	247).....	248).....	249).....
	..... %	..... %	..... %	..... %	..... %
Total Agua	250).....	251).....	252).....	253).....	354).....
	..... %	..... %	..... %	..... %	..... %

2.2 Saneamiento					
a) Urbana	255).....	256).....	257).....	258).....	259).....
	..... %	..... %	..... %	..... %	..... %
Desglose los datos de población urbana en las dos categorías siguientes (si es posible)					
b) Ingresos altos	260).....	261).....	262).....	263).....	264).....
	..... %	..... %	..... %	..... %	..... %
c) Ingresos bajos	265).....	266).....	267).....	268).....	269).....
	..... %	..... %	..... %	..... %	..... %
d) Rural	270).....	271).....	272).....	273).....	274).....
	..... %	..... %	..... %	..... %	..... %
Total Saneamiento	275).....	276).....	277).....	278).....	279).....
	..... %	..... %	..... %	..... %	..... %
TOTAL SECTOR	280).....	281).....	282).....	283).....	284).....
	..... %	..... %	..... %	..... %	

Observaciones : _____

SISTEMA DE MONITOREO DE AGUA Y SANEAMIENTO

* W A S A M S *

Estado al 31 de diciembre de 199__

CODIGO DE LOCALIDAD | ... /... /... /... /... /... |

PARTE IV. OBSERVACIONES GENERALES

1. **Calidad de los datos comunicados :**

   Le rogamos que comente la calidad de los datos.

2. **Definiciones utilizadas :**

   Le rogamos que comente las definiciones utilizadas si es que son diferentes de las orientativas (1).

puede continuar en otros folios en caso necesario

3. **Descentralización de Monitoreo**

   ¿Cuál es el nivel administrativo mas bajo que suministró los datos este año?

   (Marque la opción seleccionada)

Nacional	☐	Subnivel 1.	☐	Subnivel 2.	☐
Subnivel 3.	☐	Subnivel 4.	☐	Subnivel 5.	☐

(1) Es decir, las definiciones orientativas amplias de los "indicadores básicos" que se obtienen cuando se pulsa la tecla F1 en el programa informático WASAMS, o las definiciones orientativas adjuntas.

NORMAS PARA EL EMPLEO DEL CUESTIONARIO DEL WASAMS (1)

Para posibilitar las actividades regionales y mundiales de promoción y protección en el sector es primordial la estandarización, en el más amplio sentido del término, de las directrices aplicadas en este sector. Por consiguiente, las directrices enunciadas a continuación se refieren a los "indicadores básicos" y deben considerarse como meramente indicativas.

Directrices aplicables a las definiciones:

Es importante tener en cuenta que las "definiciones indicativas generales" que aquí se describen se refieren a los "indicadores básicos" del WASAMS que son los únicos que se proyectarán desde el nivel nacional, y se utilizarán a nivel regional y mundial con fines de promoción y de colecta de fondos.

CATEGORIAS GEOGRAFICAS

ZONAS URBANAS CON INGRESOS ALTOS :

Son aquellas zonas cuya población tiene un buen acceso, según el criterio local, a un abastecimiento de agua de buena calidad, a instalaciones de saneamiento, a unas buenas condiciones de vivienda y a otros servicios tales como la salud y el transporte público.

ZONAS URBANAS CON INGRESOS BAJOS :

Son aquellas cuya población no pertenece a la categoría precedente y que tiene un acceso mínimo a los servicios de que disfruta el grupo antes mencionado; por ejemplo, no tiene fácil acceso a un abastecimiento de agua de buena calidad, a instalaciones de saneamiento ni a otros servicios sociales.

ZONAS RURALES :

Son aquellas cuya población, según los criterios locales, reside fuera de los centros urbanos y, en general, se encuentra dispersa, con arreglo a las definiciones del censo demográfico local.

---

(1) Este cuestionario está siendo revisado con miras a preparar una versión mejorada del mismo (WASAMS Computer Program Version 1.2)

Conexiones domiciliarias :

Se trata de grifos instalados en la vivienda individual, normalmente más de uno, sin importar el origen del agua y el método de extracción.

Grifos de patio :

En general, se trata de un solo grifo instalado en una parcela o terreno de propiedad privada, pero fuera de la estructura de la vivienda, sin importar el origen del agua o el método de extracción.

Fuentes públicas :

Grifos instalados en terrenos públicos y accesibles al público en general o a la comunidad, sin importar el origen del agua o el método de extracción.

Pozos perforados con bomba manual :

Se trata de pozos perforados (revestidos o no) con un diámetro final inferior por lo general a 15 cm y con niveles de agua estática normalmente inferiores a 80 m de profundidad; están equipados con una bomba de extracción manual y rara vez se extrae el agua de profundidades superiores a 80 m.

Pozos excavados con protección :

Son pozos que han sido bien protegidos (resguardados) contra la contaminación de la superficie exterior mediante un revestimiento o cubierta y un brocal suficientemente elevado sobre el nivel del suelo, y que pueden estar equipados con una bomba de cualquier tipo. Al completar el cuestionario del WASAMS habrá que indicar si esta bomba corresponde a una tecnología de alto costo o de bajo costo (según la definición local).

Sistema de recogida de aguas pluviales :

Se trata de sistemas individuales o colectivos de recogida de aguas pluviales que normalmente consisten en una zona de captación (tejado u otro tipo de superficie, a ser posible impermeable o casi impermeable) y un elemento de almacenamiento constituido por una cisterna o por bidones, depósitos de barro cocido o algún otro recipiente de ese tipo. A veces el sistema está provisto de un filtro, instalado por lo general entre el elemento de captación y el de almacenamiento. El agua ha de tratarse para obtener un producto final apto para la bebida.

Otras tecnologías de alto costo :

Según criterios y definiciones nacionales

Otras tecnologías de bajo costo :

Según criterios y definiciones nacionales

Conexiones domésticas con la red pública de alcantarillado :

Se trata de una canalización de salida que conecta a la vivienda con el sistema público de alcantarillado y que tiene por fin transportar y evacuar las aguas residuales domésticas a un sistema de tratamiento de aguas de albañal.

Conexiones domésticas con el sistema séptico :

Se trata de cualquier sistema doméstico de saneamiento por arrastre de agua que evacúe en fosas sépticas, pozos revestidos y otros medios de evacuación subterránea.

Conexiones domésticas a una red de alcantarillado público de poco diámetro :

Se trata de sistemas de drenaje no convencionales que resultan comunes en las zonas en las que se dispone de poca agua, es decir, donde el consumo es normalmente inferior a 30 litros/cápita/día (lo que implica que en las viviendas se utiliza por la general agua procedente de grifos públicos. Estas canalizaciones suelen tener un diámetro de 10 a 15 cm y se instalan a poca profundidad (menos de 1 m por debajo de la superficie). En general, están destinadas a poblaciones con bajos ingresos, establecidas en asentamientos improvisados donde la densidad de población suele ser mayor de 200 personas por hectárea.

Letrina de agua (de cierre hidráulico etc.) :

Se trata de un sistema de drenaje doméstico en el que se utiliza una pequeña cantidad de agua (1-3 litros) para arrastrar los desechos. La salida del agua se acciona a mano y la letrina puede tener un solo agujero o dos, uno para los excrementos y otro para las aguas residuales. Por consiguiente, puede o no estar conectada a un pequeño pozo perforado o a una red ordinaria de alcantarillado.

Letrina seca (letrina de pozo mejorada con respiradero) :

Se trata de un tipo de letrina doméstica de "pozo seco" mejorado que comprende una tubería de ventilación con un tamiz que, por una parte, sirve de atrapamoscas y, por otra, permite evacuar el aire viciado en la atmósfera a través de un tejadillo. De este modo se reduce al mínimo el mal olor en el interior de la caseta y se evita que las moscas puedan diseminar enfermedades por contaminación fecal.

Letrina seca (letrina sencilla de pozo) :

Se trata de una letrina corriente de pozo "seco" sin ninguna mejora del tipo de respiraderos o telas atrapamoscas (como en el caso anterior). Estas letrinas suelen desprender mal olor y también permiten la salida de moscas con el consiguiente riesgo de contaminación alimentaria, etc.

Otras tecnologías de alto costo :

Según criterios y definicions nacionales

Otras tecnologías de bajo costo :

Según criterios y definicions nacionales

Conviene tener muy presente que las siguientes definiciones se dan únicamente a título de ejemplo. Por consiguiente, estos ejemplos tendrán que ser adaptados en los países atendiendo a las necesidades propias de cada uno.

Sistemas de abastecimiento de agua:

i. Para las redes de abastecimiento que conducen el agua a las casas, los grifos de patio o las fuentes públicas, la expresión "en funcionamiento" implica que estos sistemas trabajen por encima del 50% de su capacidad teórica día tras día.

ii. Para las bombas manuales, la expresión "en funcionamiento" se aplica a las que trabajan por encima del 70% del tiempo y en las que el intervalo entre una avería y la reparación no pasa de dos semanas.

Saneamiento:

i. "En funcionamiento" significa que la instalación es estructural y funcionalmente satisfactoria y atractiva para el usuario, que se siente estimulado a utilizarla.

Por "Organismo de Ayuda Externa" (OAE), se entiende un donante externo, sea de carácter multilateral o bien una organización internacional como el UNICEF o el PNUD, una entidad de ayuda bilaterial como la Agencia de los Estados Unidos para el Desarrollo Internacional, una organización no gubernamental (ONG) externa como la OXFAM o una organización intergubernamental como le CEE o el Banco Africano de Desarrollo.

La expresión "Otras entidades locales" se refiere a organizaciones no gubernamentales nacionales lo cual excluye a las ONG externas.

El término "Acceso" (2) utilizado como definición indicativa general se refiere a:

i. Acceso al abastecimiento de agua: disponibilidad de 20 litros por lo menos de agua de buena calidad por persona y por día, a menos de un kilómetro de la vivienda del usuario.

ii. Acceso al saneamiento: disponibilidad de una instalación sanitaria para la evacuación de deyecciones humanas y aguas residuales a una distancia razonable de la vivienda del usuario (es decir, a una distancia que no resulte disuasiva).

Sistema de evacuación de excretas :

Presupone un medio sanitario satisfactorio de evacuación de excretas, que separe higiénicamente éstas del contacto humano.

Funcionamiento y mantenimiento de los sistemas :

Implica inspecciones y reparaciones frecuentes, regulares y repetidas.

Sistemas nuevos :

Corresponde a una nueva inversión de capital destinada a ampliar la cobertura de los servicios y no a rehabilitar los sistemas existentes con miras a una posible elevación del nivel de servicios (de una fuente pública a un grifo de patio, por ejemplo).

Rehabilitación :

Corresponde a una inversión de capital considerable que puede o no aumentar el nivel de servicios (p.ej., de una fuente pública a una conexión doméstica), pero no contribuye a ampliar la cobertura de los servicios.

(2) Debe definirse específicamente a nivel nacional.

THE DECADE AND BEYOND: AT A GLANCE

by Joseph Christmas
and
Carel de Rooy

Water and Sanitation Section,
Programme Division,
UNICEF New York
Issued: 17 August 1990

THE DECADE AND BEYOND: AT A GLANCE

by Joseph Christmas and Carel de Rooy[1]

ABSTRACT

The International Drinking Water Supply and Sanitation Decade ends in 1990. Though the Decade has not achieved its numerical objective of universal access to water and sanitation, it has been quite successful in creating awareness about the sector and in developing workable strategies and models which enhance sector sustainability.

The disparity in coverage between urban and rural areas, the wide differential between the provision of water supply facilities and those for sanitation, the active and meaningful involvement of women in the management of water and sanitation programmes, and effective means of accelerating coverage in a sustainable manner, are all issues for which effective answers must be found during the 1990s.

Additionally, it is clear that with approximately 30% of the total capital investment required to provide water and sanitation services to all by the year 2000, 80% of the unserved could be reached by use of essentially low-cost technologies. This fact calls for a concerted effort to shift some resources from high-cost technologies to low-cost alternatives.

If the sector were to perform in the 1990s, similar to its performance during the 1980s, a significant proportion of developing countries' population will yet be unserved by the year 2000. Thus, the strategies of the 1990s must be such that their combined effect will make an enormous difference with respect to sector performance. A more management-oriented sector, based on frequent and systematic monitoring at country and global level, with an institutionalized entity for global advocacy, should form the corner-stone of the thrust for the 1990s.

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[1] Dr. Joseph Christmas who is a hydrogeologist and Sanitary Engineer by profession, is currently UNICEF's global Chief of Water and Environmental Sanitation, and is based at UNICEF Headquarters (3 United Nations Plaza, New York, New York 19917).

Mr. Carel de Rooy is a hydrogeologist by profession, and is currently a Senior Project Officer in the Water and Environmental Sanitation Section at UNICEF Headquarters.

TABLE OF CONTENTS

1. INTRODUCTION

On 10 November 1980, the General Assembly of the United Nations proclaimed the period 1981-1990 as the International Drinking Water Supply and Sanitation Decade (IDWSSD). The primary goal of the IDWSSD, as conceived then, was to achieve full access to water supply and to sanitation for all inhabitants in developing countries by 1990.

At this point in time, at the virtual end of the IDWSSD, it is clear that the primary goal of full access to water supply and sanitation will not be achieved by the target year of 1990, as a formal assessment by the World Health Organization (WHO) has shown. (Some of the IDWSSD material used herein is based on the WHO assessment). Consequently, both the developing countries, themselves, and the External Support Agencies (ESAS) have reached a broad consensus to continue the existing thrust of the IDWSSD, beyond 1990, to coincide with the goal of "Health for All by the Year 2000".

Therefore, the primary goal of achieving universal access to water supply and sanitation is now re-targeted for a future date.

2. EVOLUTION OF CURRENT WATER AND SANITATION DECADE (1980s)

2.1 Concepts and Approaches

The International Drinking Water Supply and Sanitation Decade (IDWSSD) of the 1980s, ushered in several novelties, gleaned from past evaluations of water and sanitation programmes in several countries. This new thrust directed attention to several hitherto untouched issues, including the following: institutional development and sector planning; the development of community-awareness and participation, including increased involvement of women; the development and utilization of affordable, appropriate technologies; the integration of water supply with sanitation and hygiene education; the importance of adequate operation and maintenance of systems; the mobilization of communities to manage their programmes, including development of their own cost recovery measures for operation and maintenance; the significance of human resources development; and the need for international coordination and cooperation regarding sector inputs.

2.2 Performance

The "Water and Sanitation Decade" was launched in November 1980 at the same time that the downturn in the world economy had begun to be felt in the developing

countries. Gross Domestic Product (GDP) growth rates in developing countries started to drop and their long-term external debts during the 1980s more than doubled. Demographic growth, particular in urban areas, further complicated the problem of expanding water and sanitation facilities to a fast-growing population. Even at the end of the 1980s, there is no general, significant improvement in the adverse economic climate and the explosive population growth among developing countries. However, there are regional disparities regarding the effects of the economic situation and the responses. Asia is showing more buoyancy and resilience whilst Africa and Latin America are suffering immensely. Thus, two factors -- inadequate funding and high population growth -- contributed significantly in curtailing the coverage rate for water and sanitation, thereby preventing the achievement of universal access to these facilities.

However, the Water and Sanitation Decade of the 1980s is not only a matter of numbers. Despite the inability to achieve 100% coverage in water supply and sanitation by 1990, it has succeeded in introducing low-cost technologies, and in focusing attention on the user communities as active participants in the developmental process, rather than their being merely passive recipients as hitherto.

Despite the austere economic climate, total global annual funding for the water and sanitation sector among developing countries, is estimated at $10,000 million. Globally, it is approximated that 65% of sector funding, during the 1980s, came from national sources. In the case of Africa and the least developed countries, where the major reliance appears to have been on external funding, this proportion was only slightly in excess of 25%, whereas in the countries of the Middle East, the figure was about 90%.

The U.N. Inter-agency Steering Committee for Cooperative Action for the Water and Sanitation Decade is involved in fostering collaboration with governments in the implementation of programmes. Coordination of the Water and Sanitation Decade activities is facilitated via this Steering Committee which is chaired by UNDP.

2.3 Coverage Status at End of Decade (1990)

The available information indicates that modest progress, in extending service coverage to the population of developing countries, took place between 1980 and 1990.

The most dramatic increase took place in the case of rural water supply where the number of persons provided with facilities in 1980, increased by 240% by 1990. The number of rural inhabitants provided with sanitation facilities in 1980 also increased, though less spectacularly, by 150%. Increases in the number of people provided with facilities in 1980, relative to 1990, were 150% each for urban drinking water supply and for sanitation. However, in the face of rapidly expanding urban population, these increases in the number of inhabitants provided with adequate services did not necessarily translate into equally significant increases, in the proportion of people with services, relative to the

total population. Only in the case of rural water supply did it result in a doubling of the proportion served between 1980 and 1990.

Table 1 summarizes changes in service coverage achieved during the period 1980-90, on a regional and global basis. Figures 1, 2, 3 and 4 graphically represent the percentage changes in service coverage, during the same 10-year period, on a regional and global scale, whilst Figures 5, 6, 7 and 8 depict the changes in coverage, in absolute population, for the same geographic regions. The data show, among other things, that over the 10-year period an additional 1,347 million and 748 million persons were served with water and with sanitation facilities, respectively.

As expected, there are significant variations from region to region (and even from country to country within a region). A review of progress in Africa is of particular interest since the continent contains most of the world's least developed countries, and has suffered acute water problems associated with drought during the 1980s. Overall, countries in the African region fell significantly short of their targets for the decade of the 1980s. Despite the absolute numbers of people served, the proportion for urban water supply coverage increased by a mere 5% from 77% in 1980 to 82% in 1990. For urban sanitation, the gains were extremely modest, as coverage increased by only 3 percentage points. For rural Africa, the relative success achieved in water supply coverage compares favourably with that for sanitation as, during the 1980s, the former rose by 9 percentage points as against the latter's 8 percentage points.

After 10 years of intensified global effort, the water and sanitation coverage in 1990, among developing countries, is approximated by the following statistics: urban water 82%; rural water 63%; urban sanitation 72%; and rural sanitation 49%. Figures 9, 10, 11 and 12 illustrate. Thus, in absolute terms, at the start of the 1990s, there are an estimated 1,230 million people in developing countries without access to adequate and safe water supplies, and 1,740 million without access to appropriate sanitation, i.e., 31% without water, and 43% without sanitation. The consequences of this, in terms of human health and suffering, as well as social and economic cost, are staggering.

2.4 Lessons of the 1980s

In retrospect, the decade of the 1980s has revealed the following:

- Progress has been made in developing models for sustainable development of water and sanitation programmes in rural and peri-urban areas of developing countries. But greater efforts are required to translate these models into workable approaches for application to programmes, especially for the rapid delivery of programmes and acceleration of the coverage rate.

Fig. 1: DECADE PERFORMANCE
URBAN WATER SUPPLY COVERAGE

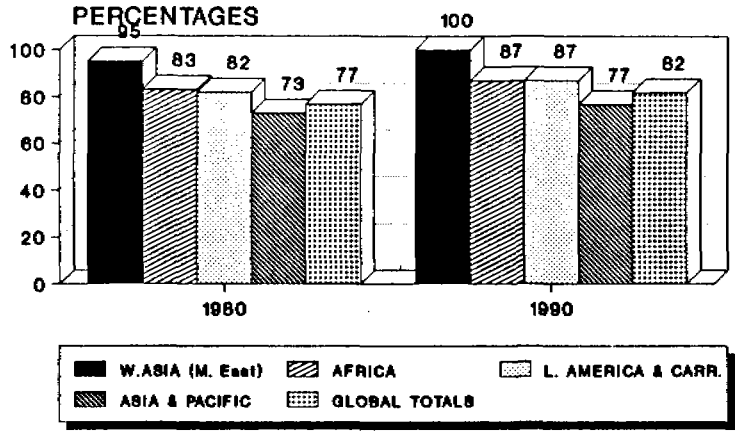


Fig. 2: DECADE PERFORMANCE
RURAL WATER SUPPLY COVERAGE

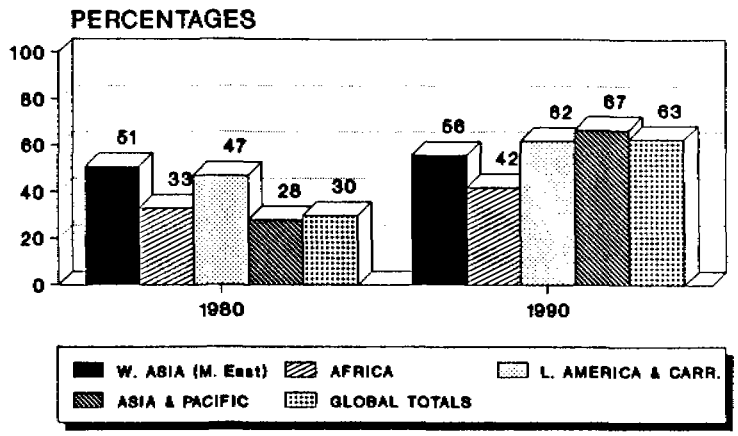


Fig. 3: DECADE PERFORMANCE
URBAN SANITATION COVERAGE

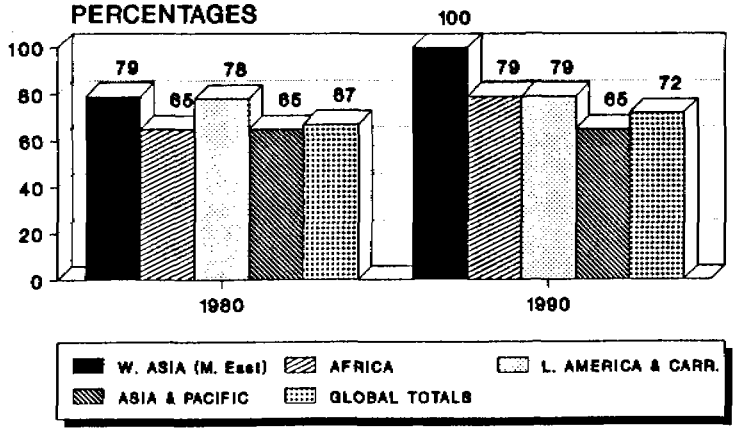


Fig. 4: DECADE PERFORMANCE
RURAL SANITATION COVERAGE

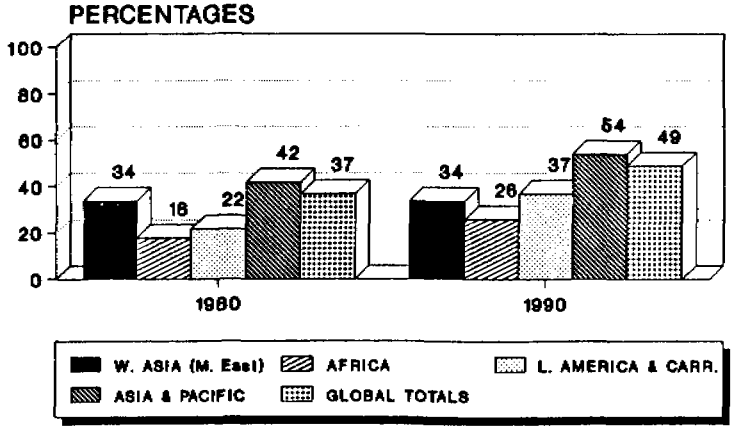


Fig. 5: ABSOLUTE COVERAGE 1980s
URBAN WATER SUPPLY

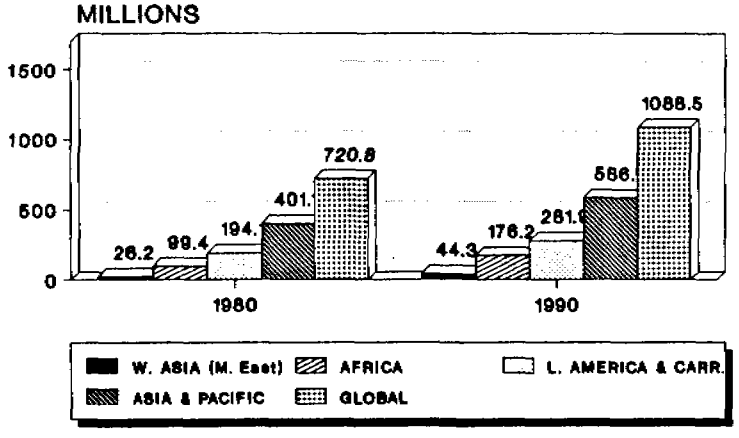


Fig. 6: ABSOLUTE COVERAGE 1980s
RURAL WATER SUPPLY

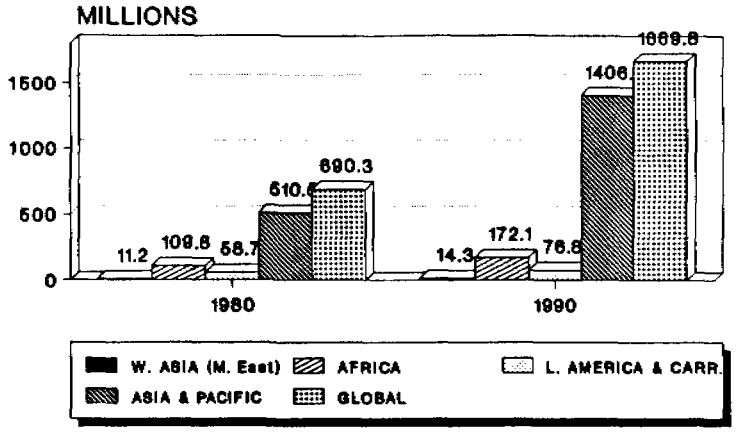


Fig. 7: ABSOLUTE COVERAGE 1980s
URBAN SANITATION

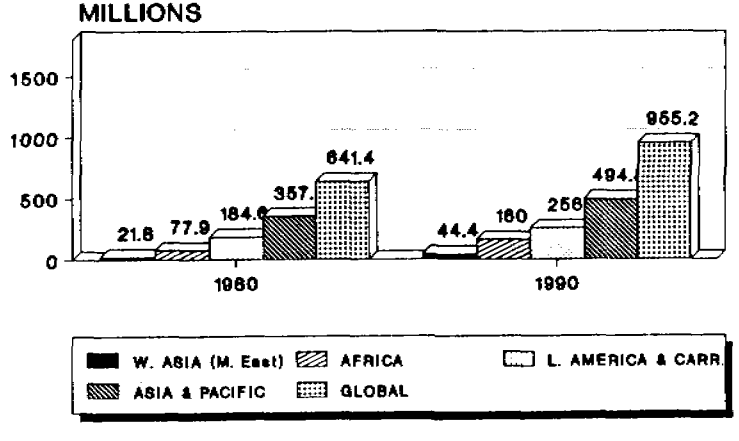


Fig. 8: ABSOLUTE COVERAGE 1980s
RURAL SANITATION

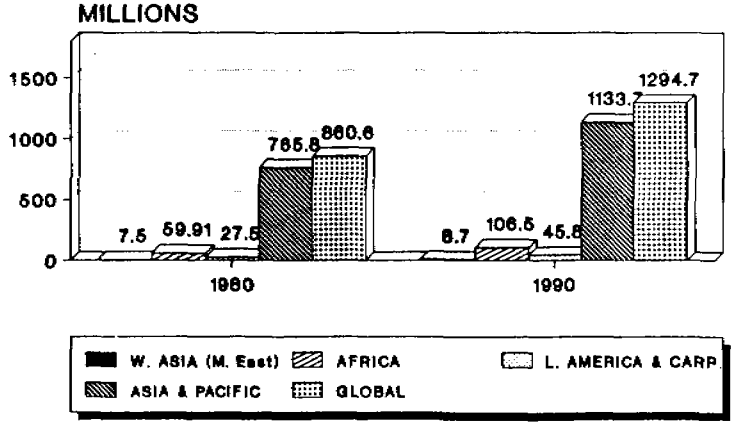
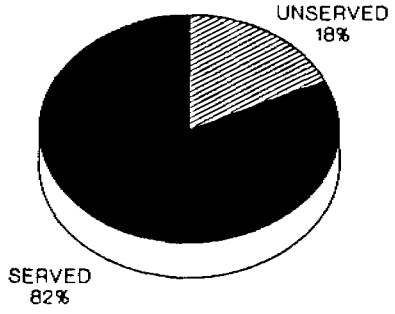
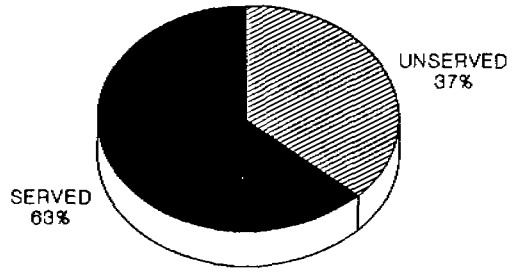


Fig. 9: ESTIMATED COVERAGE 1990
URBAN WATER



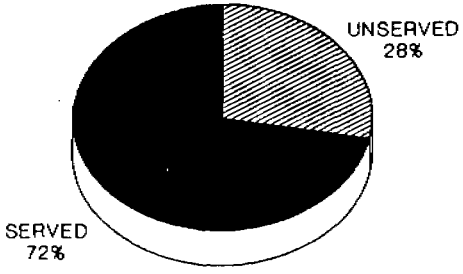
Unserved Population 243.70 M

Fig. 10: ESTIMATED COVERAGE 1990
RURAL WATER



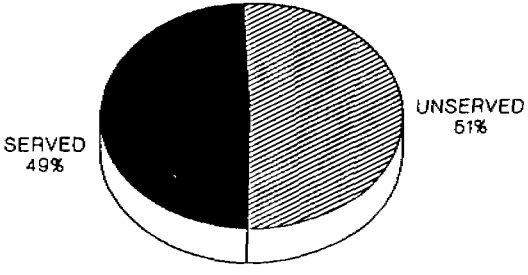
Unserved Population 988.72 M

Fig. 11: ESTIMATED COVERAGE 1990
URBAN SANITATION



Unserved Population 377.00 M

Fig. 12: ESTIMATED COVERAGE 1990
RURAL SANITATION



Unserved Population 1363.79 M

Active and systematic management of the 1980s decade could have resulted in greater progress, if applied.

- Globally, virtually all developing countries lack properly devised action plans for methodical guidance of their decade activities.

- Women's involvement, crucial for community participation, has not been systematically applied, but, at best, is ad hoc.

- The promotion and acceptance of cost-sharing mechanisms (cost recovery schemes for operation and maintenance, etc.) face formidable resistance at government level in many countries, and are difficult to put in practice at the community level.

- Maintenance still poses significant problems despite the appropriateness of the technologies. The problems relate mainly to sustainable funding for the provision of spare parts.

- Low-cost technology projects get only about 4% of the estimated total annual external funding of $3,000 million whilst governments' firm commitment to such projects is indicated by a 6-fold increase since 1980.

- In global terms, there is an insufficiency of trained professional and sub-professional personnel within the sector, among developing countries.

The major constraints to the water and sanitation programme, as identified by developing countries' governments, for the four main geographic regions are:

- Africa: Funding limitation, inadequate cost recovery, poor operation and maintenance, and lack of trained professional personnel – in that order.

- Latin America & the Caribbean: This region gave the same constraints, in the same order, as for Africa.

- Asia & the Pacific: Insufficient trained professionals, funding limitations, lack of cost recovery, and inadequate operation and maintenance -- in that order. In addition, several countries, particularly small island nations, underscored the difficulties associated with basic shortages of water resources.

- Middle East: Funding limitations, lack of trained manpower both professional and sub-professional, and poor operation and maintenance -- in that order. It is noteworthy that in this grouping of some of the world's wealthiest nations, funding limitation is still considered the main constraint. This perhaps indicates inadequate allocation of funds, particularly to rural areas of the sector.

3. DEVELOPMENTAL FRAMEWORK FOR 1990s

3.1 General Global Requirements

Water and sanitation programmes are national responsibilities thus, strategies and planned activities of the United Nations Agencies and the rest of the external support community should strengthen and reflect national priorities and, additionally, complement national endeavours in such a manner as to enhance overall effectiveness.

It is clear that if developing countries' water and sanitation programme delivery continues in the 1990s, in the same vain, at the same rate, as in the 1980s, the global service coverage in the year 2000 will fall well short of 100%. Figures 13, 14, 15 and 16 indicate the projected percentage coverage at the year 2000, for water and sanitation in both urban and rural areas, based on the implementation rates of the 1980s.

Against the foregoing background, the broad requirements of the water and sanitation sector, in developing countries, for the 1990s, include the following:

- Re-formulation of national coverage goals to achieve widespread access to water and sanitation by the year 2000. This long-term goal should be sub-divided into expected annual coverage so as to facilitate annual monitoring.

- Re-invigoration and re-application of the concepts and approaches of the International Drinking Water Supply and Sanitation Decade of the 1980s (as outlined under Section 2.1).

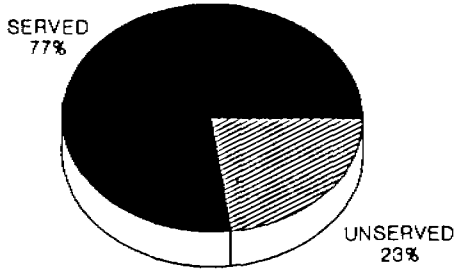
- Rationalization in the use of sector funds. Total annual funding, globally, for the sector, among developing countries, during the 1980s was about US$10,000 million. The External Support Agencies provided approximately US$3,000 million of this total. Estimated funding needs for the 1990s are US$36,000 million annually based on 100% coverage by the year 2000. As funding in this order of magnitude is unlikely under the prevailing economic conditions, greater cost efficiency and effectiveness, even with the existing funding level, is required to accelerate the coverage rate.

- Intensification of measures to control the population growth rate and to curtail urbanization.

- Priority to be given to personnel needs, via human resources development for the strengthening of national institutional structures.

- More vigorous promotion and application of low-cost technology programmes, with

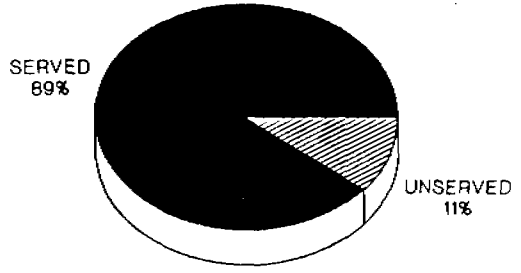
Fig. 13 PROJECTED % COVERAGE - YEAR 2000
GIVEN 1980s' IMPLEMENTATION RATES



URBAN WATER

Unserved Population 445.5 M.

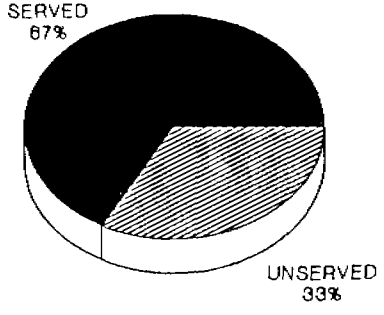
Fig. 14 PROJECTED % COVERAGE - YEAR 2000
GIVEN 1980s' IMPLEMENTATION RATES



RURAL WATER

Unserved Population 321.3 M.

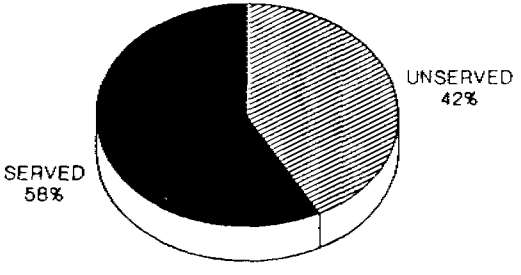
Fig. 15 PROJECTED % COVERAGE - YEAR 2000
GIVEN 1980s' IMPLEMENTATION RATES



URBAN SANITATION

Unserved Population 632.7 M.

Fig. 16 PROJECTED % COVERAGE - YEAR 2000
GIVEN 1980s' IMPLEMENTATION RATES



RURAL SANITATION

Unserved Population 1241.8 M

emphasis on technical cooperation among developing countries (TCDC), and dissemination and exchange of information amongst the scientific community in developing countries.

- Meaningful linkage of the water and sanitation sector with other sectors, especially health, education, women, communications, and nutrition (via home-gardening).

- Execution of all programmes as integral components of overall water resources management and environmental health.

- Strengthening and broadening the coordination and cooperation among national governments and the External Support Agencies.

- Establishment of policy and strategies to make extensive and systematic use of social communications for global and community-based mobilization of people and resources.

The foregoing broad needs are high-lighted, in essence, to provide the basis for accelerating the coverage rate, in a sustainable manner, to achieve widespread access to water and sanitation by the target year, 2000. Figures 17 and 18 show the projected absolute population served with water and sanitation facilities at the year 2000, based on the trend of the 1980s. The gap shown between the total population and those covered by services, is enormous. Calculations indicate that 1980s implementation rates for urban water and for rural water, would have to increase about 2.5 and 1.5 times, respectively, whilst urban sanitation and rural sanitation would have to increase 3 and 4 times, respectively, during the 1990s, if universal access to these facilities is to be achieved by the year 2000.

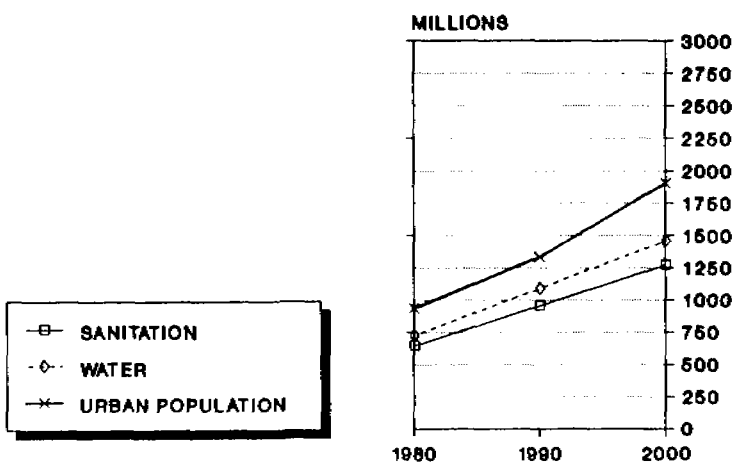
3.2 Priority Actions

Though there are a plethora of activities to be implemented in the 1990s, priority attention should be given to the implementation of the concept of management by objectives, with respect to the water and sanitation sector, at both the country and the global level. Regular, perhaps annual or more frequent, monitoring of the sector's performance should form the basis for its management. To give effect to this concept, the following should be pursued:

- Execution of a review of each country's status regarding water and sanitation coverage as of 1990 and a realistic estimate of coverage to be achieved by the year 2000; and the types of assistance required.

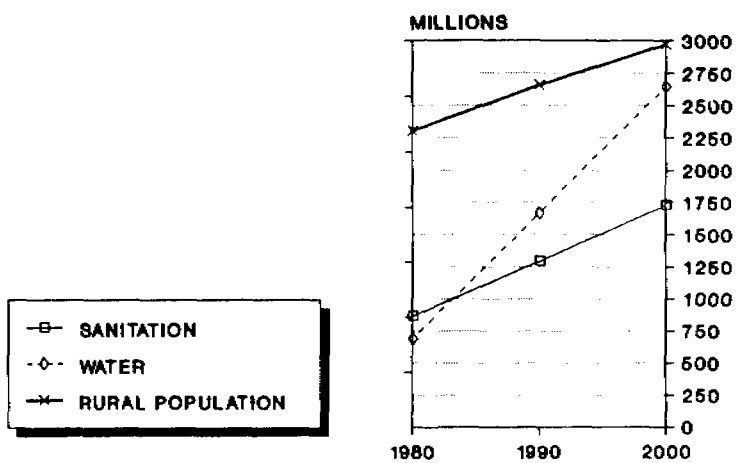
- Establishment of an action plan -- just a framework -- for the 1990s based on the review of the country's status and its goal.

Fig. 17 PROJECTED COVERAGE FOR YEAR 2000
GIVEN 1980s' IMPLEMENTATION RATES



WATER AND SANITATION - URBAN AREAS

Fig. 18 PROJECTED COVERAGE FOR YEAR 2000
GIVEN 1980s' IMPLEMENTATION RATES



WATER AND SANITATION - RURAL AREAS

- Establishment of a national monitoring unit by Government, at the country level, with assistance, if necessary, from the External Support Agencies. The unit will monitor the sector performance and apprise the country-level management (co-ordination) body of its findings. Actions are to be taken based on these findings.

- At the global level, a management/coordination entity, comprising members from the developing countries and the External Support Agencies, should be formed to perform a largely advocacy role on behalf of the sector, with respect to findings from global monitoring.

4. CAPITAL COST OF COMPLETE COVERAGE

4.1 Elements Influencing the Costing Model

A costing model, with respect to capital investments only, is devised to provide an estimated cost of completely serving the unserved, among developing countries, with water supply and sanitation, by the year 2000. Recurrent costs though highly essential for operation and maintenance, especially, are not included in the model. Costs are based on 1990 values. The model can be considered a preliminary one with the possibility for further refinement.

The total population among developing countries, in 1990, is estimated at 4,000 million, with urban and rural sharing 1,332 million and 2,668 million, respectively. Figures 9,10,11 and 12 indicate the proportion and number of unserved persons as of 1990. The total population among developing countries, by the year 2000, is approximated at 4,810 million, with urban and rural ares, respectively, having 1,902 and 2,908 million.

China, India, Pakistan, Bangladesh, Indonesia, and Vietnam in Asia; Nigeria and Egypt in Africa; and Brazil and Mexico in Latin America account for approximately 75% of the current developing countries' population, and it is likely that this picture will not change significantly over the forthcoming decade. What happens in these countries will therefore dictate the overall outcome in costs and coverage by the year 2000.

The 1980s witnessed for the first time in history a concerted effort to provide needy (poor) people in urban and rural areas with water and sanitation services on a large scale. one of the outcomes of this effort was the emergence of an array of low-cost approaches and technologies which have effected significant cost reductions as they were transferred from their research and developmental phase into large scale implementation programmes.

In UNICEF-assisted projects, Nigeria, the average unit cost of a handpump-equipped borehole was reduced from over US$20,000.00 in 1982, to under US$ 4,000.00 by 1989 largely through the use of appropriate technologies. A similar trend has been observed in

the Sudan where more efficient resource management has reduced the unit cost of handpump-equipped boreholes from US$9,500 in 1987 to US$2,800 in 1989.

While progress has been made in cost reduction via low-cost technologies it is undeniable that, as urban centres grow and more distant and/or deeper additional water sources have to be identified and developed, the cost of service delivery may increase.

This principle is not limited to urban areas; when the more distant and isolated populations in rural areas have to be reached, the scarcity of adequate infrastructures tends to raise developmental costs substantially.

A few UNICEF-assisted water and sanitation projects have derived quite accurate costs for low-cost water and sanitation service delivery. The applicability of these on large scale cost projections is however, limited because of several factors:

- UNICEF-provided hardware (capital goods) enter countries duty free and are therefore much cheaper than private sector equivalents found in the developing countries;

- Depreciation of capital goods are usually linear and do not take into account payment of loans or interest rates because all equipment is granted to the countries.

- UNICEF is, in absolute financial terms, but a small partner in the sector. It contributes less than 1% of the sector's global total annual investment (but its impact on coverage is significant because of its emphasis on low-cost technologies and approaches).

The above mentioned facts make "UNICEF costs" low, on the cost spectrum for water and sanitation service delivery, and render them somewhat inapplicable to global cost projections. However, UNICEF's low-cost and cost reduction approaches are good pointers regarding the direction in which cost efficient water and sanitation programmes should be developed.

4.2 The Model

The several, and at times opposing, forces which influence water and sanitation service delivery costs were taken into account for the costing model applied herein.

World Bank and UNDP water and sanitation colleagues were consulted and several "technology categories" with respective costs were determined.

For the costing model, the unserved population over the next ten years, up to the year 2000, is divided into three broad geographic groups representing what, in reality, is

much less well defined. These are urban, peri-urban, and rural. Specific "technology categories" are then assigned to the geographic groupings.

By knowing the number of unserved persons per geographic group, and also the unit cost for water supply and for sanitation facilities for the assigned technology category, the total cost of having 100% coverage among the unserved by the year 2000, can be estimated.

The model assumes that low-cost technologies will be applied to the entire rural areas; that 50% of the urban areas will have high-cost technologies; the remaining half of the urban areas will be equally divided into low-cost (25%) and intermediate cost (25%).

The geographic groups with their corresponding Technology categories and unit costs are as follows:

TECHNOLOGY CATEGORY	COST PER CAPITA (in US$)
HIGH-COST TECHNOLOGY	
▸ Urban Water Supply	200
▸ Urban Sanitation	350
INTERMEDIATE TECHNOLOGY	
▸ Peri-urban Water Supply	100
▸ Peri-urban Sanitation	25
LOW-COST TECHNOLOGY	
▸ Rural Water Supply	30
▸ Rural Sanitation	20

High Cost Technology applies to the urban-type system with elaborate pumping stations, water and sewerage treatment plants, complete distribution systems and individual household connections for both water supply and sewerage.

Intermediate Technology, applicable to peri-urban areas essentially, comprises pipeborne water supply (no allowance for elaborate treatment) leading to public standposts, and "on-site" sanitation including technologies such as pour-flush and ventilated improved pit latrines.

Low-cost Technology, targeted to rural areas essentially, includes handpump-equipped boreholes or handdug wells, rainwater Harvesting systems and pipe-borne gravity-fed Systems with public standposts, for water supply. Sanitation technologies are the same as those allocated to the "intermediate technology" category with a slight cost reduction allowing for the use of locally available construction materials for the building of Latrine super-structures.

4.3 Population to be Served

In order to raise the service coverage from the 1990 levels of 82% for urban water, 63% for rural water, 72% for urban sanitation, and 49% for rural sanitation to 100% for all four sub-components by the year 2000, several millions of unserved people must be

TABLE 1. WATER SUPPLY AND SANITATION COVERAGE BY REGION 1980-1990
DEVELOPING COUNTRIES (Population in millions; source: WHO)

Region/sector	1980 Population	1980 % coverage	1980 No. served	1980 No. unserved	1990 Population	1990 % coverage	1990 No. served	1990 No unserved
Africa								
Urban Water	119.77	83	99.41	20.36	202.54	87	176.21	26.33
Rural Water	332.83	33	109.83	223.00	409.64	42	172.05	237.59
Urban Sanitation	119.77	65	77.85	41.92	202.54	79	160.01	42.53
Rural Sanitation	332.83	18	59.91	272.92	409.64	26	106.51	303.13
Latin America and the Caribbean								
Urban Water	236.72	82	194.11	42.61	324.08	87	281.95	42.13
Rural Water	124.91	47	58.71	66.20	123.87	62	76.80	47.07
Urban Sanitation	236.72	78	184.64	52.08	324.08	79	256.02	68.06
Rural Sanitation	124.91	22	27.48	97.43	123.87	37	45.83	78.04
Asia and the Pacific								
Urban Water	549.44	73	401.09	148.35	761.18	77	586.11	175.07
Rural Water	1823.30	28	510.52	1312.78	2099.40	67	1406.60	692.80
Urban Sanitation	549.44	65	357.14	192.30	761.18	65	494.77	266.41
Rural Sanitation	1823.30	42	765.79	1057.51	2099.40	54	1133.68	965.72
Western Asia (Middle East)								
Urban Water	27.54	95	26.16	1.38	44.42	100	44.25	0.17
Rural Water	21.95	51	11.19	10.76	25.60	56	14.34	11.26
Urban Sanitation	27.54	79	21.76	5.78	44.42	100	44.42	0.00
Rural Sanitation	21.95	34	7.46	14.49	25.60	34	8.70	16.90
Global totals								
Urban Water	933.47	77	720.77	212.70	1332.22	82	1088.52	243.70
Rural Water	2302.99	30	690.25	1612.74	2658.51	63	1669.79	988.72
Urban Sanitation	933.47	69	641.39	292.08	1332.23	72	955.22	377.00
Rural Sanitation	2302.99	37	860.64	1442.35	2658.51	49	1294.72	1363.79

provided water and sanitation facilities at an accelerated rate. Consequently, in absolute terms, 813 million people in urban areas and 1,301 million people in rural areas will require water supply, and 947 million urban and 1,676 million rural people will need sanitation services (if full coverage is envisaged by the year 2000). Tables 2 and 3 provide a breakdown of these statistics.

4.4 Investment Cost

A total cost of approximately US$357,000 million (US$357 billion) was derived to attain a water and sanitation service coverage of 100% by the year 2000 based on the following distribution of technology categories:

US$247 billion for high-cost in urban areas,

US$26 billion for intermediate technologies in mainly periurban areas,

US$11 billion for low-cost in (the remaining) peri-urban areas, and

US$73 billion for low-cost in rural areas.

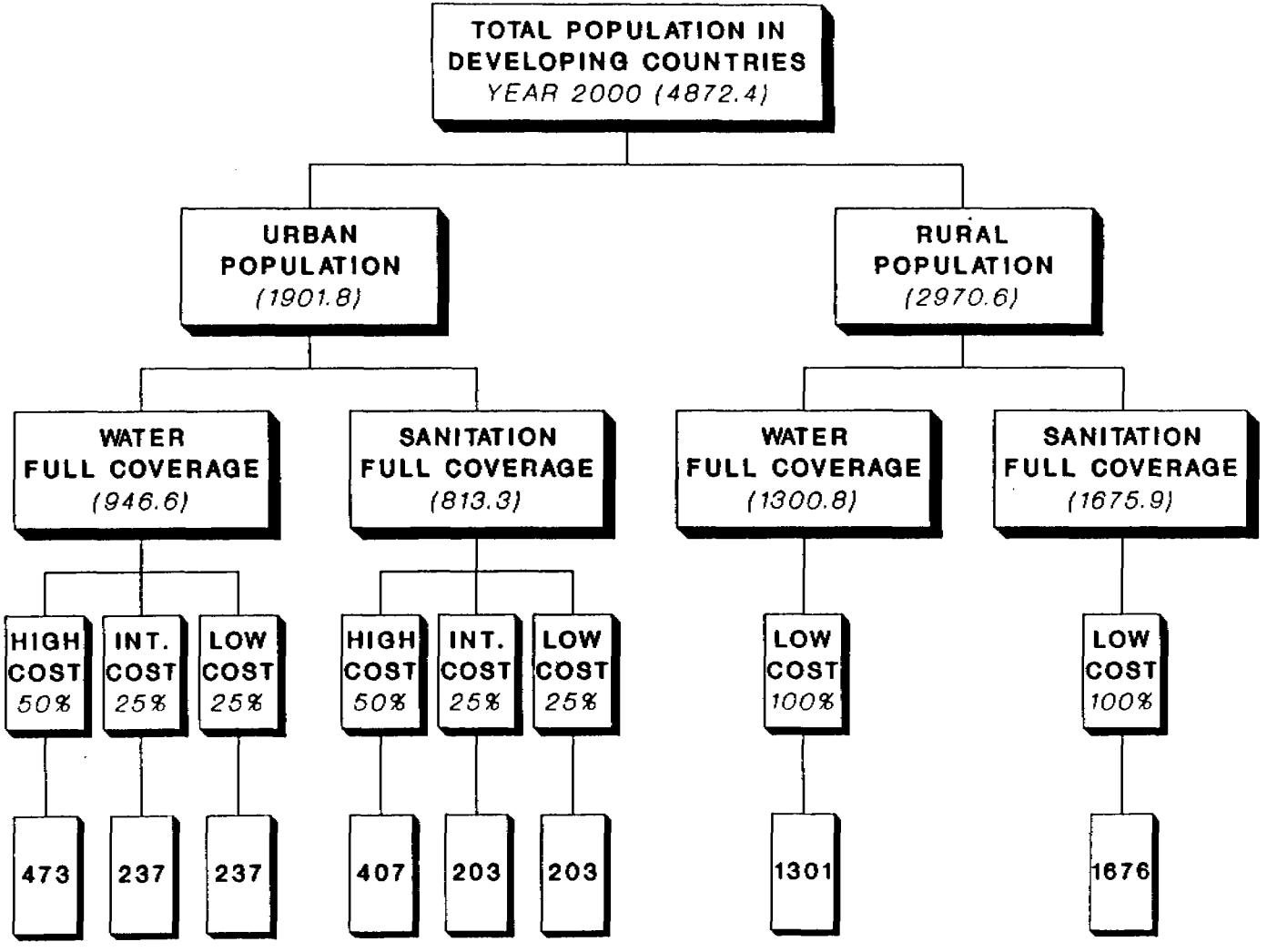
Figure 19 indicates the funding required per technology type, namely, high-cost ($247 billion), intermediate ($26 billion), and low-cost ($84 billion). Figures 20, 21, 22 and 23 provide further details regarding the costs for water supply and for sanitation, within the framework of the technology types. All costs are based on 1990 values.

The 10-year capital investment cost of US$357 billion, when apportioned, allows for US$147 billion for water supply and US$210 for sanitation. These estimates imply an investment of about US$36 billion per year over a 10 year period (1991-2000), with US$15.0 billion for water supply and US$21.0 billion for sanitation. The cost derived is equivalent to about three and one-half times the average annual investment into the sector during the 1980s. (Developing countries spend about US$200 billion annually on the military.)

However, as sector funding in this order of magnitude, $36 billion annually, is not forthcoming, in the current economic climate, restructuring the use of existing sector funds in terms of efficiency and effectiveness must be pursued parallel to mobilizing for additional funds.

Therefore, if one were to focus on the provision of services to the needy (poor), herein categorized as the total rural population plus 50% of the urban population (essentially peri-urban), it is clear that ***with only 30% (US$110 billion) of the total investment (US$357 billion), over 2 billion needy people could be reached with sanitation and 1.6 billion with water supply.***

Table 2: BREAKDOWN UNSERVED POPULATION (YEAR 2000) INTO SERVICE TYPES



ALL POPULATION FIGURES IN MILLIONS

TABLE 3:
ESTIMATED FINANCIAL REQUIREMENTS TO PROVIDE SERVICES TO 100% OF THE UNSERVED POPULATION BY THE YEAR 2000.

(ALL POPULATION FIGURES IN MILLIONS)	POP BY YEAR 2000	REQUIRED SERVICE COVERAGE TO ATTAIN 100% COVERAGE	HIGH-COST TECHNOLOGY: POP SERVED WITH HIGH COST	HIGH-COST TECHNOLOGY: COST PER CAPITA (US$)	HIGH-COST TECHNOLOGY: SUBTOTAL IN MILLIONS OF US$	INTERMEDIATE TECHNOLOGY: POP. SERVED WITH INTERMED.	INTERMEDIATE TECHNOLOGY: COST PER CAPITA (US$)	INTERMEDIATE TECHNOLOGY: SUBTOTAL IN MILLIONS OF US$	LOW-COST TECHNOLOGY: POP. SERVED WITH LOW-COST	LOW-COST TECHNOLOGY: COST PER CAPITA (US$)	LOW-COST TECHNOLOGY: SUBTOTAL IN MILLIONS OF US$
Urban water	1901.80	813.28	406.64	200.00	81,328	203.32	100.00	20,332	203.32	30.00	6,100
Rural water	2970.60	1300.81							1,300.81	30.00	39,024
Urban sanit	1901.80	946.58	473.20	350.00	165,652	236.65	25.00	5,916	236.65	20.00	4,733
Rural sanit	2970.60	1675.88							1,675.88	20.00	33,518

SUBTOTAL URBAN HIGH-COST TECHNOLOGY:	246,980
TOTAL HIGH-COST TECHNOLOGY:	246,980
AVERAGE ANNUAL INVESTMENT REQUIRED FOR HIGH-COST TECHNOLOGY:	24,698

SUBTOTAL URBAN INTERMEDIATE TECHNOLOGY:	26,248
TOTAL URBAN:	284,060
AVERAGE ANNUAL INVESTMENT REQUIRED FOR URBAN AREAS:	28,406

SUBTOTAL URBAN LOW-COST TECHNOLOGY:	10,833
SUBTOTAL RURAL LOW-COST TECHNOLOGY:	72,542
TOTAL RURAL:	72,542
AVERAGE ANNUAL INVESTMENT REQUIRED FOR RURAL AREAS:	7,254
TOTAL LOW-COST AND INTERMEDIATE TECHNOLOGY:	109,623
AVERAGE ANNUAL INVESTMENT REQUIRED FOR LOW-COST AND INTERMEDIATE TECHNOLOGY:	10,962
TOTAL GLOBAL:	356,602
AVERAGE ANNUAL INVESTMENT REQUIRED TO ATTAIN GLOBAL COVERAGE OF 90%	35,660

A) COVERAGE OF UNSERVED RURAL POPULATION WITH LOW COST WATER AND SANITATION TECHNOLOGIES BY YEAR 2000 REQUIRES A TOTAL CAPITAL INVESTMENT OF $72.5 BILLION OR AN ANNUAL INVESTMENT OF $7.3 BILLION FOR RURAL AREAS.

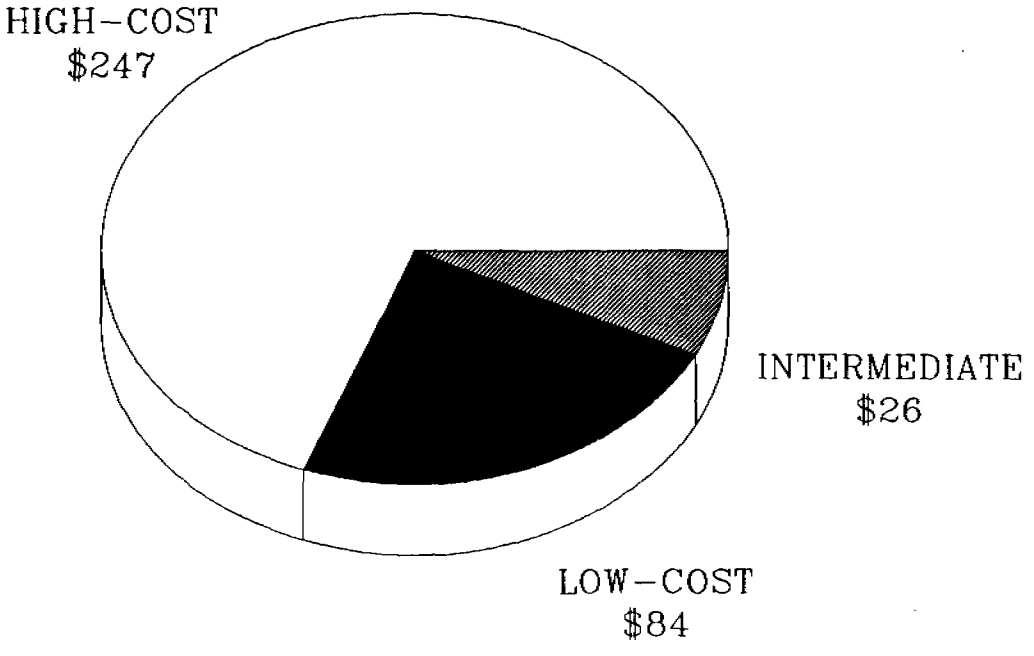
B) COVERAGE OF UNSERVED URBAN POOR (MAINLY PERI-URBAN DWELLERS WITH A MIXTURE OF LOW-COST ($10.8 BILLION) AND INTERMEDIATE TECHNOLOGIES ($26.3 BILLION) BY THE YEAR 2000 REQUIRES A TOTAL INVESTMENT OF $37 BILLION, OR AN ANNUAL INVESTMENT OF $3.7 BILLION.

C) COVERAGE OF THE REMAINING URBAN POPULATION (ECONOMICALLY ABLE) WITH HIGH-COST WATER AND SANITATION TECHNOLOGIES BY THE YEAR 2000, REQUIRES A TOTAL INVESTMENT OF $246.9 BILLION OR AN ANNUAL CAPITAL INVESTMENT OF $24.7 BILLION.

D) TOTAL COVERAGE OF THE UNSERVED BY THE YEAR 2000, WITH A MIXTURE OF WATSAN TECHNOLOGIES BY YEAR 2000 REQUIRES A TOTAL CAPITAL INVESTMENT OF $357 BILLION OR AN ANNUAL INVESTMENT OF $36 BILLION.

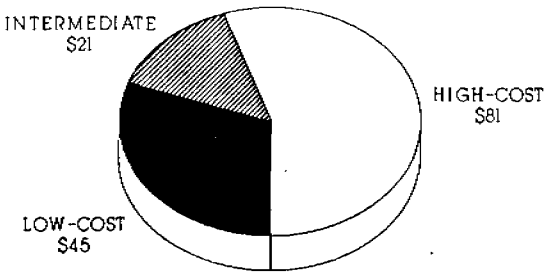
From this costing analysis, unrefined as it is, the indication is that over the next ten years, by the use of essentially low-cost technologies (and a few intermediate ones), about 80% of the unserved population, among developing countries, can annually be served with water and sanitation facilities at 30% (US$11 billion) of the total annual cost (US$36 billion) of providing such facilities to all of the unserved. In other words, ***30% of the total cost can service 80% of the unserved, if the low-cost option is emphasized.***

Fig.19: TECHNOLOGY TYPES & FUNDS NEEDED FOR 100% COVERAGE BY YEAR 2000



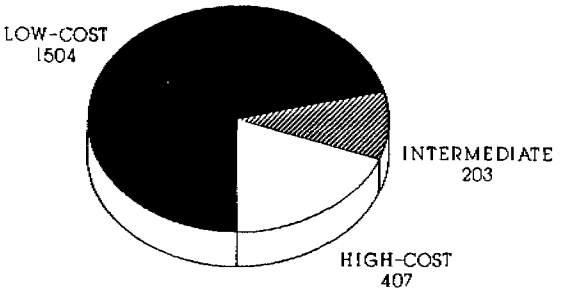
IN BILLIONS OF US$

Fig. 20: REQUIRED INVESTMENT PER TECHNOLOGY FOR WATER SUPPLY BY YEAR 2000



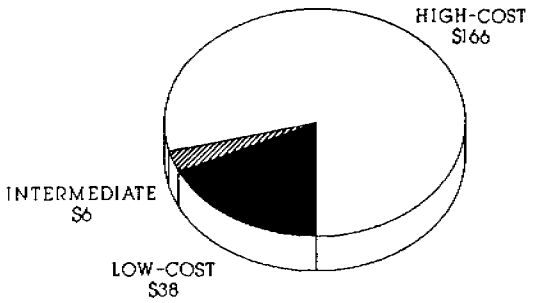
IN BILLIONS OF US$

Fig. 21: POPULATION SERVED PER TECHNOLOGY FOR WATER SUPPLY BY YEAR 2000



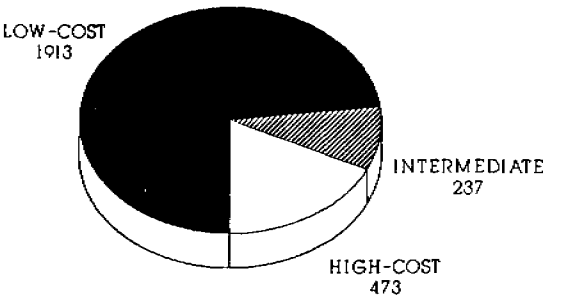
IN MILLIONS OF PEOPLE

Fig. 22: REQUIRED INVESTMENT PER TECHNOLOGY FOR SANITATION BY YEAR 2000



IN BILLIONS OF US$

Fig. 23: POPULATION SERVED PER TECHNOLOGY FOR SANITATION BY YEAR 2000



IN MILLIONS OF PEOPLE

The rural and peri-urban areas are together more amenable to low-cost technologies, and jointly they cater for the majority of the population amongst developing countries. Consequently, to significantly enhance coverage, a greater proportion of resources, than presently, should be allocated to these areas.

Estimates indicate that the current allocation of funds to high-cost and low-cost technology is in the order of 80% and 20%, respectively. A shift in this ratio of a few percentage points, in favour of low-cost technology, could make a positive contribution to the unserved poor, without negatively impacting the more economically able among the unserved population. Thus, a re-structuring of funds allocated to high-cost and low-cost technology is an imperative, if coverage rates are to be enhanced.

Based on the foregoing analysis, a shift of US$l million from the high-cost to the low-cost/intermediate technology category, would provide coverage to an additional 18,000 needy people (rural and peri-urban areas) at the cost of 2,000 economically able people (urban areas per se). Consequently, the transfer of sector funds from high-cost to low-cost/intermediate technology has a multiplier effect, upon service coverage, of a factor of nine. One is not recommending the abandonment of investment in strictly urban areas - only a more equitable division of available resources.

On the other hand, in developing countries, the more privileged urban population should pay for the full cost of highcost services where this has not yet been achieved. Additionally, cost-sharing and/or cost-recovery mechanisms should be implemented among the needy. In principle, ample evidence exists that the poor are willing to participate in such efforts. Expansion and proliferation of self-help projects is but one of the means to attain the necessary acceleration of service coverage at affordable costs.

One may conclude that it is morally unacceptable to continue depriving the poor of basic water and sanitation services, particularly when it is clear that with an annual investment of only 30% of the total annual capital investment cost, over 80% of the poor could be provided with essentially low-cost water and sanitation.

5. THE BENEFITS OF WIDESPREAD SERVICE COVERAGE

One of UNICEF's goals for the year 2000 is 1125 per cent reduction of the diarrhoea incidence rate". This goal can be realistically attained only if water and sanitation service coverage is substantially raised. Several studies undertaken during the 1980s have pointed out that, on average, the expected reduction of diarrhoeal morbidity incidence, attributable to water and sanitation interventions, is significant, with improvements in water availability and in excreta disposal achieving, respectively, about 25% and 22% reductions.

The benefits of accessible water and sanitation would have a positive impact on the estimated 200 million people who are victims of schistosomiasis and the 20 million people annually at risk of Guinea worm infections, among other preventable diseases.

The nutritional status of women and children particularly - as the main drawers of domestic water - would be substantially enhanced through accessible water, as this would provide substantial energy and time saving.

The economic benefits of having access to water and sanitation have not been fully evaluated, but available experience indicates that significant benefits can be derived.

An estimate based on a rice growing area of Nigeria, which is also endemic to Guinea worm disease, indicated that amongst a population of 1.6 million, US$20 million per year would be generated from increased rice sales exclusively, if the disease were to be eliminated.

Examples of positive economic impact are not limited exclusively to rural populations actively involved in agricultural production. Peri-urban areas would also gain enormously in welfare. In the "barrios marginales" of Tegucigalpa, Honduras, households spend up to 40% of their income on domestic water supply provided by vendors. The provision of safe and reliable water supply under such circumstances has an immediate impact upon family welfare.

These apparently isolated and small scale examples may not be extrapolated globally but they are an indication that water and sanitation investments can derive tangible economic returns.

6. CONCLUSION

If the water and sanitation sector were to build on its experiences of the 1980s, and guide the 1990s with an approach based on management by monitoring, it would have found a way of making a significant difference with respect to accelerating coverage in a sustainable manner.

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THE DECADE AND BEYOND: AT A GLANCE

by Joseph Christmas
and
Carel de Rooy

Water and Sanitation Section,
Programme Division,
UNICEF New York
Issued: 17 August 1990

THE DECADE AND BEYOND: AT A GLANCE

by Joseph Christmas and Carel de Rooy[1]

ABSTRACT

The International Drinking Water Supply and Sanitation Decade ends in 1990. Though the Decade has not achieved its numerical objective of universal access to water and sanitation, it has been quite successful in creating awareness about the sector and in developing workable strategies and models which enhance sector sustainability.

The disparity in coverage between urban and rural areas, the wide differential between the provision of water supply facilities and those for sanitation, the active and meaningful involvement of women in the management of water and sanitation programmes, and effective means of accelerating coverage in a sustainable manner, are all issues for which effective answers must be found during the 1990s.

Additionally, it is clear that with approximately 30% of the total capital investment required to provide water and sanitation services to all by the year 2000, 80% of the unserved could be reached by use of essentially low-cost technologies. This fact calls for a concerted effort to shift some resources from high-cost technologies to low-cost alternatives.

If the sector were to perform in the 1990s, similar to its performance during the 1980s, a significant proportion of developing countries' population will yet be unserved by the year 2000. Thus, the strategies of the 1990s must be such that their combined effect will make an enormous difference with respect to sector performance. A more management-oriented sector, based on frequent and systematic monitoring at country and global level, with an institutionalized entity for global advocacy, should form the corner-stone of the thrust for the 1990s.

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[1] Dr. Joseph Christmas who is a hydrogeologist and Sanitary Engineer by profession, is currently UNICEF's global Chief of Water and Environmental Sanitation, and is based at UNICEF Headquarters (3 United Nations Plaza, New York, New York 19917).

Mr. Carel de Rooy is a hydrogeologist by profession, and is currently a Senior Project Officer in the Water and Environmental Sanitation Section at UNICEF Headquarters.

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1. INTRODUCTION

On 10 November 1980, the General Assembly of the United Nations proclaimed the period 1981-1990 as the International Drinking Water Supply and Sanitation Decade (IDWSSD). The primary goal of the IDWSSD, as conceived then, was to achieve full access to water supply and to sanitation for all inhabitants in developing countries by 1990.

At this point in time, at the virtual end of the IDWSSD, it is clear that the primary goal of full access to water supply and sanitation will not be achieved by the target year of 1990, as a formal assessment by the World Health Organization (WHO) has shown. (Some of the IDWSSD material used herein is based on the WHO assessment). Consequently, both the developing countries, themselves, and the External Support Agencies (ESAS) have reached a broad consensus to continue the existing thrust of the IDWSSD, beyond 1990, to coincide with the goal of "Health for All by the Year 2000".

Therefore, the primary goal of achieving universal access to water supply and sanitation is now re-targeted for a future date.

2. EVOLUTION OF CURRENT WATER AND SANITATION DECADE (1980s)

2.1 Concepts and Approaches

The International Drinking Water Supply and Sanitation Decade (IDWSSD) of the 1980s, ushered in several novelties, gleaned from past evaluations of water and sanitation programmes in several countries. This new thrust directed attention to several hitherto untouched issues, including the following: institutional development and sector planning; the development of community-awareness and participation, including increased involvement of women; the development and utilization of affordable, appropriate technologies; the integration of water supply with sanitation and hygiene education; the importance of adequate operation and maintenance of systems; the mobilization of communities to manage their programmes, including development of their own cost recovery measures for operation and maintenance; the significance of human resources development; and the need for international coordination and cooperation regarding sector inputs.

2.2 Performance

The "Water and Sanitation Decade" was launched in November 1980 at the same time that the downturn in the world economy had begun to be felt in the developing

countries. Gross Domestic Product (GDP) growth rates in developing countries started to drop and their long-term external debts during the 1980s more than doubled. Demographic growth, particular in urban areas, further complicated the problem of expanding water and sanitation facilities to a fast-growing population. Even at the end of the 1980s, there is no general, significant improvement in the adverse economic climate and the explosive population growth among developing countries. However, there are regional disparities regarding the effects of the economic situation and the responses. Asia is showing more buoyancy and resilience whilst Africa and Latin America are suffering immensely. Thus, two factors -- inadequate funding and high population growth -- contributed significantly in curtailing the coverage rate for water and sanitation, thereby preventing the achievement of universal access to these facilities.

However, the Water and Sanitation Decade of the 1980s is not only a matter of numbers. Despite the inability to achieve 100% coverage in water supply and sanitation by 1990, it has succeeded in introducing low-cost technologies, and in focusing attention on the user communities as active participants in the developmental process, rather than their being merely passive recipients as hitherto.

Despite the austere economic climate, total global annual funding for the water and sanitation sector among developing countries, is estimated at $10,000 million. Globally, it is approximated that 65% of sector funding, during the 1980s, came from national sources. In the case of Africa and the least developed countries, where the major reliance appears to have been on external funding, this proportion was only slightly in excess of 25%, whereas in the countries of the Middle East, the figure was about 90%.

The U.N. Inter-agency Steering Committee for Cooperative Action for the Water and Sanitation Decade is involved in fostering collaboration with governments in the implementation of programmes. Coordination of the Water and Sanitation Decade activities is facilitated via this Steering Committee which is chaired by UNDP.

2.3 Coverage Status at End of Decade (1990)

The available information indicates that modest progress, in extending service coverage to the population of developing countries, took place between 1980 and 1990.

The most dramatic increase took place in the case of rural water supply where the number of persons provided with facilities in 1980, increased by 240% by 1990. The number of rural inhabitants provided with sanitation facilities in 1980 also increased, though less spectacularly, by 150%. Increases in the number of people provided with facilities in 1980, relative to 1990, were 150% each for urban drinking water supply and for sanitation. However, in the face of rapidly expanding urban population, these increases in the number of inhabitants provided with adequate services did not necessarily translate into equally significant increases, in the proportion of people with services, relative to the

total population. Only in the case of rural water supply did it result in a doubling of the proportion served between 1980 and 1990.

Table 1 summarizes changes in service coverage achieved during the period 1980-90, on a regional and global basis. Figures 1, 2, 3 and 4 graphically represent the percentage changes in service coverage, during the same 10-year period, on a regional and global scale, whilst Figures 5, 6, 7 and 8 depict the changes in coverage, in absolute population, for the same geographic regions. The data show, among other things, that over the 10-year period an additional 1,347 million and 748 million persons were served with water and with sanitation facilities, respectively.

As expected, there are significant variations from region to region (and even from country to country within a region). A review of progress in Africa is of particular interest since the continent contains most of the world's least developed countries, and has suffered acute water problems associated with drought during the 1980s. Overall, countries in the African region fell significantly short of their targets for the decade of the 1980s. Despite the absolute numbers of people served, the proportion for urban water supply coverage increased by a mere 5% from 77% in 1980 to 82% in 1990. For urban sanitation, the gains were extremely modest, as coverage increased by only 3 percentage points. For rural Africa, the relative success achieved in water supply coverage compares favourably with that for sanitation as, during the 1980s, the former rose by 9 percentage points as against the latter's 8 percentage points.

After 10 years of intensified global effort, the water and sanitation coverage in 1990, among developing countries, is approximated by the following statistics: urban water 82%; rural water 63%; urban sanitation 72%; and rural sanitation 49%. Figures 9, 10, 11 and 12 illustrate. Thus, in absolute terms, at the start of the 1990s, there are an estimated 1,230 million people in developing countries without access to adequate and safe water supplies, and 1,740 million without access to appropriate sanitation, i.e., 31% without water, and 43% without sanitation. The consequences of this, in terms of human health and suffering, as well as social and economic cost, are staggering.

2.4 Lessons of the 1980s

In retrospect, the decade of the 1980s has revealed the following:

- Progress has been made in developing models for sustainable development of water and sanitation programmes in rural and peri-urban areas of developing countries. But greater efforts are required to translate these models into workable approaches for application to programmes, especially for the rapid delivery of programmes and acceleration of the coverage rate.

Fig. 1: DECADE PERFORMANCE
URBAN WATER SUPPLY COVERAGE

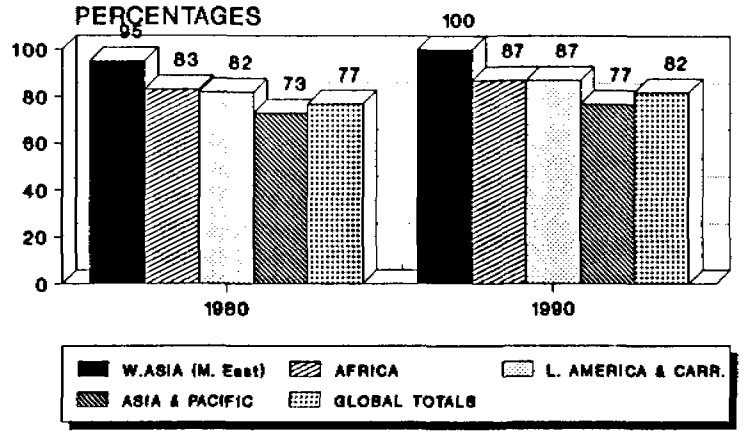


Fig. 2: DECADE PERFORMANCE
RURAL WATER SUPPLY COVERAGE

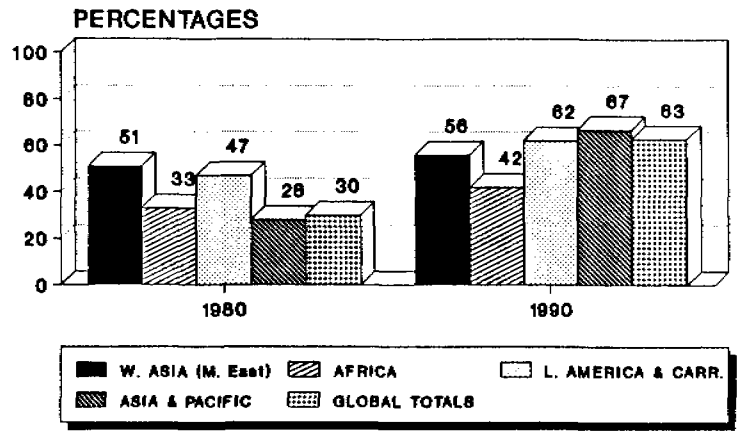


Fig. 3: DECADE PERFORMANCE
URBAN SANITATION COVERAGE

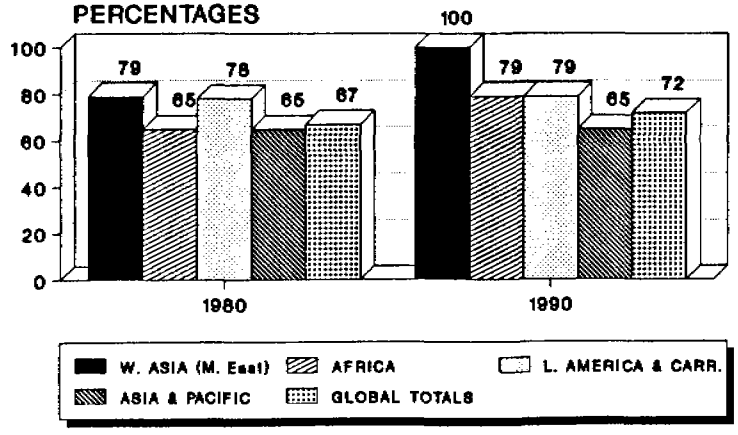


Fig. 4: DECADE PERFORMANCE
RURAL SANITATION COVERAGE

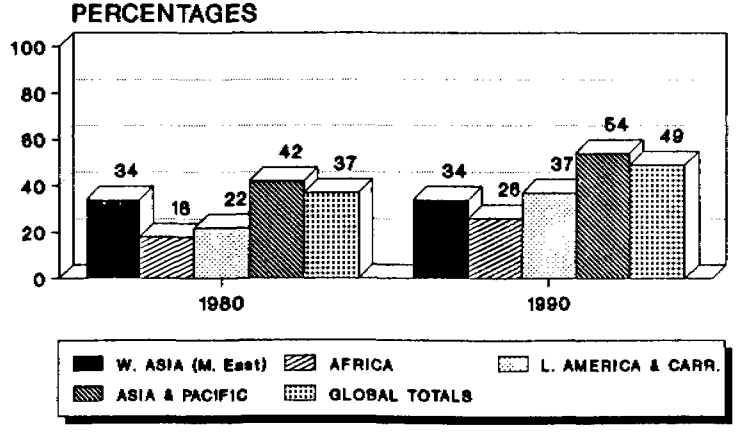


Fig. 5: ABSOLUTE COVERAGE 1980s
URBAN WATER SUPPLY

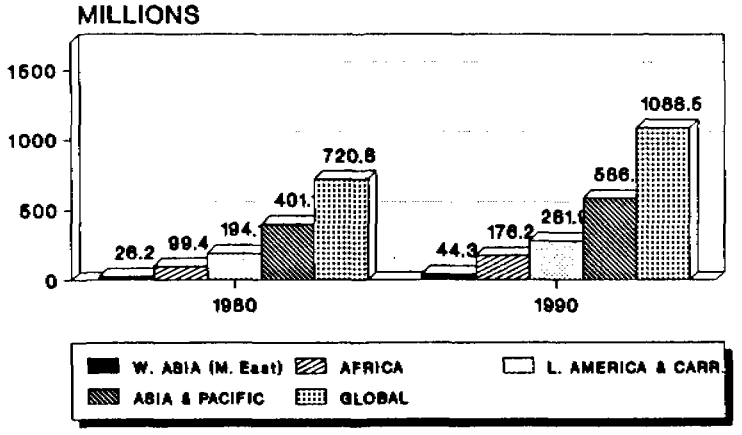


Fig. 6: ABSOLUTE COVERAGE 1980s
RURAL WATER SUPPLY

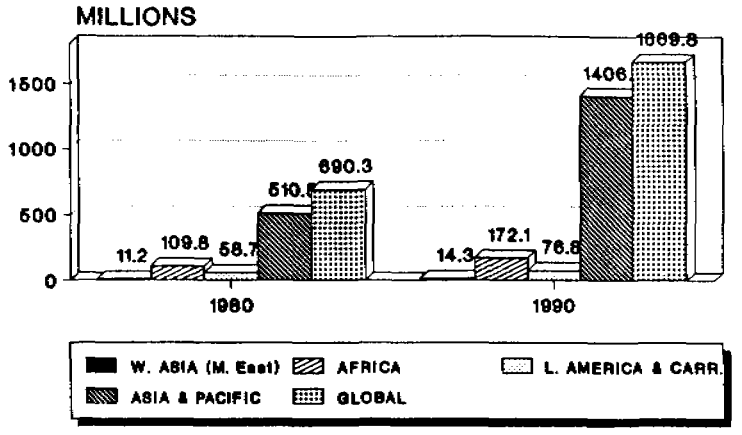


Fig. 7: ABSOLUTE COVERAGE 1980s
URBAN SANITATION

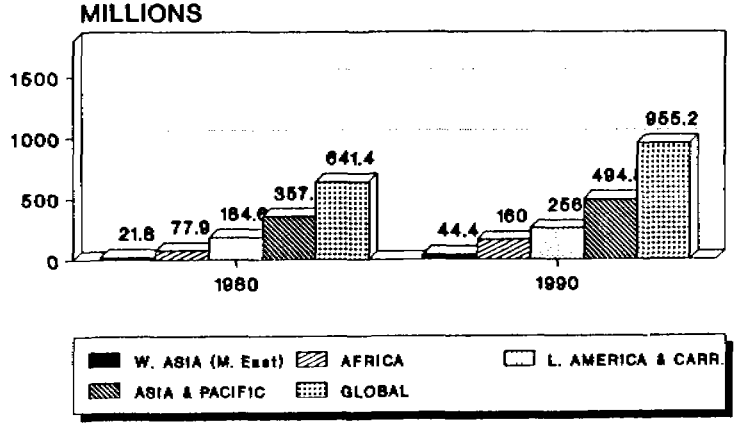


Fig. 8: ABSOLUTE COVERAGE 1980s
RURAL SANITATION

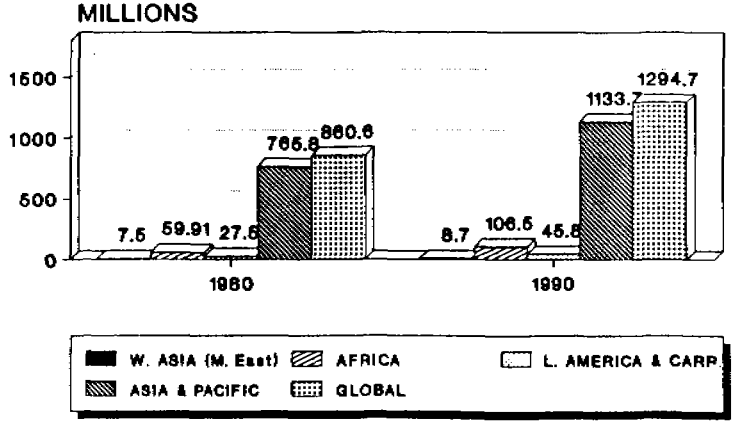
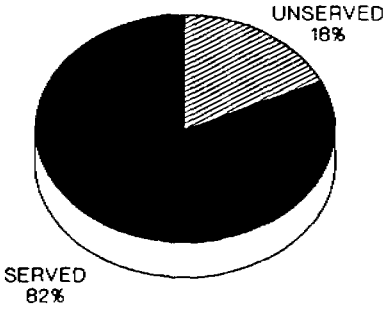
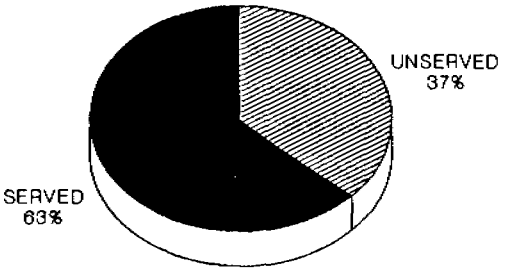


Fig. 9: ESTIMATED COVERAGE 1990
URBAN WATER



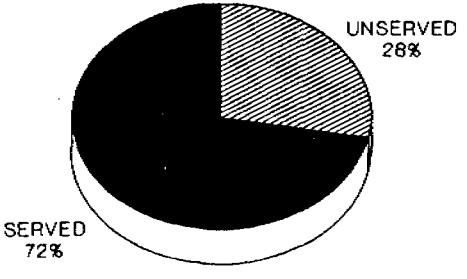
Unserved Population 243.70 M

Fig. 10: ESTIMATED COVERAGE 1990
RURAL WATER



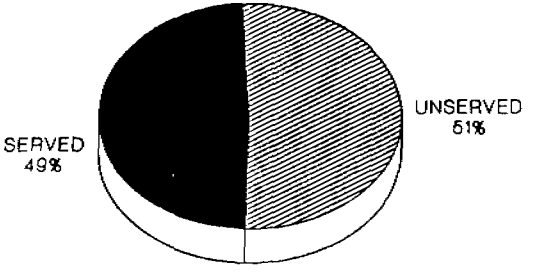
Unserved Population 988.72 M

Fig. 11: ESTIMATED COVERAGE 1990
URBAN SANITATION



Unserved Population 377.00 M

Fig. 12: ESTIMATED COVERAGE 1990
RURAL SANITATION



Unserved Population 1363.79 M

Active and systematic management of the 1980s decade could have resulted in greater progress, if applied.

- Globally, virtually all developing countries lack properly devised action plans for methodical guidance of their decade activities.

- Women's involvement, crucial for community participation, has not been systematically applied, but, at best, is ad hoc.

- The promotion and acceptance of cost-sharing mechanisms (cost recovery schemes for operation and maintenance, etc.) face formidable resistance at government level in many countries, and are difficult to put in practice at the community level.

- Maintenance still poses significant problems despite the appropriateness of the technologies. The problems relate mainly to sustainable funding for the provision of spare parts.

- Low-cost technology projects get only about 4% of the estimated total annual external funding of $3,000 million whilst governments' firm commitment to such projects is indicated by a 6-fold increase since 1980.

- In global terms, there is an insufficiency of trained professional and sub-professional personnel within the sector, among developing countries.

The major constraints to the water and sanitation programme, as identified by developing countries' governments, for the four main geographic regions are:

- Africa: Funding limitation, inadequate cost recovery, poor operation and maintenance, and lack of trained professional personnel -- in that order.

- Latin America & the Caribbean: This region gave the same constraints, in the same order, as for Africa.

- Asia & the Pacific: Insufficient trained professionals, funding limitations, lack of cost recovery, and inadequate operation and maintenance -- in that order. In addition, several countries, particularly small island nations, underscored the difficulties associated with basic shortages of water resources.

- Middle East: Funding limitations, lack of trained manpower both professional and sub-professional, and poor operation and maintenance -- in that order. It is noteworthy that in this grouping of some of the world's wealthiest nations, funding limitation is still considered the main constraint. This perhaps indicates inadequate allocation of funds, particularly to rural areas of the sector.

3. DEVELOPMENTAL FRAMEWORK FOR 1990s

3.1 General Global Requirements

Water and sanitation programmes are national responsibilities thus, strategies and planned activities of the United Nations Agencies and the rest of the external support community should strengthen and reflect national priorities and, additionally, complement national endeavours in such a manner as to enhance overall effectiveness.

It is clear that if developing countries' water and sanitation programme delivery continues in the 1990s, in the same vain, at the same rate, as in the 1980s, the global service coverage in the year 2000 will fall well short of 100%. Figures 13, 14, 15 and 16 indicate the projected percentage coverage at the year 2000, for water and sanitation in both urban and rural areas, based on the implementation rates of the 1980s.

Against the foregoing background, the broad requirements of the water and sanitation sector, in developing countries, for the 1990s, include the following:

- Re-formulation of national coverage goals to achieve widespread access to water and sanitation by the year 2000. This long-term goal should be sub-divided into expected annual coverage so as to facilitate annual monitoring.

- Re-invigoration and re-application of the concepts and approaches of the International Drinking Water Supply and Sanitation Decade of the 1980s (as outlined under Section 2.1).

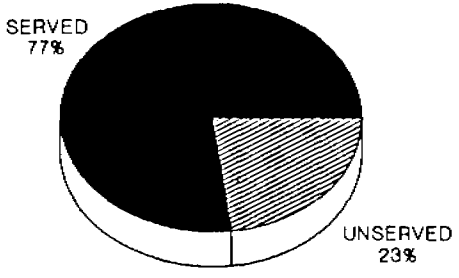
- Rationalization in the use of sector funds. Total annual funding, globally, for the sector, among developing countries, during the 1980s was about US$10,000 million. The External Support Agencies provided approximately US$3,000 million of this total. Estimated funding needs for the 1990s are US$36,000 million annually based on 100% coverage by the year 2000. As funding in this order of magnitude is unlikely under the prevailing economic conditions, greater cost efficiency and effectiveness, even with the existing funding level, is required to accelerate the coverage rate.

- Intensification of measures to control the population growth rate and to curtail urbanization.

- Priority to be given to personnel needs, via human resources development for the strengthening of national institutional structures.

- More vigorous promotion and application of low-cost technology programmes, with

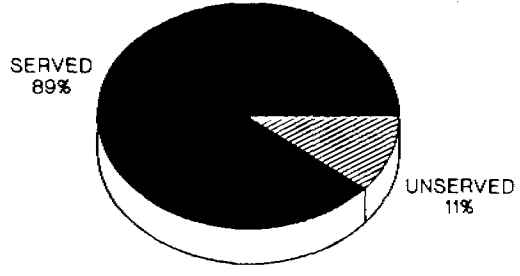
Fig. 13 PROJECTED % COVERAGE - YEAR 2000
GIVEN 1980s' IMPLEMENTATION RATES



URBAN WATER

Unserved Population 445.5 M.

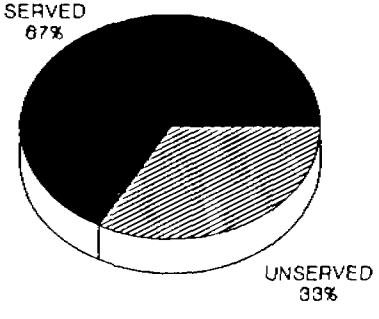
Fig. 14 PROJECTED % COVERAGE - YEAR 2000
GIVEN 1980s' IMPLEMENTATION RATES



RURAL WATER

Unserved Population 321.3 M.

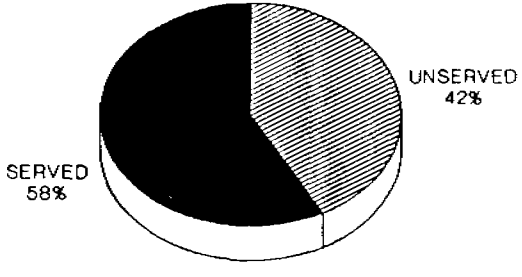
Fig. 15 PROJECTED % COVERAGE - YEAR 2000
GIVEN 1980s' IMPLEMENTATION RATES



URBAN SANITATION

Unserved Population 632.7 M.

Fig. 16 PROJECTED % COVERAGE - YEAR 2000
GIVEN 1980s' IMPLEMENTATION RATES



RURAL SANITATION

Unserved Population 1241.8 M

emphasis on technical cooperation among developing countries (TCDC), and dissemination and exchange of information amongst the scientific community in developing countries.

- Meaningful linkage of the water and sanitation sector with other sectors, especially health, education, women, communications, and nutrition (via home-gardening).

- Execution of all programmes as integral components of overall water resources management and environmental health.

- Strengthening and broadening the coordination and cooperation among national governments and the External Support Agencies.

- Establishment of policy and strategies to make extensive and systematic use of social communications for global and community-based mobilization of people and resources.

The foregoing broad needs are high-lighted, in essence, to provide the basis for accelerating the coverage rate, in a sustainable manner, to achieve widespread access to water and sanitation by the target year, 2000. Figures 17 and 18 show the projected absolute population served with water and sanitation facilities at the year 2000, based on the trend of the 1980s. The gap shown between the total population and those covered by services, is enormous. Calculations indicate that 1980s implementation rates for urban water and for rural water, would have to increase about 2.5 and 1.5 times, respectively, whilst urban sanitation and rural sanitation would have to increase 3 and 4 times, respectively, during the 1990s, if universal access to these facilities is to be achieved by the year 2000.

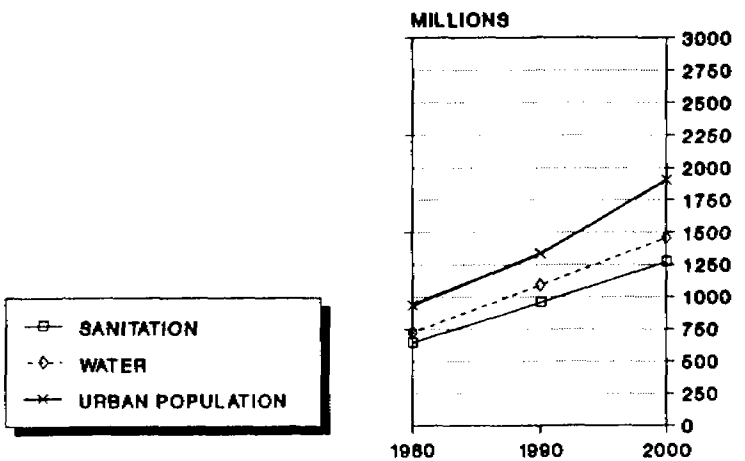
3.2 Priority Actions

Though there are a plethora of activities to be implemented in the 1990s, priority attention should be given to the implementation of the concept of management by objectives, with respect to the water and sanitation sector, at both the country and the global level. Regular, perhaps annual or more frequent, monitoring of the sector's performance should form the basis for its management. To give effect to this concept, the following should be pursued:

- Execution of a review of each country's status regarding water and sanitation coverage as of 1990 and a realistic estimate of coverage to be achieved by the year 2000; and the types of assistance required.

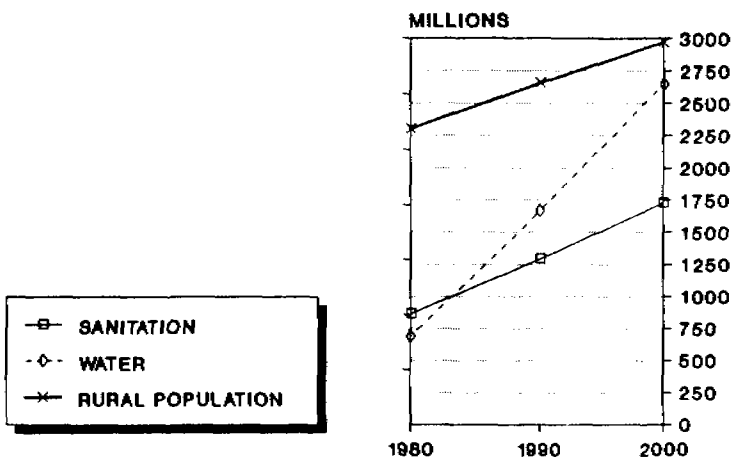
- Establishment of an action plan -- just a framework -- for the 1990s based on the review of the country's status and its goal.

Fig. 17 PROJECTED COVERAGE FOR YEAR 2000
GIVEN 1980s' IMPLEMENTATION RATES



WATER AND SANITATION - URBAN AREAS

Fig. 18 PROJECTED COVERAGE FOR YEAR 2000
GIVEN 1980s' IMPLEMENTATION RATES



WATER AND SANITATION - RURAL AREAS

- Establishment of a national monitoring unit by Government, at the country level, with assistance, if necessary, from the External Support Agencies. The unit will monitor the sector performance and apprise the country-level management (co-ordination) body of its findings. Actions are to be taken based on these findings.

- At the global level, a management/coordination entity, comprising members from the developing countries and the External Support Agencies, should be formed to perform a largely advocacy role on behalf of the sector, with respect to findings from global monitoring.

4. CAPITAL COST OF COMPLETE COVERAGE

4.1 Elements Influencing the Costing Model

A costing model, with respect to capital investments only, is devised to provide an estimated cost of completely serving the unserved, among developing countries, with water supply and sanitation, by the year 2000. Recurrent costs though highly essential for operation and maintenance, especially, are not included in the model. Costs are based on 1990 values. The model can be considered a preliminary one with the possibility for further refinement.

The total population among developing countries, in 1990, is estimated at 4,000 million, with urban and rural sharing 1,332 million and 2,668 million, respectively. Figures 9,10,11 and 12 indicate the proportion and number of unserved persons as of 1990. The total population among developing countries, by the year 2000, is approximated at 4,810 million, with urban and rural ares, respectively, having 1,902 and 2,908 million.

China, India, Pakistan, Bangladesh, Indonesia, and Vietnam in Asia; Nigeria and Egypt in Africa; and Brazil and Mexico in Latin America account for approximately 75% of the current developing countries' population, and it is likely that this picture will not change significantly over the forthcoming decade. What happens in these countries will therefore dictate the overall outcome in costs and coverage by the year 2000.

The 1980s witnessed for the first time in history a concerted effort to provide needy (poor) people in urban and rural areas with water and sanitation services on a large scale. one of the outcomes of this effort was the emergence of an array of low-cost approaches and technologies which have effected significant cost reductions as they were transferred from their research and developmental phase into large scale implementation programmes.

In UNICEF-assisted projects, Nigeria, the average unit cost of a handpump-equipped borehole was reduced from over US$20,000.00 in 1982, to under US$ 4,000.00 by 1989 largely through the use of appropriate technologies. A similar trend has been observed in

the Sudan where more efficient resource management has reduced the unit cost of handpump-equipped boreholes from US$9,500 in 1987 to US$2,800 in 1989.

While progress has been made in cost reduction via low-cost technologies it is undeniable that, as urban centres grow and more distant and/or deeper additional water sources have to be identified and developed, the cost of service delivery may increase.

This principle is not limited to urban areas; when the more distant and isolated populations in rural areas have to be reached, the scarcity of adequate infrastructures tends to raise developmental costs substantially.

A few UNICEF-assisted water and sanitation projects have derived quite accurate costs for low-cost water and sanitation service delivery. The applicability of these on large scale cost projections is however, limited because of several factors:

- UNICEF-provided hardware (capital goods) enter countries duty free and are therefore much cheaper than private sector equivalents found in the developing countries;

- Depreciation of capital goods are usually linear and do not take into account payment of loans or interest rates because all equipment is granted to the countries.

- UNICEF is, in absolute financial terms, but a small partner in the sector. It contributes less than 1% of the sector's global total annual investment (but its impact on coverage is significant because of its emphasis on low-cost technologies and approaches).

The above mentioned facts make "UNICEF costs" low, on the cost spectrum for water and sanitation service delivery, and render them somewhat inapplicable to global cost projections. However, UNICEF's low-cost and cost reduction approaches are good pointers regarding the direction in which cost efficient water and sanitation programmes should be developed.

4.2 The Model

The several, and at times opposing, forces which influence water and sanitation service delivery costs were taken into account for the costing model applied herein.

World Bank and UNDP water and sanitation colleagues were consulted and several "technology categories" with respective costs were determined.

For the costing model, the unserved population over the next ten years, up to the year 2000, is divided into three broad geographic groups representing what, in reality, is

much less well defined. These are urban, peri-urban, and rural. Specific "technology categories" are then assigned to the geographic groupings.

By knowing the number of unserved persons per geographic group, and also the unit cost for water supply and for sanitation facilities for the assigned technology category, the total cost of having 100% coverage among the unserved by the year 2000, can be estimated.

The model assumes that low-cost technologies will be applied to the entire rural areas; that 50% of the urban areas will have high-cost technologies; the remaining half of the urban areas will be equally divided into low-cost (25%) and intermediate cost (25%).

The geographic groups with their corresponding Technology categories and unit costs are as follows:

TECHNOLOGY CATEGORY	COST PER CAPITA (in US$)
HIGH-COST TECHNOLOGY	
▸ Urban Water Supply	200
▸ Urban Sanitation	350
INTERMEDIATE TECHNOLOGY	
▸ Peri-urban Water Supply	100
▸ Peri-urban Sanitation	25
LOW-COST TECHNOLOGY	
▸ Rural Water Supply	30
▸ Rural Sanitation	20

High Cost Technology applies to the urban-type system with elaborate pumping stations, water and sewerage treatment plants, complete distribution systems and individual household connections for both water supply and sewerage.

Intermediate Technology, applicable to peri-urban areas essentially, comprises pipeborne water supply (no allowance for elaborate treatment) leading to public standposts, and "on-site" sanitation including technologies such as pour-flush and ventilated improved pit latrines.

Low-cost Technology, targeted to rural areas essentially, includes handpump-equipped boreholes or handdug wells, rainwater Harvesting systems and pipe-borne gravity-fed Systems with public standposts, for water supply. Sanitation technologies are the same as those allocated to the "intermediate technology" category with a slight cost reduction allowing for the use of locally available construction materials for the building of Latrine super-structures.

4.3 Population to be Served

In order to raise the service coverage from the 1990 levels of 82% for urban water, 63% for rural water, 72% for urban sanitation, and 49% for rural sanitation to 100% for all four sub-components by the year 2000, several millions of unserved people must be

TABLE 1. WATER SUPPLY AND SANITATION COVERAGE BY REGION 1980-1990
DEVELOPING COUNTRIES (Population in millions; source: WHO)

Region/sector	1980 Population	1980 % coverage	1980 No. served	1980 No. unserved	1990 Population	1990 % coverage	1990 No. served	1990 No unserved
Africa								
Urban Water	119.77	83	99.41	20.36	202.54	87	176.21	26.33
Rural Water	332.83	33	109.83	223.00	409.64	42	172.05	237.59
Urban Sanitation	119.77	66	77.85	41.92	202.54	79	160.01	42.53
Rural Sanitation	332.83	18	59.91	272.92	409.64	26	106.51	303.13
Latin America and the Caribbean								
Urban Water	236.72	82	194.11	42.61	324.08	87	281.95	42.13
Rural Water	124.91	47	58.71	66.20	123.87	62	76.80	47.07
Urban Sanitation	236.72	78	184.64	52.08	324.08	79	256.02	68.06
Rural Sanitation	124.91	22	27.48	97.43	123.87	37	45.83	78.04
Asia and the Pacific								
Urban Water	549.44	73	401.09	148.35	761.18	77	586.11	175.07
Rural Water	1823.30	28	510.52	1312.78	2099.40	67	1406.60	692.80
Urban Sanitation	549.44	65	357.14	192.30	761.18	65	494.77	266.41
Rural Sanitation	1823.30	42	765.79	1057.51	2099.40	54	1133.68	965.72
Western Asia (Middle East)								
Urban Water	27.54	95	26.16	1.38	44.42	100	44.25	0.17
Rural Water	21.95	51	11.19	10.76	25.60	56	14.34	11.26
Urban Sanitation	27.54	79	21.76	5.78	44.42	100	44.42	0.00
Rural Sanitation	21.95	34	7.46	14.49	25.60	34	8.70	16.90
Global totals								
Urban Water	933.47	77	720.77	212.70	1332.22	82	1088.52	243.70
Rural Water	2302.99	30	690.25	1612.74	2658.51	63	1669.79	988.72
Urban Sanitation	933.47	69	641.39	292.08	1332.23	72	955.22	377.00
Rural Sanitation	2302.99	37	860.64	1442.35	2658.51	49	1294.72	1363.79

provided water and sanitation facilities at an accelerated rate. Consequently, in absolute terms, 813 million people in urban areas and 1,301 million people in rural areas will require water supply, and 947 million urban and 1,676 million rural people will need sanitation services (if full coverage is envisaged by the year 2000). Tables 2 and 3 provide a breakdown of these statistics.

4.4 Investment Cost

A total cost of approximately US$357,000 million (US$357 billion) was derived to attain a water and sanitation service coverage of 100% by the year 2000 based on the following distribution of technology categories:

US$247 billion for high-cost in urban areas,

US$26 billion for intermediate technologies in mainly periurban areas,

US$11 billion for low-cost in (the remaining) peri-urban areas, and

US$73 billion for low-cost in rural areas.

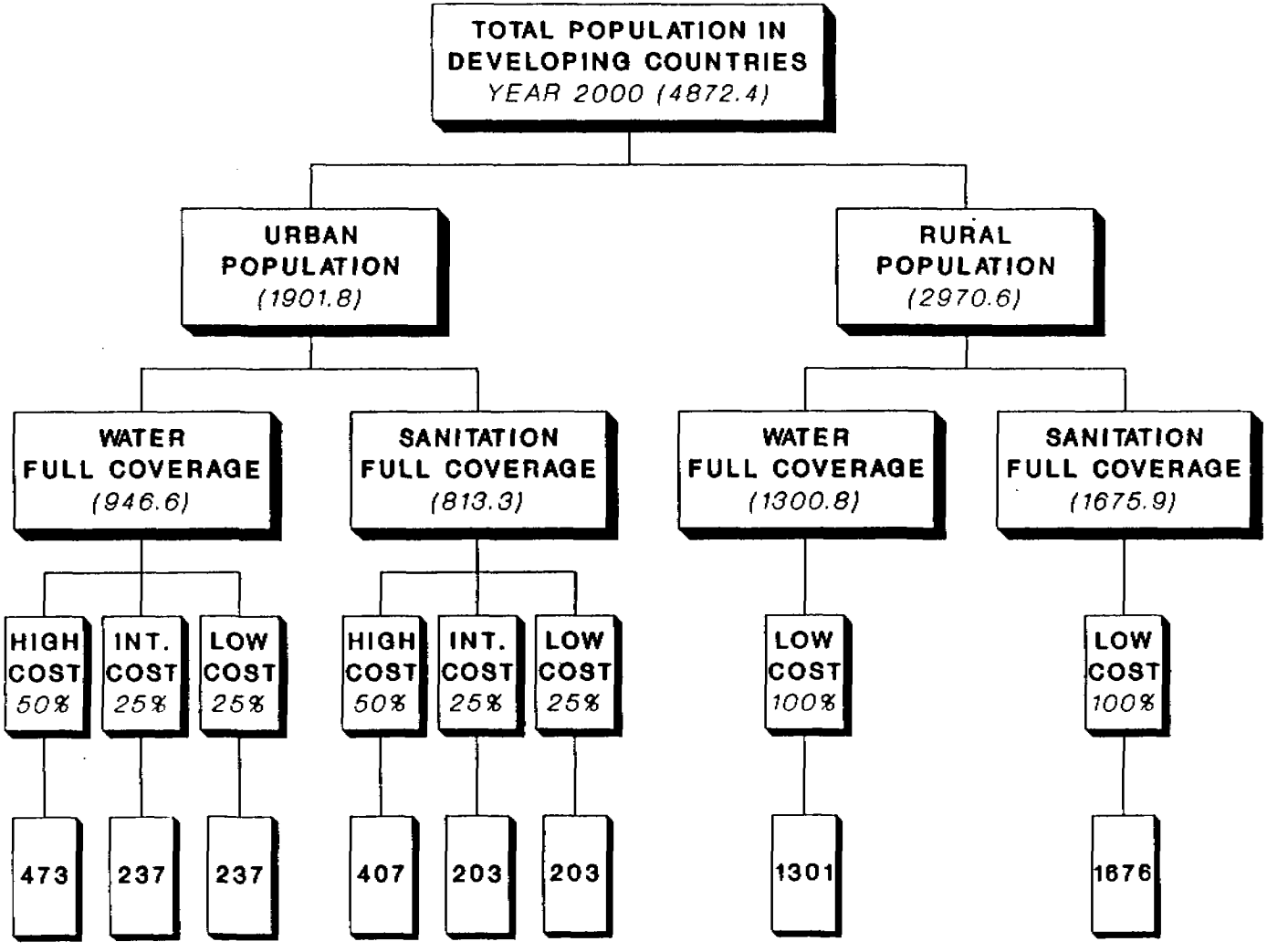
Figure 19 indicates the funding required per technology type, namely, high-cost ($247 billion), intermediate ($26 billion), and low-cost ($84 billion). Figures 20, 21, 22 and 23 provide further details regarding the costs for water supply and for sanitation, within the framework of the technology types. All costs are based on 1990 values.

The 10-year capital investment cost of US$357 billion, when apportioned, allows for US$147 billion for water supply and US$210 for sanitation. These estimates imply an investment of about US$36 billion per year over a 10 year period (1991-2000), with US$15.0 billion for water supply and US$21.0 billion for sanitation. The cost derived is equivalent to about three and one-half times the average annual investment into the sector during the 1980s. (Developing countries spend about US$200 billion annually on the military.)

However, as sector funding in this order of magnitude, $36 billion annually, is not forthcoming, in the current economic climate, restructuring the use of existing sector funds in terms of efficiency and effectiveness must be pursued parallel to mobilizing for additional funds.

Therefore, if one were to focus on the provision of services to the needy (poor), herein categorized as the total rural population plus 50% of the urban population (essentially peri-urban), it is clear that ***with only 30% (US$110 billion) of the total investment (US$357 billion), over 2 billion needy people could be reached with sanitation and 1.6 billion with water supply.***

Table 2: BREAKDOWN UNSERVED POPULATION (YEAR 2000) INTO SERVICE TYPES



ALL POPULATION FIGURES IN MILLIONS

TABLE 3:
ESTIMATED FINANCIAL REQUIREMENTS TO PROVIDE SERVICES TO 100% OF THE UNSERVED POPULATION BY THE YEAR 2000.

(ALL POPULATION FIGURES IN MILLIONS)	POP BY YEAR 2000	REQUIRED SERVICE COVERAGE TO ATTAIN 100% COVERAGE	HIGH-COST TECHNOLOGY POP SERVED WITH HIGH COST	HIGH-COST TECHNOLOGY COST PER CAPITA (US$)	HIGH-COST TECHNOLOGY SUBTOTAL IN MILLIONS OF US$	INTERMEDIATE TECHNOLOGY POP. SERVED WITH INTERMED.	INTERMEDIATE TECHNOLOGY COST PER CAPITA (US$)	INTERMEDIATE TECHNOLOGY SUBTOTAL IN MILLIONS OF US$	LOW-COST TECHNOLOGY POP. SERVED WITH LOW-COST	LOW-COST TECHNOLOGY COST PER CAPITA (US$)	LOW-COST TECHNOLOGY SUBTOTAL IN MILLIONS OF US$
Urban water	1901.80	813.28	406.64	200.00	81,328	203.32	100.00	20,332	203.32	30.00	6,100
Rural water	2970.60	1300.81							1,300.81	30.00	39,024
Urban sanit	1901.80	946.58	473.20	350.00	165,652	236.65	25.00	5,916	236.65	20.00	4,733
Rural sanit	2970.60	1675.88							1,675.88	20.00	33,518

SUBTOTAL URBAN HIGH-COST TECHNOLOGY:	246,980	SUBTOTAL URBAN INTERMEDIATE TECHNOLOGY:	26,248	SUBTOTAL URBAN LOW-COST TECHNOLOGY:	10,833
TOTAL HIGH-COST TECHNOLOGY:	246,980	TOTAL URBAN:	284,060	SUBTOTAL RURAL LOW-COST TECHNOLOGY:	72,542
AVERAGE ANNUAL INVESTMENT REQUIRED FOR HIGH-COST TECHNOLOGY:	24,698	AVERAGE ANNUAL INVESTMENT REQUIRED FOR URBAN AREAS:	28,406	TOTAL RURAL:	72,542
				AVERAGE ANNUAL INVESTMENT REQUIRED FOR RURAL AREAS:	7,254
				TOTAL LOW-COST AND INTERMEDIATE TECHNOLOGY:	109,623
				AVERAGE ANNUAL INVESTMENT REQUIRED FOR LOW-COST AND INTERMEDIATE TECHNOLOGY:	10,962
				TOTAL GLOBAL:	356,602
				AVERAGE ANNUAL INVESTMENT REQUIRED TO ATTAIN GLOBAL COVERAGE OF 90%	35,660

A) COVERAGE OF UNSERVED RURAL POPULATION WITH LOW COST WATER AND SANITATION TECHNOLOGIES BY YEAR 2000 REQUIRES A TOTAL CAPITAL INVESTMENT OF $72.5 BILLION OR AN ANNUAL INVESTMENT OF $7.3 BILLION FOR RURAL AREAS.

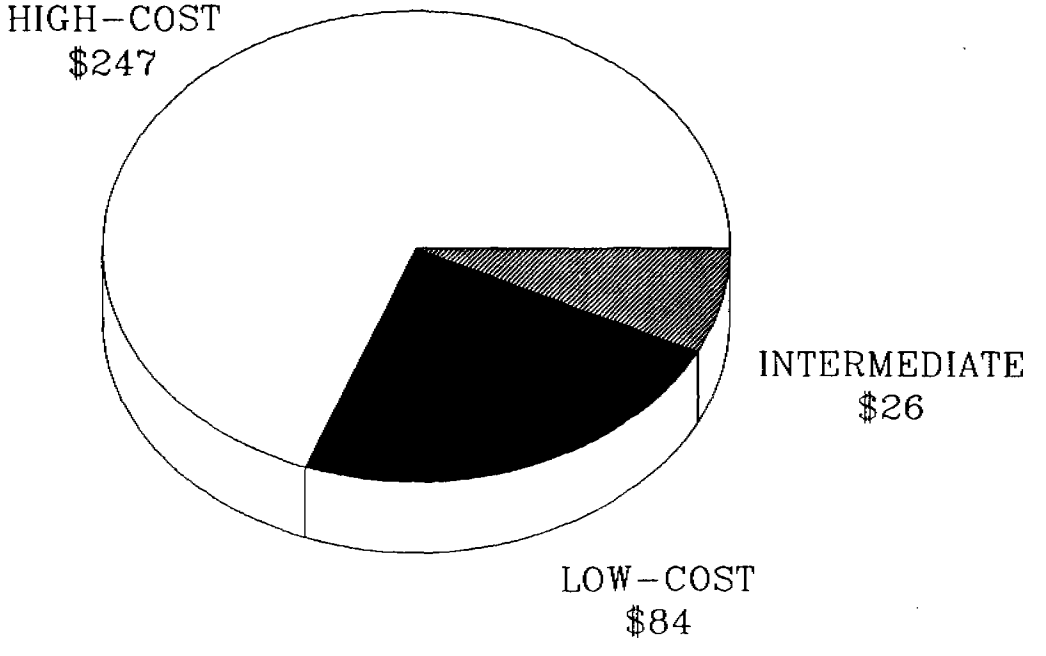
B) COVERAGE OF UNSERVED URBAN POOR (MAINLY PERI-URBAN DWELLERS WITH A MIXTURE OF LOW-COST ($10.8 BILLION) AND INTERMEDIATE TECHNOLOGIES ($26.3 BILLION) BY THE YEAR 2000 REQUIRES A TOTAL INVESTMENT OF $37 BILLION, OR AN ANNUAL INVESTMENT OF $3.7 BILLION.

C) COVERAGE OF THE REMAINING URBAN POPULATION (ECONOMICALLY ABLE) WITH HIGH-COST WATER AND SANITATION TECHNOLOGIES BY THE YEAR 2000, REQUIRES A TOTAL INVESTMENT OF $246.9 BILLION OR AN ANNUAL CAPITAL INVESTMENT OF $24.7 BILLION.

D) TOTAL COVERAGE OF THE UNSERVED BY THE YEAR 2000, WITH A MIXTURE OF WATSAN TECHNOLOGIES BY YEAR 2000 REQUIRES A TOTAL CAPITAL INVESTMENT OF $357 BILLION OR AN ANNUAL INVESTMENT OF $36 BILLION.

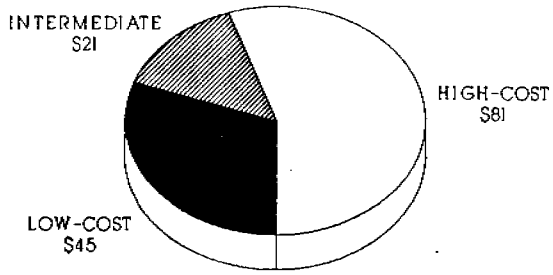
From this costing analysis, unrefined as it is, the indication is that over the next ten years, by the use of essentially low-cost technologies (and a few intermediate ones), about 80% of the unserved population, among developing countries, can annually be served with water and sanitation facilities at 30% (US$11 billion) of the total annual cost (US$36 billion) of providing such facilities to all of the unserved. In other words, ***30% of the total cost can service 80% of the unserved, if the low-cost option is emphasized.***

Fig.19: TECHNOLOGY TYPES & FUNDS NEEDED FOR 100% COVERAGE BY YEAR 2000



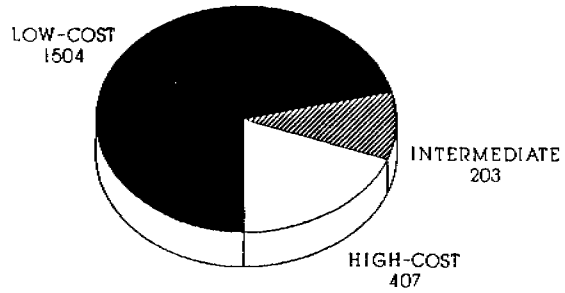
IN BILLIONS OF US$

Fig. 20: REQUIRED INVESTMENT PER TECHNOLOGY FOR WATER SUPPLY BY YEAR 2000



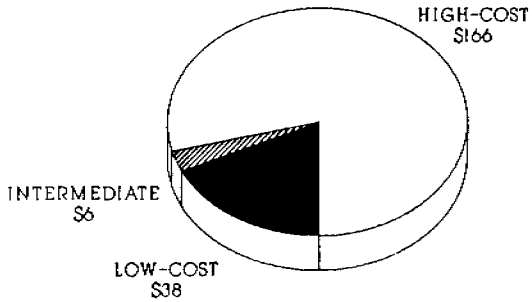
IN BILLIONS OF US$

Fig. 21: POPULATION SERVED PER TECHNOLOGY FOR WATER SUPPLY BY YEAR 2000



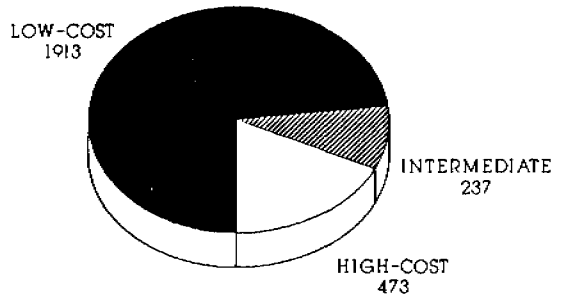
IN MILLIONS OF PEOPLE

Fig. 22: REQUIRED INVESTMENT PER TECHNOLOGY FOR SANITATION BY YEAR 2000



IN BILLIONS OF US$

Fig. 23: POPULATION SERVED PER TECHNOLOGY FOR SANITATION BY YEAR 2000



IN MILLIONS OF PEOPLE

The rural and peri-urban areas are together more amenable to low-cost technologies, and jointly they cater for the majority of the population amongst developing countries. Consequently, to significantly enhance coverage, a greater proportion of resources, than presently, should be allocated to these areas.

Estimates indicate that the current allocation of funds to high-cost and low-cost technology is in the order of 80% and 20%, respectively. A shift in this ratio of a few percentage points, in favour of low-cost technology, could make a positive contribution to the unserved poor, without negatively impacting the more economically able among the unserved population. Thus, a re-structuring of funds allocated to high-cost and low-cost technology is an imperative, if coverage rates are to be enhanced.

Based on the foregoing analysis, a shift of US$1 million from the high-cost to the low-cost/intermediate technology category, would provide coverage to an additional 18,000 needy people (rural and peri-urban areas) at the cost of 2,000 economically able people (urban areas per se). Consequently, the transfer of sector funds from high-cost to low-cost/intermediate technology has a multiplier effect, upon service coverage, of a factor of nine. One is not recommending the abandonment of investment in strictly urban areas - only a more equitable division of available resources.

On the other hand, in developing countries, the more privileged urban population should pay for the full cost of highcost services where this has not yet been achieved. Additionally, cost-sharing and/or cost-recovery mechanisms should be implemented among the needy. In principle, ample evidence exists that the poor are willing to participate in such efforts. Expansion and proliferation of self-help projects is but one of the means to attain the necessary acceleration of service coverage at affordable costs.

One may conclude that it is morally unacceptable to continue depriving the poor of basic water and sanitation services, particularly when it is clear that with an annual investment of only 30% of the total annual capital investment cost, over 80% of the poor could be provided with essentially low-cost water and sanitation.

5. THE BENEFITS OF WIDESPREAD SERVICE COVERAGE

One of UNICEF's goals for the year 2000 is **1125 per cent reduction of the diarrhoea incidence rate"**. This goal can be realistically attained only if water and sanitation service coverage is substantially raised. Several studies undertaken during the 1980s have pointed out that, on average, the expected reduction of diarrhoeal morbidity incidence, attributable to water and sanitation interventions, is significant, with improvements in water availability and in excreta disposal achieving, respectively, about 25% and 22% reductions.

The benefits of accessible water and sanitation would have a positive impact on the estimated 200 million people who are victims of schistosomiasis and the 20 million people annually at risk of Guinea worm infections, among other preventable diseases.

The nutritional status of women and children particularly - as the main drawers of domestic water - would be substantially enhanced through accessible water, as this would provide substantial energy and time saving.

The economic benefits of having access to water and sanitation have not been fully evaluated, but available experience indicates that significant benefits can be derived.

An estimate based on a rice growing area of Nigeria, which is also endemic to Guinea worm disease, indicated that amongst a population of 1.6 million, US$20 million per year would be generated from increased rice sales exclusively, if the disease were to be eliminated.

Examples of positive economic impact are not limited exclusively to rural populations actively involved in agricultural production. Peri-urban areas would also gain enormously in welfare. In the "barrios marginales" of Tegucigalpa, Honduras, households spend up to 40% of their income on domestic water supply provided by vendors. The provision of safe and reliable water supply under such circumstances has an immediate impact upon family welfare.

These apparently isolated and small scale examples may not be extrapolated globally but they are an indication that water and sanitation investments can derive tangible economic returns.

6. CONCLUSION

If the water and sanitation sector were to build on its experiences of the 1980s, and guide the 1990s with an approach based on management by monitoring, it would have found a way of making a significant difference with respect to accelerating coverage in a sustainable manner.

Issued 17 August 1990

WATER AND SANITATION MONITORING SYSTEM

W A S A M S

Version 1.3

(January 1992)

WHO/UNICEF JOINT MONITORING PROGRAMME

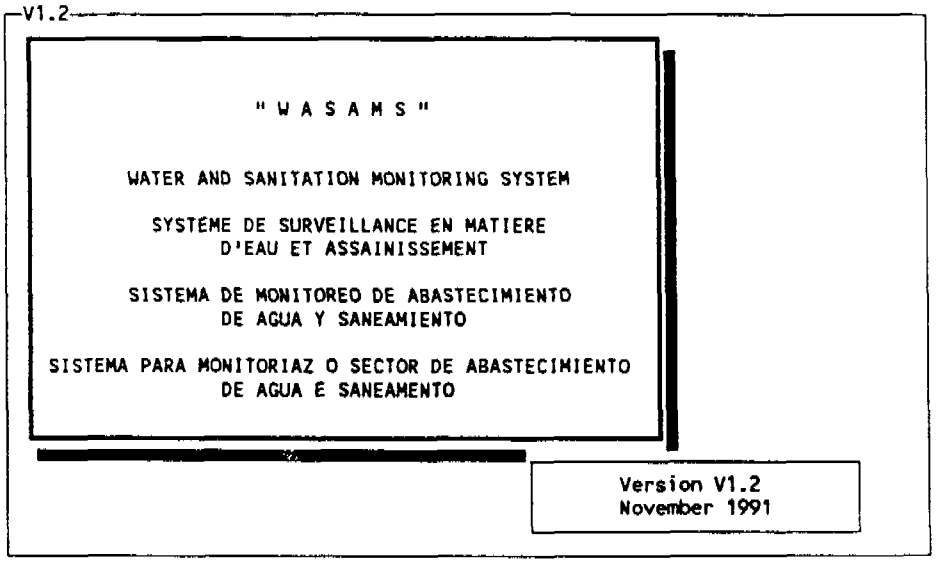
U S E R G U I D E

WORLD HEALTH ORGANIZATION

Community Water Supply and Sanitation Unit
1211 Geneva 27
Switzerland

Tel: (41) 22 791 2111

UNITED NATIONS CHILDREN'S FUND
Water and Sanitation Section
UNICEF House (H-11F)
3 United Nations Plaza
New York
New York 10017 USA
Tel: (212) 326-7120/21



Press any key to continue...

WASAMS COMPUTER SYSTEM

WASAMS is a sector management tool. It has been developed to improve monitoring at the country level through systematic coordinated reporting within the framework of sector strategies and goals. It was designed to facilitate the collection and aggregation of data from the lowest level of administration, through to national level.

The system has been developed as an open ended "add-on" to the broader CESI+ Country Statistics Monitoring System (CESTAT) developed during the IDWSSD[1] by WHO for the purpose of monitoring the water supply and sanitation sector and has therefore the potential for continuous modification, expansion and upgrading to correspond to specific country needs. The limited number of core indicators remain a permanent feature to ensure regional and global standardization.

The WASAMS computer application is an information management system developed on relational data base. It is primarily intended to facilitate water supply and sanitation sector monitoring, planning and management at country level. The system was developed in 1990-1991 in response to needs for enhancement of sector monitoring at country level identified during review of the sector situation at the end of the IDWSSD by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF).

The microcomputer application is an on-line, interactive, real time and menu driven system. As a user you will find out that there are built-in controls and validations for most fields and there are also "look-up and/or select" functions to help you to enter or edit information.

The system operates on three data bases: **PRODUCTION**, **SIMULATION** and **TEST/CONTROL**. The "production data base" is where the verified data is stored. The "simulation data base" is a subset or full copy of the first one. It can be freely modified for analysing the resulting changes - simulations. The "test/control data base" is used to load data received and to examine it. Once it is checked and eventually corrected it can be moved to the "production data base".

To learn more about WASAMS functions and how to use the programme, a WASAMS tutorial is available, but to find out more about installation, operation requirements, logical and physical data base characteristics and other more technical issues, please refer to the TECHNICAL MANUAL.

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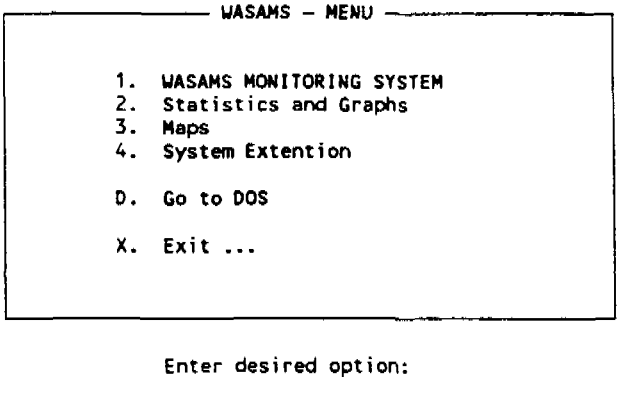
[1] International Drinking Water Supply and Sanitation Decade

Countries without the **WASAMS** computer application will operate for an interim period on the basis of hard-copy questionnaires. Those with **WASAMS** computer application will use its data entry programmes at central level to enter the information, while operating with the hard-copy questionnaires at lower administrative levels. The decentralization of computer use to lower administrative levels is the objective.

Some of the main **WASAMS** features are:

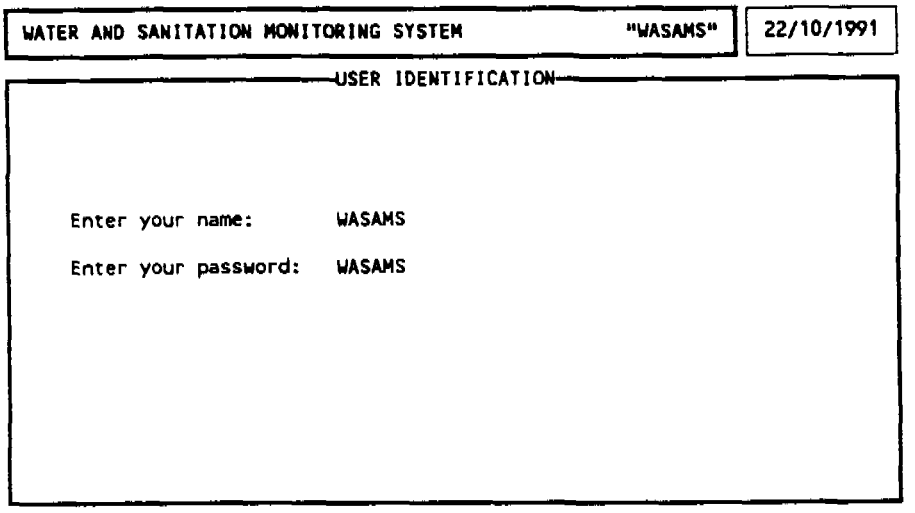
- Data collecting, analysis and reporting by country political/administrative sub-levels (up to 5)
- Flexible regional sub-divisioning.
- National, regional and local reporting.
- Financial figures can be given in local currency.
- Utilities for download/upload, data export/import, data merge, printout of a blank questionnaire, and extensive data purge or archiving.
- System extendability
- Analysis & Graphics
- Maps

The picture below illustrates the WASAMS menu.



U S E R I D E N T I F I C A T I O N

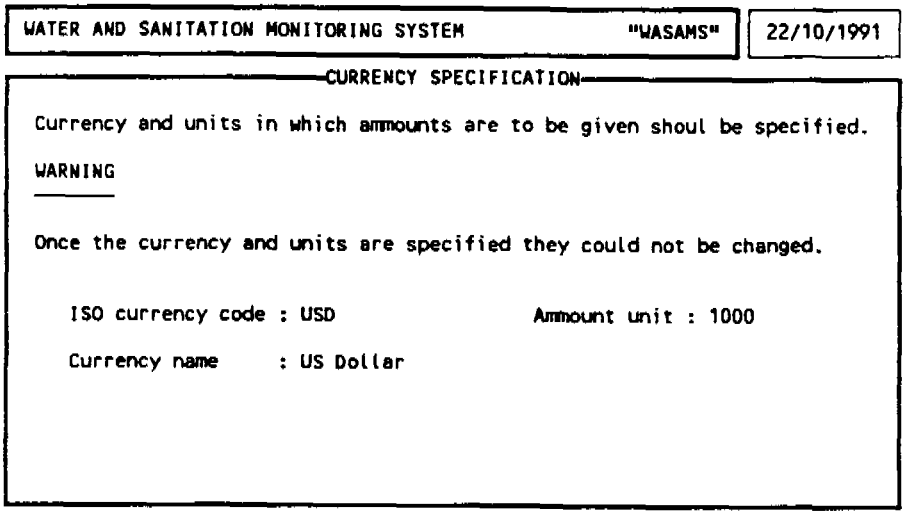
Once we have selected option 1. WASAMS MONITORING SYSTEM from WASAMS menu, USER IDENTIFICATION screen will appear (see picture below). Each user is assigned it's identification (user name), password and a priviliged level by the system administrator. To successfully log on the user is asked to enter identification and password.



Enter your password (lower case distinct from upper case!).

C U R R E N C Y S P E C I F I C A T I O N

The currency specification (screen illustrated below) can be done only once. The user should specify currency with it's ISO code and the unit to be used when entering financial figures.

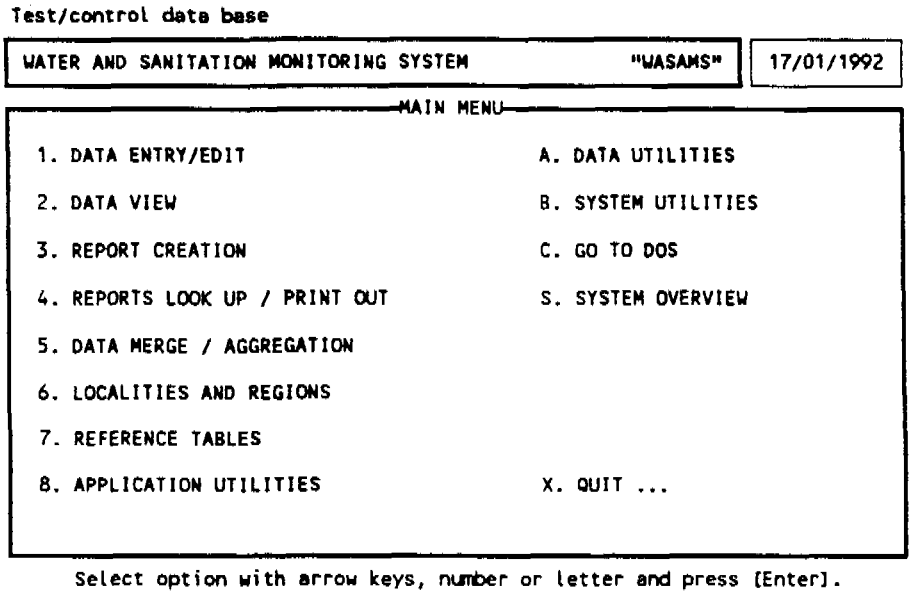


Enter the ammount unit (1, 10, 100, 1000, 10 000, 100 000 or 1 000 000).

M A I N M E N U

The **WASAMS** system, was designed to make the data input, maintenance and reporting as simple and rapid as possible. Its data input screens correspond to parts of the sector questionnaire, in fact they are identical. The only restriction is screen size and for that reason there are more screens than pages.

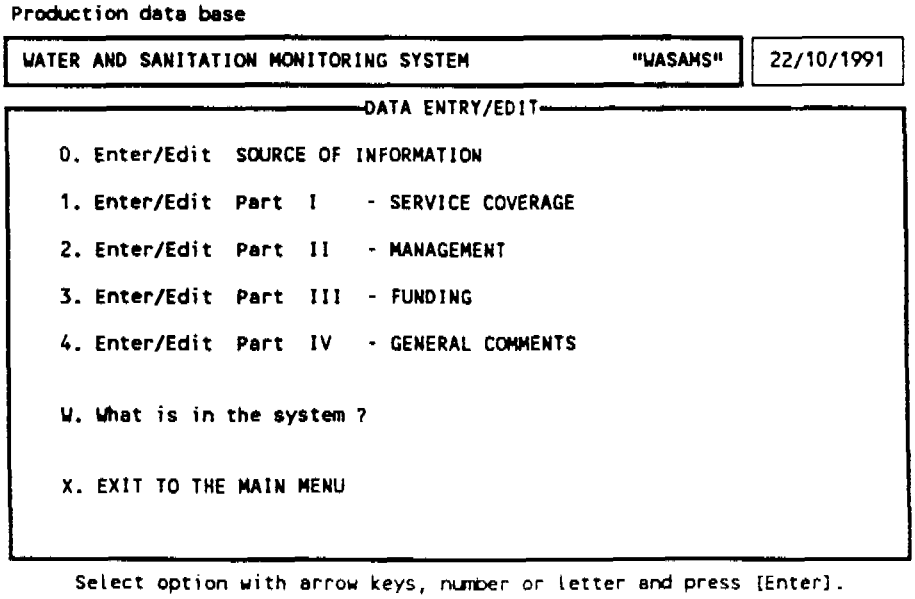
The picture below illustrates the **MAIN MENU**.



D A T A E N T R Y / E D I T

The DATA ENTRY/EDIT gives you access to 15 screens corresponding to the 5 sector questionnaire components shown as above. In addition, there is a review function to check what has so far been entered into the system.

Within functions there is the option to print a questionnaire for specified country and year with all the data entered (see picture below).

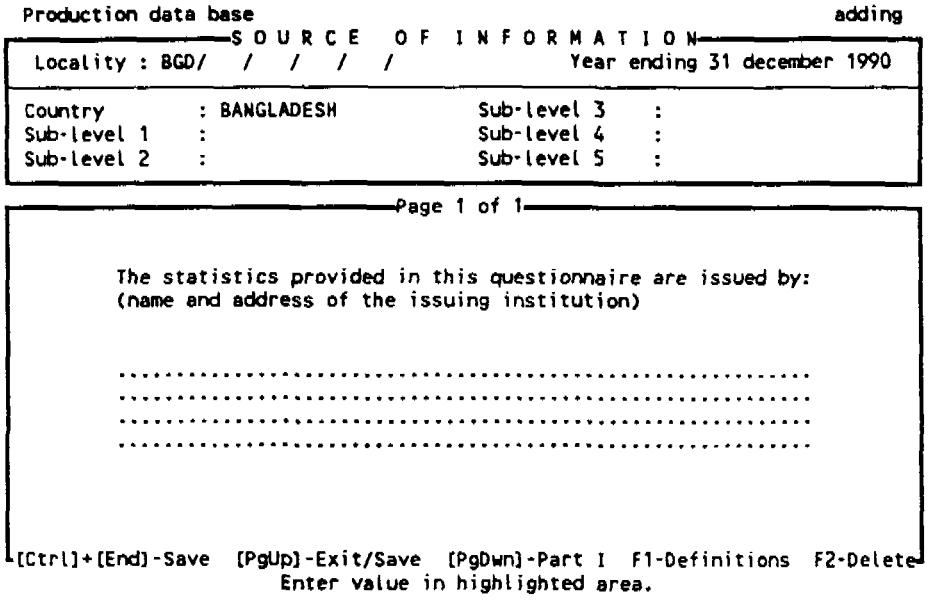


DATA ENTRY/EDIT SCREENS

The picture below illustrates WASAMS "SOURCE OF INFORMATION" screen.

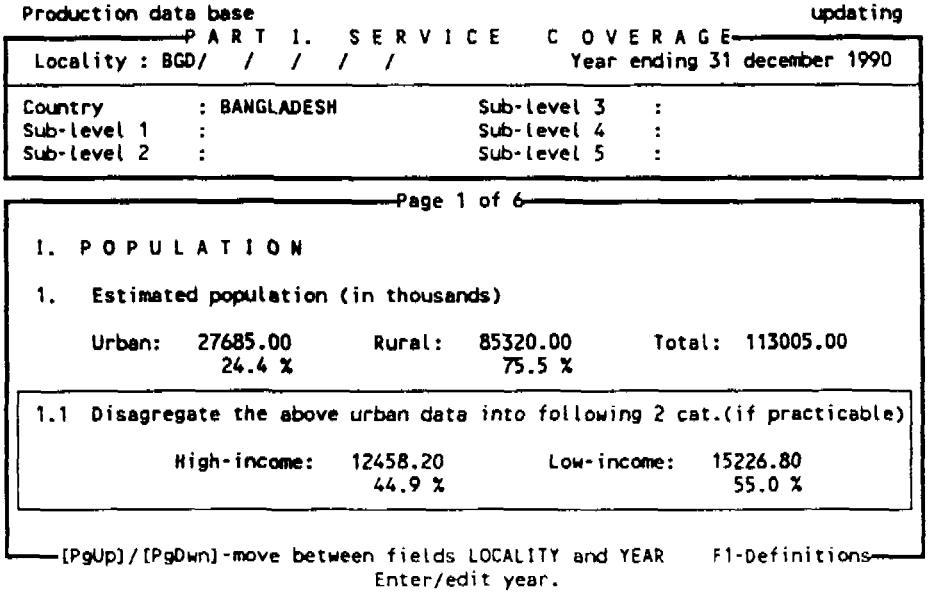
There the user enters WASAMS cover page information on issuing institution and responsible offices.

This is a reference type information helping the National Monitoring Unit locate and identify the information source.



The picture below illustrates WASAMS Service Coverage screen No 1 - POPULATION

Note the functions assigned to the F keys. F1 is for reading the definitions, F2 is for deletion of the Part 1, F4 is a look up/selection function throughout whole system. For example, when entering/editing country 3 letters code, F4 would give you a list of all valid codes to look-up and/or select from.



DATA ENTRY/EDIT SCREENS

The picture below illustrates **WASAMS** screen No. 2 - **SERVICE COVERAGE**

Production data base updating

PART I. SERVICE C O V E R A G E

Locality : BGD/ / / / / Year ending 31 december 1990

Country	: BANGLADESH	Sub-level 3	:
Sub-level 1	:	Sub-level 4	:
Sub-level 2	:	Sub-level 5	:

Page 2 of 6

II. SAFE WATER SUPPLY

Population with access to functioning systems (in thousands)

	Urban		Rural	
house connections	5144.68	24.4 %	0.00	.0 %
yard taps	118.85	.5 %	0.00	.0 %
public standpipes	717.30	3.4 %	0.00	.0 %
boreholes with handpumps	10503.00	49.8 %	58466.00	84.6 %
protected dug wells	0.00	.0 %	85.00	.1 %
rainwater collection systems	0.00	.0 %	0.00	.0 %
other high-cost technologies	4567.50	21.6 %	10500.00	15.2 %
other low-cost technologies	0.00	.0 %	0.00	.0 %
total served	21051.33	76.0 %	69051.00	80.9 %
total unserved	6633.67	23.9 %	16269.00	19.0 %

[Ctrl]+[End]-Save [PgUp]-Page 1. [PgDwn]-Page 3. F1-Definitions F2-Delete

If entered value must be >= 0.

Note that the urban figures should be disaggregated into urban high-income and urban low-income whenever practicable (see picture below).

Production data base updating

PART I. SERVICE C O V E R A G E

Locality : BGD/ / / / / Year ending 31 december 1990

Country	: BANGLADESH	Sub-level 3	:
Sub-level 1	:	Sub-level 4	:
Sub-level 2	:	Sub-level 5	:

Page 3 of 6

II. SAFE WATER SUPPLY

Disaggregate page 2. urban data into following 2 cat. (if practicable)

	Urban high-income		Urban low-income	
house connections	5144.68	41.9 %	0.00	.0 %
yard taps	118.85	.9 %	0.00	.0 %
public standpipes	475.50	3.8 %	241.80	2.7 %
boreholes with handpumps	6525.00	53.2 %	3978.00	45.2 %
protected dug wells	0.00	.0 %	0.00	.0 %
rainwater collection systems	0.00	.0 %	0.00	.0 %
other high-cost technologies	0.00	.0 %	4567.50	51.9 %
other low-cost technologies	0.00	.0 %	0.00	.0 %
total served	12264.03	98.4 %	8787.30	57.7 %
total unserved	194.17	1.5 %	6439.50	42.2 %

[Ctrl]+[End]-Save [PgUp]-Page 2. [PgDwn]-Page 4. F1-Definitions F2-Delete

If entered value must be >= 0.

DATA ENTRY/EDIT SCREENS

Page 4 of SERVICE COVERAGE is illustrated below.

Production data base updating

PART I. SERVICE COVERAGE

Locality : BGD/ / / / / Year ending 31 december 1990

Country : BANGLADESH Sub-level 3 :
Sub-level 1 : Sub-level 4 :
Sub-level 2 : Sub-level 5 :

Page 4 of 6

III. SANITATION (sanitary means of excreta disposal)
Popul. with access to adequate excreta disposal facilities (in thousands)

	Urban		Rural	
house connect. to conv.publ.sewers	938.05	5.9 %	0.00	.0 %
house connect.to small-bore sewers	0.00	.0 %	0.00	.0 %
house connect. to septic tanks	4941.57	31.4 %	0.00	.0 %
latrines, wet (pour flush etc.)	3729.17	23.7 %	5120.00	75.0 %
latrines, dry (vent. improved pit)	0.00	.0 %	0.00	.0 %
latrines, dry (simple pit etc.)	5855.41	37.2 %	1706.00	24.9 %
other high-cost technologies	249.00	1.5 %	0.00	.0 %
other low-cost technologies	0.00	.0 %	0.00	.0 %
total served	15713.20	56.7 %	6826.00	8.0 %
total unserved	11971.80	43.2 %	78494.00	91.9 %

[Ctrl]+[End]-Save [PgUp]-Page 3. [PgDwn]-Page 5. F1-Definitions F2-Delete
If entered, value must be >= 0.

Always observe the top and bottom lines of your screen.
The top line tells you which data base you work with and what you are doing: adding a new form or updating an already existing one.

The two lines at the bottom of the screen are command and message lines. The commands are standard.

On all the screens there is a data quality control built-in. Totals, if given, have to be equal to the sum of the components, there is often a range within which the value has to fall, etc.

The picture below illustrates the urban figures breakdown.

Production data base updating

PART I. SERVICE COVERAGE

Locality : BGD/ / / / / Year ending 31 december 1990

Country : BANGLADESH Sub-level 3 :
Sub-level 1 : Sub-level 4 :
Sub-level 2 : Sub-level 5 :

Page 5 of 6

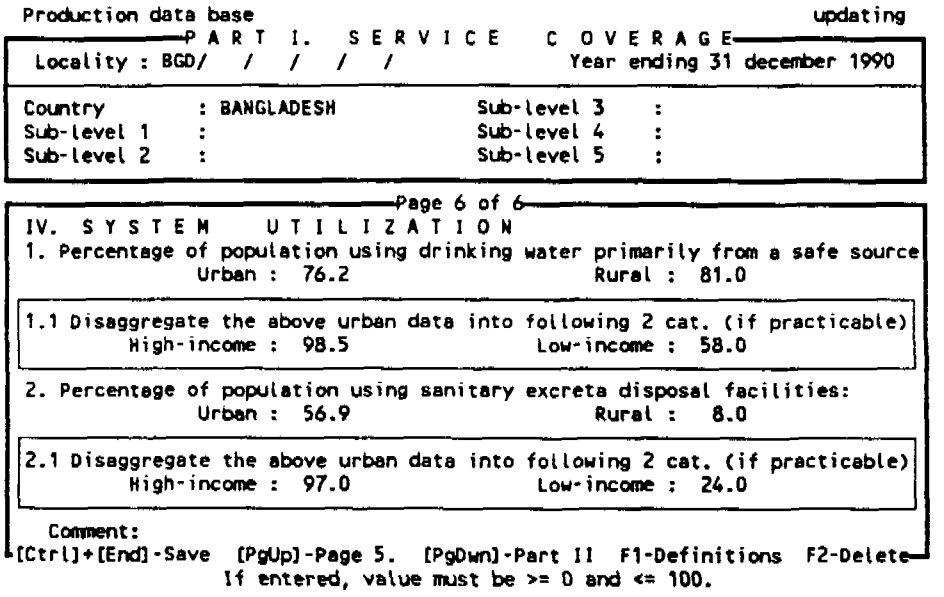
III. SANITATION (sanitary means of excreta disposal)
Disaggregate page 4. urban data into following 2 cat. (if practicable)

	Urban high-income		Urban low-income	
house connect. to conv.publ.sewers	938.05	7.7 %	0.00	.0 %
house connect.to small-bore sewers	0.00	.0 %	0.00	.0 %
house connect. to septic tanks	4941.57	40.9 %	0.00	.0 %
latrines, wet (pour flush etc.)	2815.57	23.3 %	913.60	24.9 %
latrines, dry (vent. improved pit)	0.00	.0 %	0.00	.0 %
latrines, dry (simple pit etc.)	3114.60	25.8 %	2740.81	75.0 %
other high-cost technologies	249.00	2.0 %	0.00	.0 %
other low-cost technologies	0.00	.0 %	0.00	.0 %
total served	12058.79	96.7 %	3654.41	23.9 %
total unserved	399.41	3.2 %	11572.39	76.0 %

[Ctrl]+[End]-Save [PgUp]-Page 4. [PgDwn]-Page 6. F1-Definitions F2-Delete
If entered, value must be >= 0.

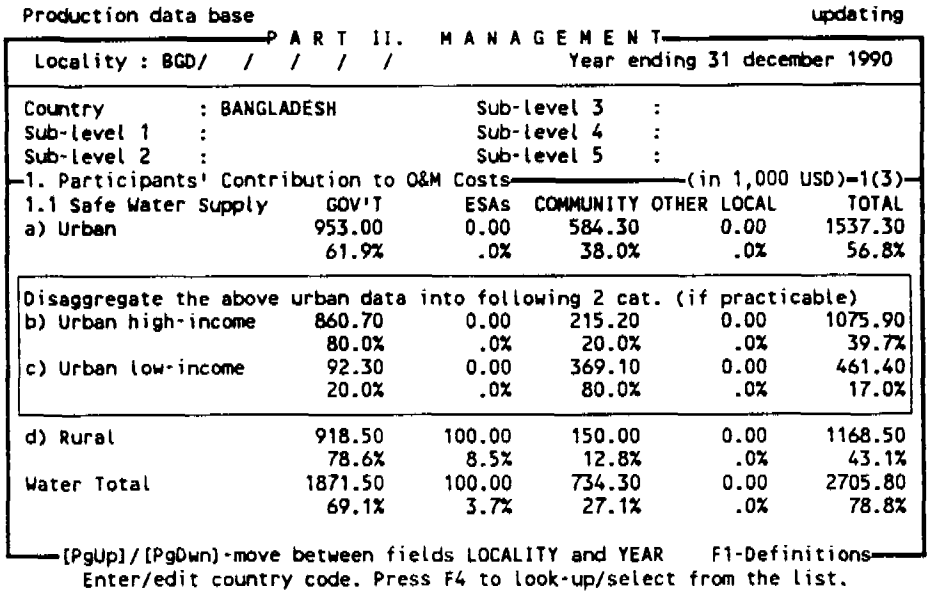
DATA ENTRY/EDIT SCREENS

The picture below illustrates the sixth and last screen of the service coverage. The features described for previous screens also apply to the screen below.



DATA ENTRY/EDIT SCREENS

The picture illustrates WASAMS Part 2 Screen 1 - **MANAGEMENT**



Production data base updating

PART II. MANAGEMENT

Locality : BGD/ / / / / Year ending 31 december 1990

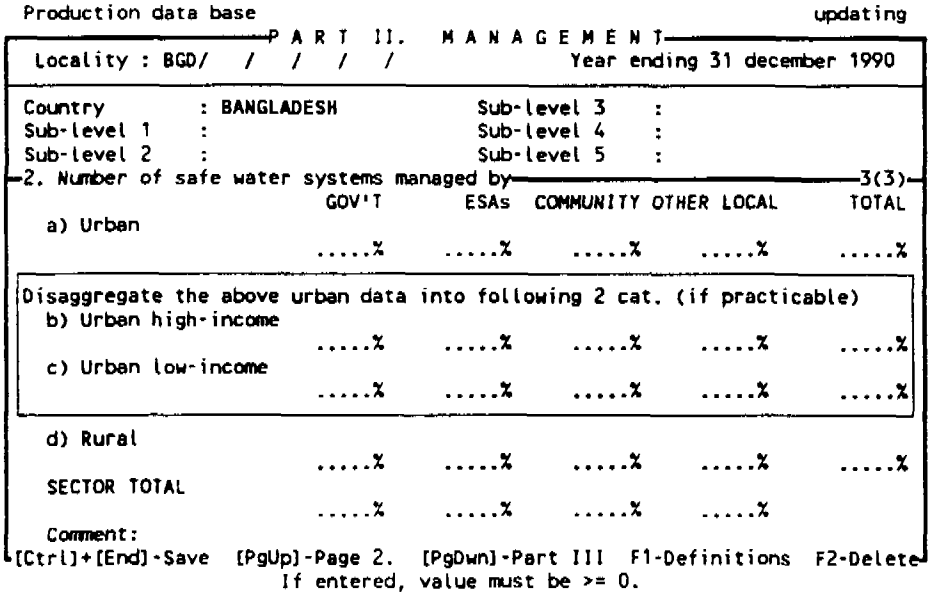
Country : BANGLADESH Sub-level 3 :
Sub-level 1 : Sub-level 4 :
Sub-level 2 : Sub-level 5 :

1. Participants' Contribution to O&M Costs (in 1,000 USD)=1(3)

1.1 Safe Water Supply	GOV'T	ESAs	COMMUNITY	OTHER LOCAL	TOTAL
a) Urban	953.00	0.00	584.30	0.00	1537.30
	61.9%	.0%	38.0%	.0%	56.8%
Disaggregate the above urban data into following 2 cat. (if practicable)					
b) Urban high-income	860.70	0.00	215.20	0.00	1075.90
	80.0%	.0%	20.0%	.0%	39.7%
c) Urban low-income	92.30	0.00	369.10	0.00	461.40
	20.0%	.0%	80.0%	.0%	17.0%
d) Rural	918.50	100.00	150.00	0.00	1168.50
	78.6%	8.5%	12.8%	.0%	43.1%
Water Total	1871.50	100.00	734.30	0.00	2705.80
	69.1%	3.7%	27.1%	.0%	78.8%

[PgUp]/[PgDwn]-move between fields LOCALITY and YEAR F1-Definitions
Enter/edit country code. Press F4 to look-up/select from the list.

Below illustrated is the screen for entry/edit of safe water systems managements information,



Production data base updating

PART II. MANAGEMENT

Locality : BGD/ / / / / Year ending 31 december 1990

Country : BANGLADESH Sub-level 3 :
Sub-level 1 : Sub-level 4 :
Sub-level 2 : Sub-level 5 :

2. Number of safe water systems managed by 3(3)

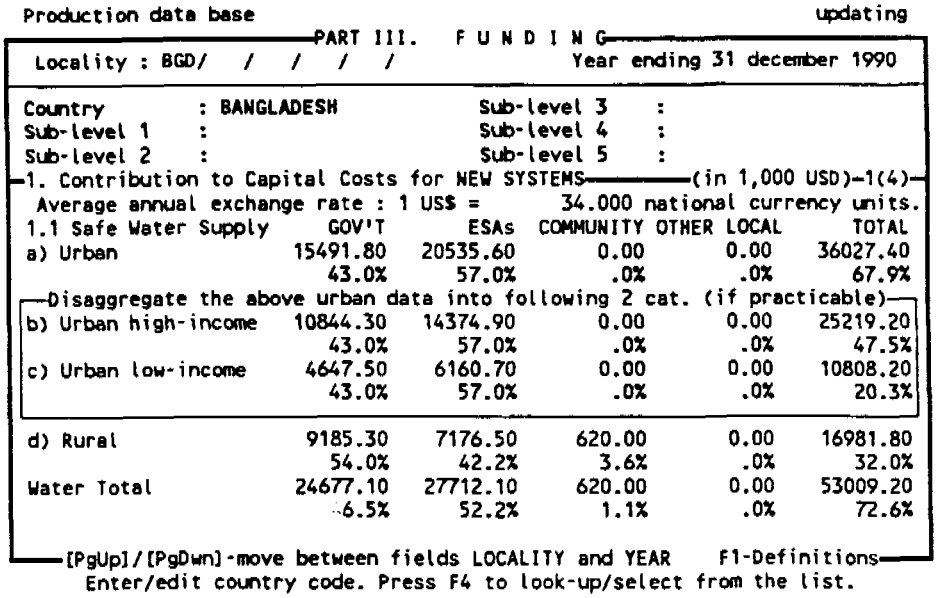
	GOV'T	ESAs	COMMUNITY	OTHER LOCAL	TOTAL
a) Urban					
	.....%	.....%	.....%	.....%	.....%
Disaggregate the above urban data into following 2 cat. (if practicable)					
b) Urban high-income	.....%	.....%	.....%	.....%	.....%
c) Urban low-income	.....%	.....%	.....%	.....%	.....%
d) Rural	.....%	.....%	.....%	.....%	.....%
SECTOR TOTAL	.....%	.....%	.....%	.....%	

Comment:

[Ctrl]+[End]-Save [PgUp]-Page 2. [PgDwn]-Part III F1-Definitions F2-Delete
If entered, value must be >= 0.

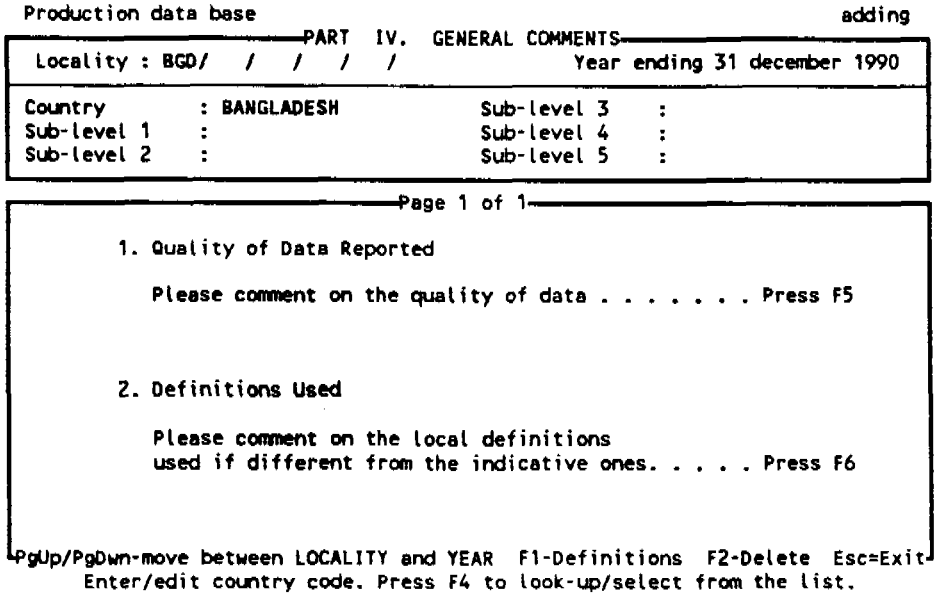
DATA ENTRY/EDIT SCREENS.

The picture below illustrates **WASAMS** Part 3 screen 1: **FUNDING** Functions and controls are as described before.



```
Production data base                                              updating
                          PART III.  F U N D I N G
 Locality : BGD/  /  /  /  /                    Year ending 31 december 1990

Country       : BANGLADESH              Sub-level 3    :
Sub-level 1   :                         Sub-level 4    :
Sub-level 2   :                         Sub-level 5    :
1. Contribution to Capital Costs for NEW SYSTEMS          (in 1,000 USD)-1(4)
 Average annual exchange rate : 1 US$ =       34.000 national currency units.
1.1 Safe Water Supply     GOV'T      ESAs  COMMUNITY OTHER LOCAL      TOTAL
a) Urban                15491.80  20535.60       0.00       0.00   36027.40
                           43.0%     57.0%       .0%        .0%      67.9%
 Disaggregate the above urban data into following 2 cat. (if practicable)
b) Urban high-income    10844.30  14374.90       0.00       0.00   25219.20
                           43.0%     57.0%       .0%        .0%      47.5%
c) Urban low-income      4647.50   6160.70       0.00       0.00   10808.20
                           43.0%     57.0%       .0%        .0%      20.3%

d) Rural                 9185.30   7176.50     620.00       0.00   16981.80
                           54.0%     42.2%       3.6%       .0%      32.0%
Water Total             24677.10  27712.10     620.00       0.00   53009.20
                            6.5%     52.2%       1.1%       .0%      72.6%

 [PgUp]/[PgDwn]-move between fields LOCALITY and YEAR    F1-Definitions
      Enter/edit country code. Press F4 to look-up/select from the list.
```

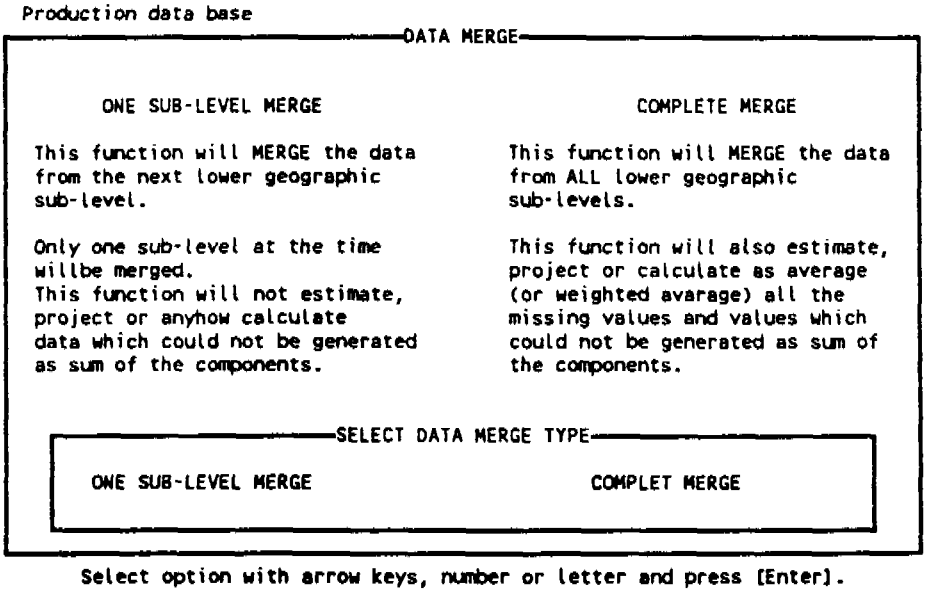
For entering comments on data quality and/or definitions used, there is a simple word processor available. Press F5/F6 to open a window for entering/editing free format text.



```
Production data base                                              adding
                          PART  IV.  GENERAL COMMENTS
 Locality : BGD/  /  /  /  /                    Year ending 31 december 1990

Country       : BANGLADESH              Sub-level 3    :
Sub-level 1   :                         Sub-level 4    :
Sub-level 2   :                         Sub-level 5    :

                                Page 1 of 1

      1. Quality of Data Reported

         Please comment on the quality of data . . . . . . . Press F5


      2. Definitions Used

         Please comment on the local definitions
         used if different from the indicative ones. . . . . Press F6


PgUp/PgDwn-move between LOCALITY and YEAR  F1-Definitions  F2-Delete  Esc=Exit
      Enter/edit country code. Press F4 to look-up/select from the list.
```

DATA AGGREGATION

Data Merge programme is aggregating all data 1) from the same administrative level into the first higher level data, for the specified year or 2) through the entire administrative structure with computing missing values.



When selecting a locality to aggregate data, use F4 for looking up into the components at the lower level.

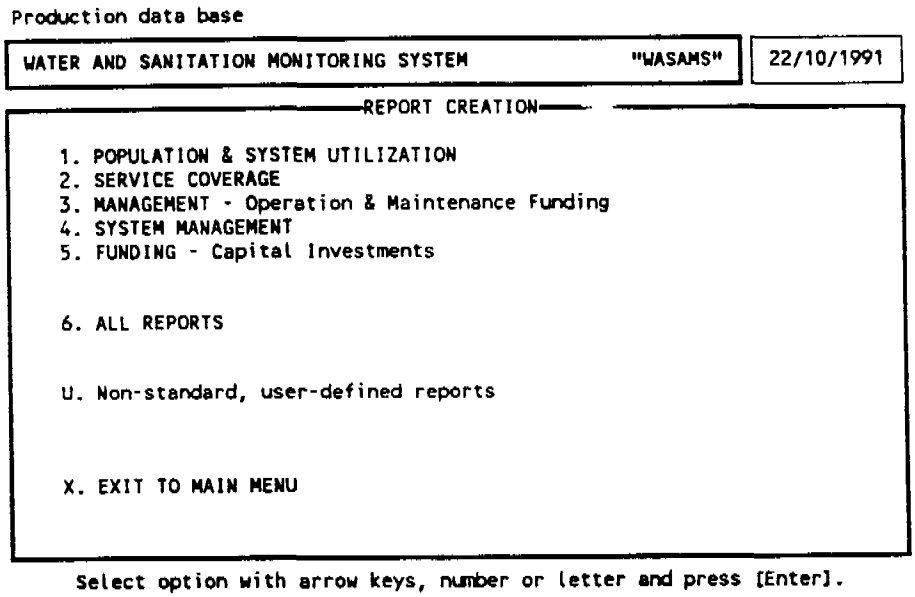
When selecting year use F4 for the list of the years represented in the data base.

REPORTS

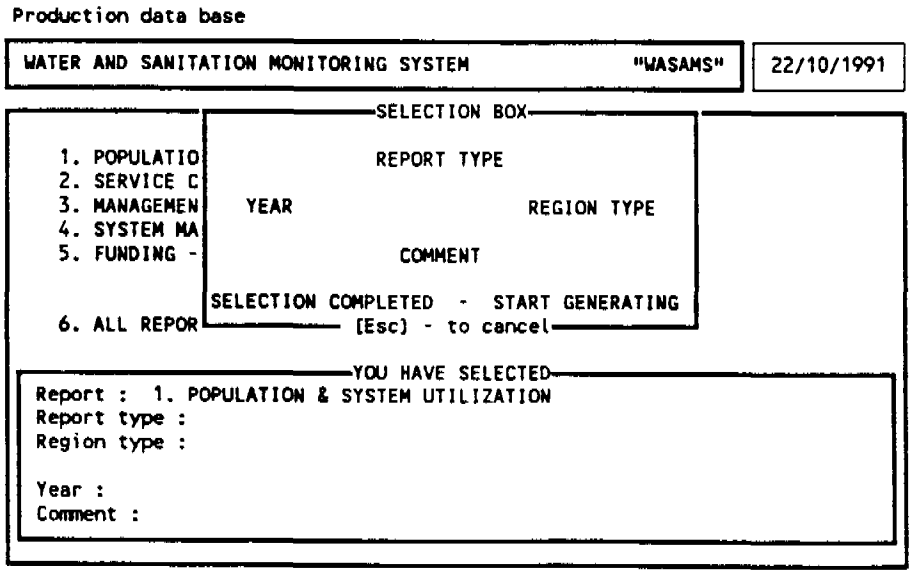
All reports generated by the system are saved for later reference and/or printout. Many reports of the same kind could be generated and saved. In such cases the file name would only have a new version number. When no longer needed reports can be deleted.

To generate report(s) the user should specify a number of parameters depending on the type of report: region type, region, year, etc.

The picture below illustrates reports menu.



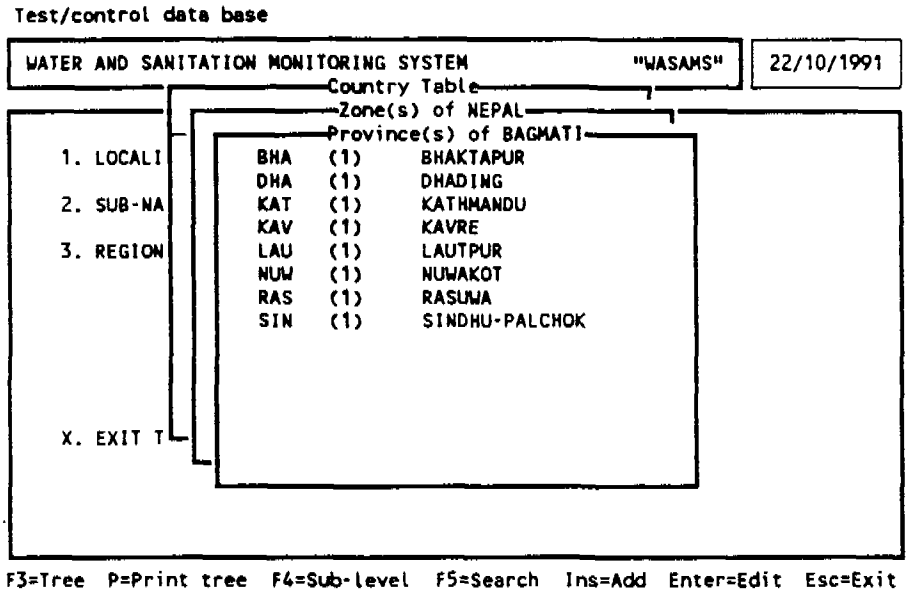
This screen will be followed by the **PARAMETERS SELECTION SCREEN** which is illustrated below.



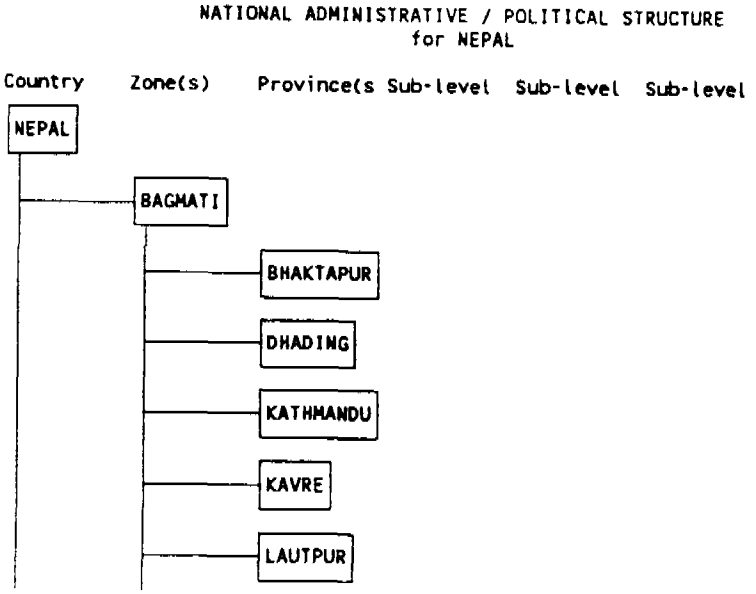
COUNTRY ADMINISTRATIVE SUB-LEVELS

As mentioned earlier, countries' multi-level admistrative/political structure can be specified. Each component on each level could be chosen for later data aggregation or reporting.

Once a country is selected, F4 key will list its first sub-level, next stroke on F4 will list next sub-level, etc. Bottom line indicates that standard file maintenance commands are available.



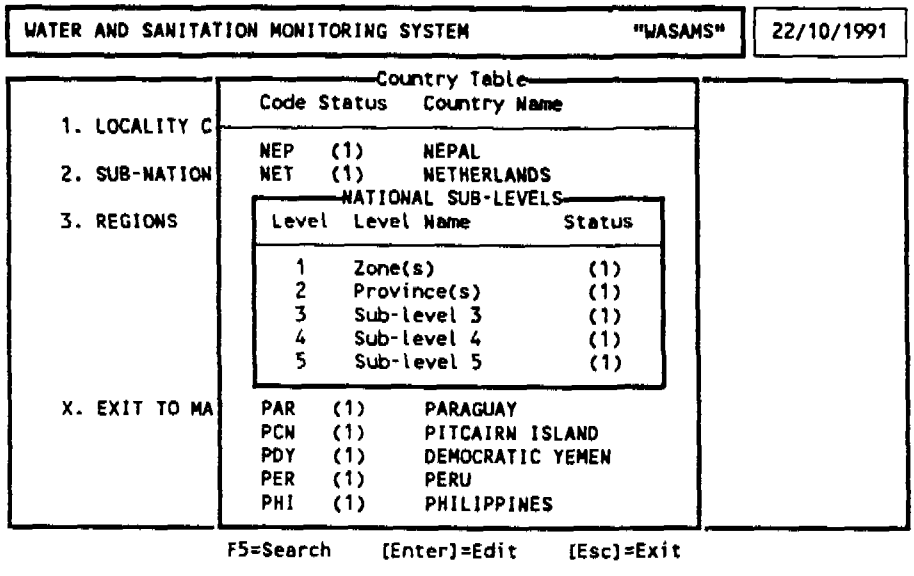
There is also a function available to view/print the national administrative/political structure.



ADMINISTRATIVE SUB-LEVEL DESIGNATION

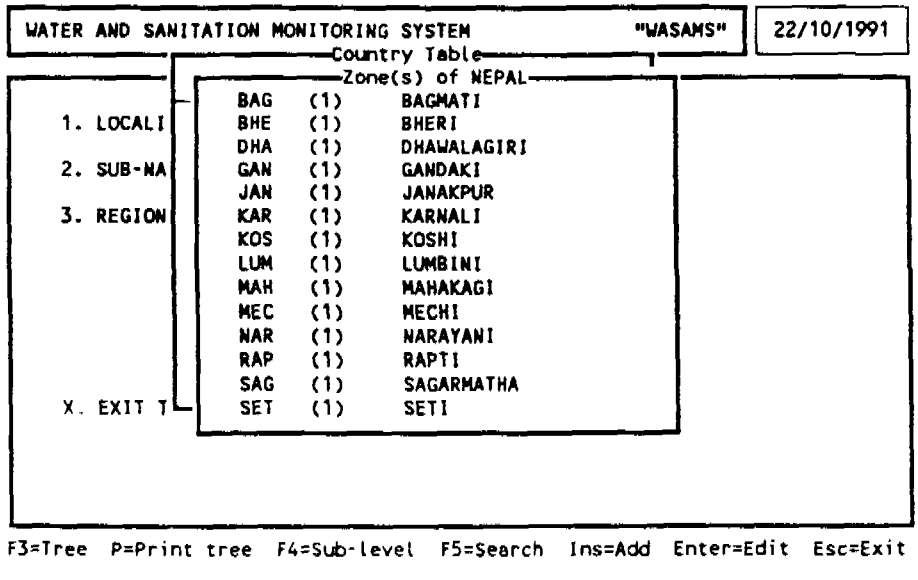
In addition to specifying sub-levels, **WASAMS** computer system provides the user with a feature to name the sub-levels since in different countries they have different titles.

Production data base



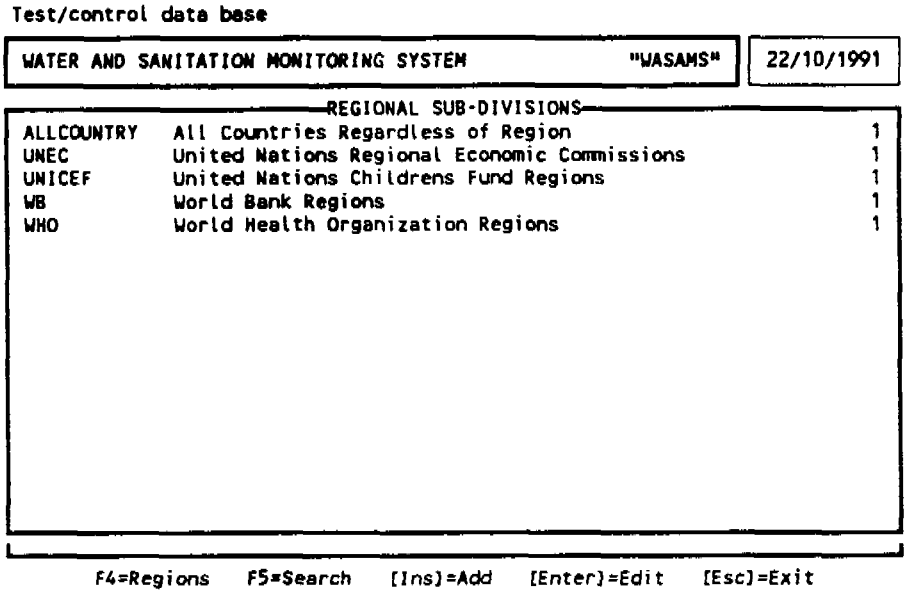
These names (labels) will appear later on all reports and level component listings as well as with locality identification on data entry and data aggregation.

Test/control data base

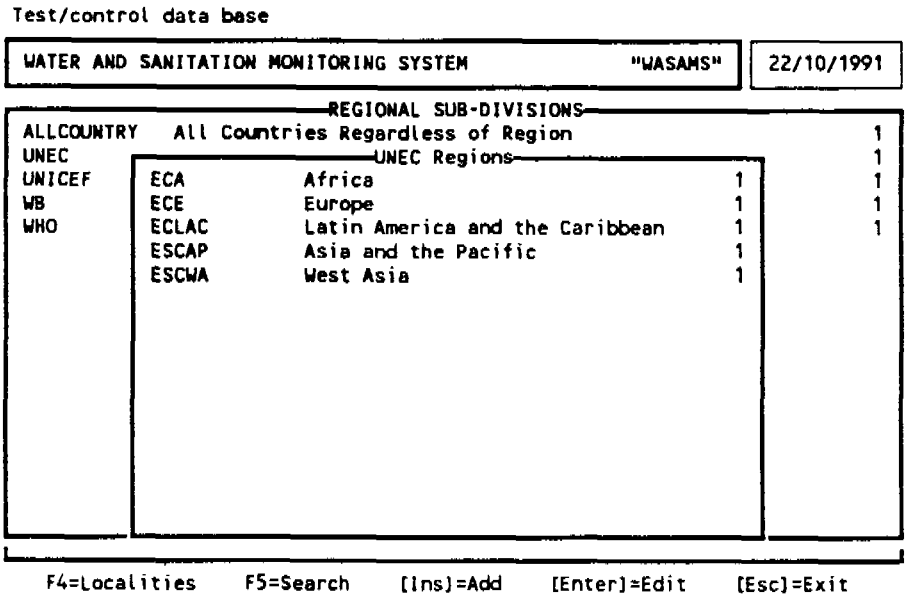


REGIONAL SUB-DIVISIONS

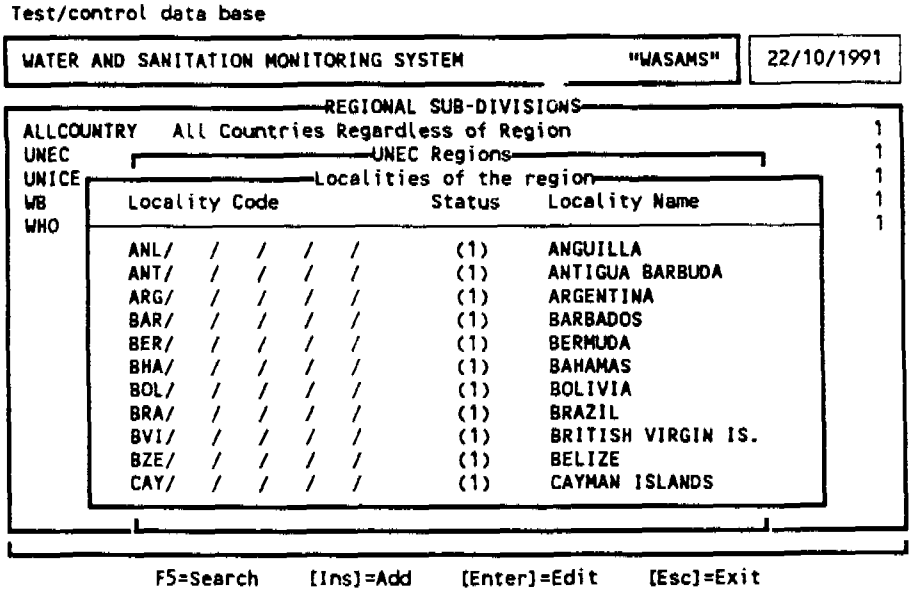
WASAMS computer system is designed and developed to work with unlimited number of various regional sub-divisions. It is necessary to be able to produce reports for many different organizations, agencies or ministries. Picture below illustrates only a few of many possible regional sub-divisions.



Highlighting one and pressing F4 would list regions. That is illustrated in the next picture.



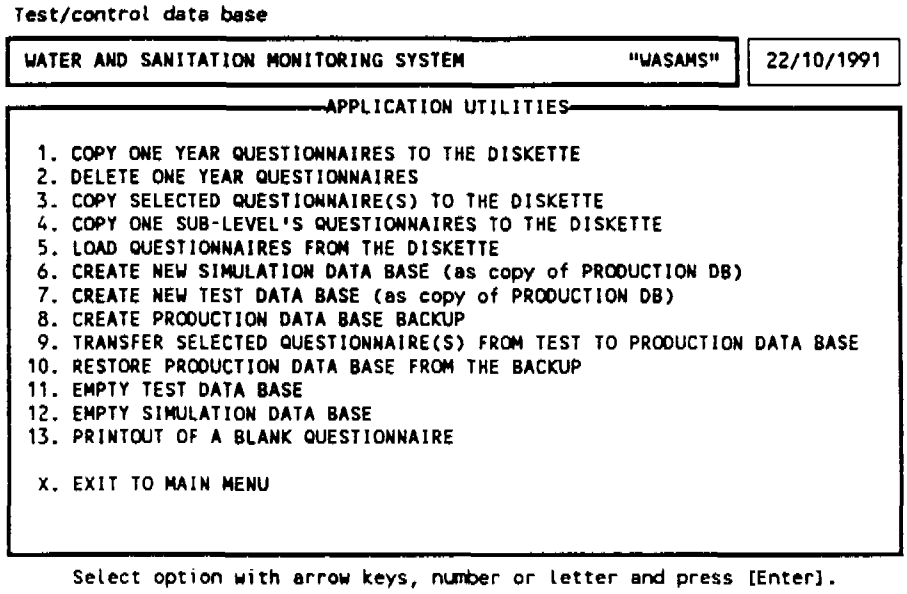
Highlighting one region and pressing F4 would list all localities from that region.



Note the commands available for maintaining region types, regions and countries.

UTILITIES

The picture below illustrates the **WASAMS** Utilities Menu.



Note the utilities for download/upload used for data export/import. Those utilities are used when the data is to be sent to the upper level or to the WHO headquarters, or when received.

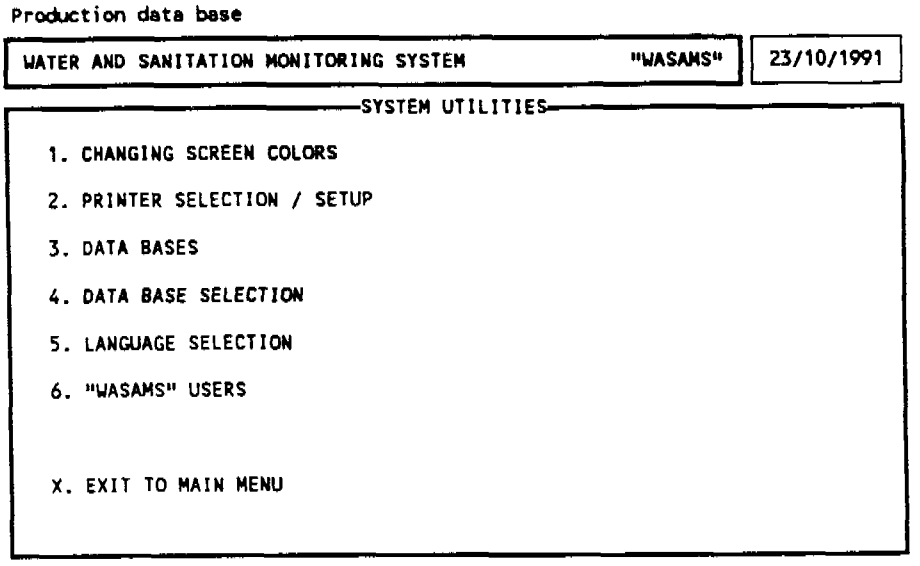
When the data is received it should first be loaded into the test/control data base and examined there. Reports can be generated from that data. They can also be printed in the form of Questionnaires.

Once the data is confirmed as correct it can be moved to the production data base using transfer UTILITY (No 9).

The utility, CREATE NEW SIMULATION DATA BASE, will simply copy all production data (real data) into the simulation data base overwriting everything that was there. In the simulation data base, the user can make any changes and analyse the impact, aware that the real (production) data is still unchanged and safe.

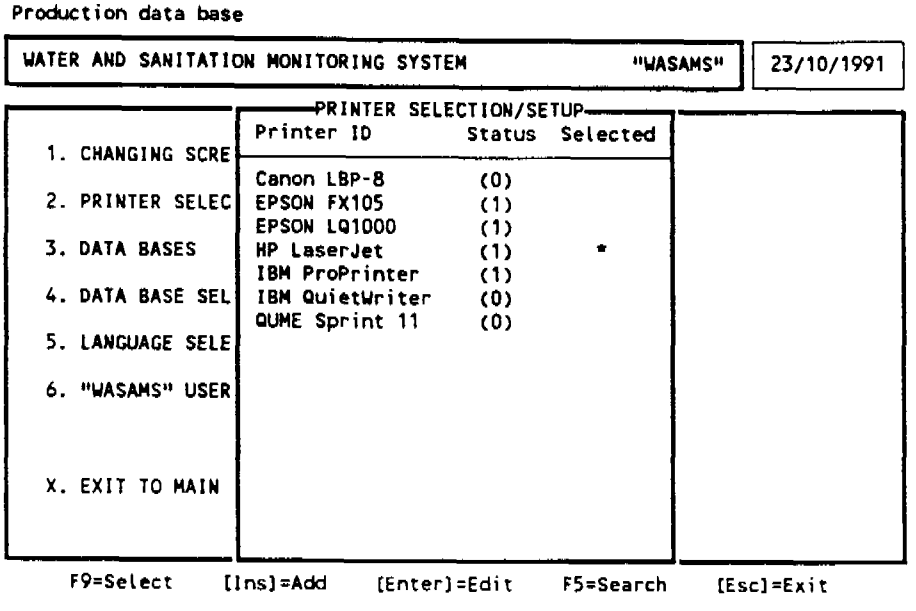
SYSTEM UTILITIES

There is a number of standard system utilities avilable. See picture below.



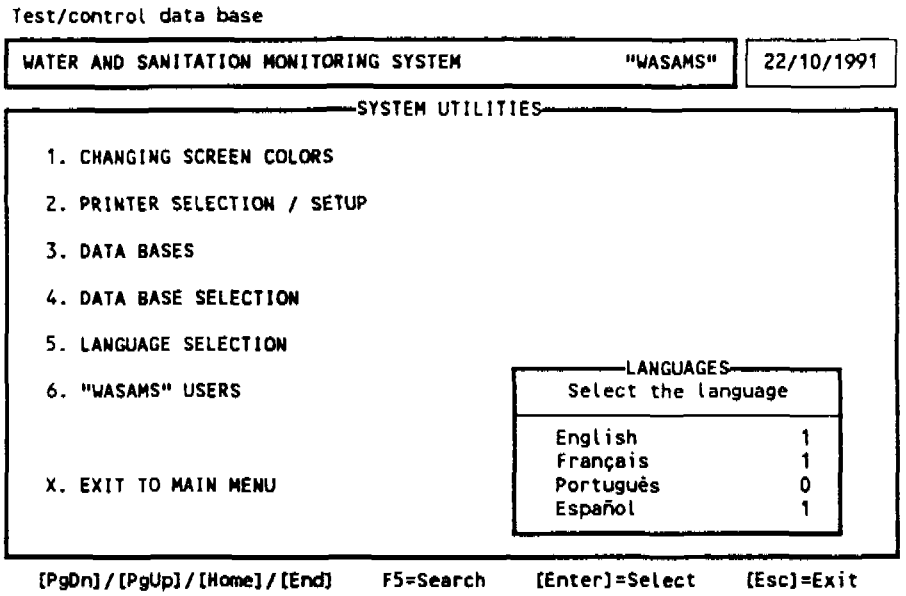
PRINTERS

WASAMS computer system supports work with an unlimited number of different printers. Any printer can be added to the list. System administrator/support will also add all needed controlcontrol codes.



LANGUAGES

WASAMS is a multi-language application. The utility No. 5 Language choice gives the list of languages with a code (0/1) indicating if the language is available or not. Selection of a different language will have an immediate effect.

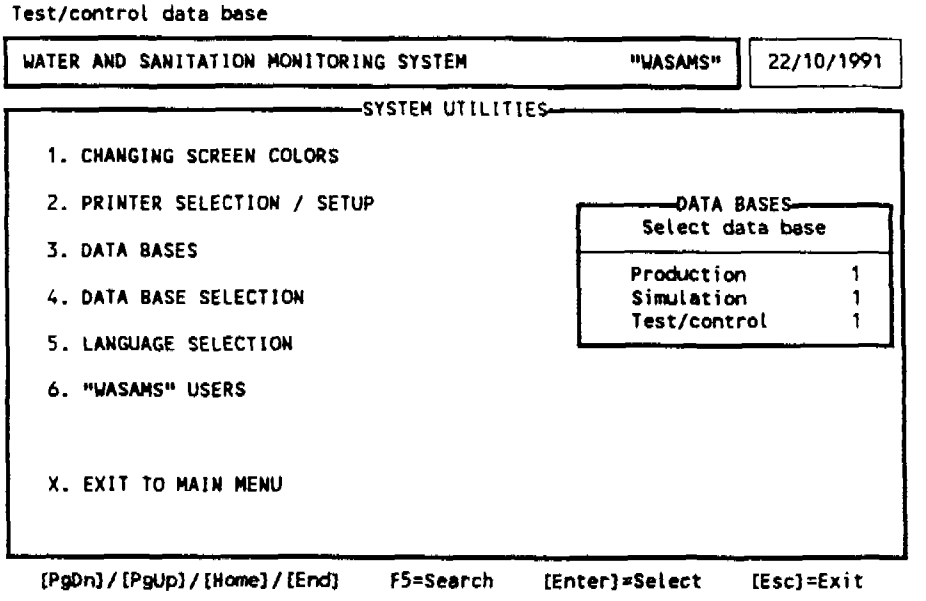


All the screens, reports and messages would be in the newly selected language.

DATA BASES

Utility No. 4 Data base choice is a switch between different data bases called: Production, Simulation and Test/Control.

The purpose of having them available is to separate validated (Production) data from that being used in the Test or Simulation.



The Test/Control data base is the one where the data should be loaded up when received, examined and controlled and only if correct it should be copied into the Production, data base.

WATER AND SANITATION MONITORING SYSTEM

W A S A M S

Version 1.3

(January 1992)

WHO/UNICEF JOINT MONITORING PROGRAMME

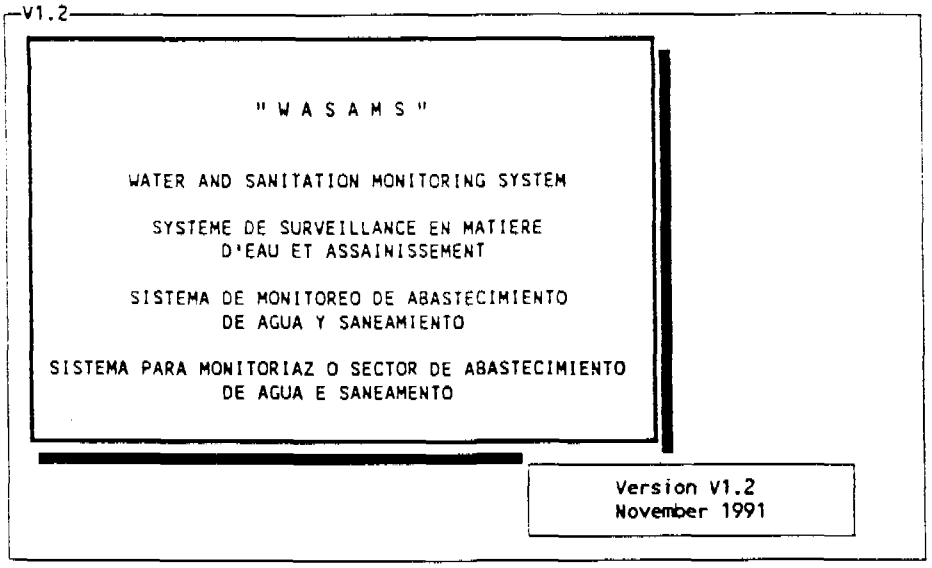
T U T O R I A L

WORLD HEALTH ORGANIZATION

Community Water Supply and Sanitation Unit
1211 Geneva 27
Switzerland

Tel: (41) 22 791 2111

UNITED NATIONS CHILDREN'S FUND
Water and Sanitation Section
UNICEF House (H-11F)
3 United Nations Plaza
New York
New York 10017 USA
Tel: (212) 326-7120/21



Press any key to continue...

WASAMS COMPUTER SYSTEM

WASAMS is a sector management tool. It has been developed to improve monitoring at the country level through systematic coordinated reporting within the framework of sector strategies and goals. It was designed to facilitate the collection and aggregation of data from the lowest level of administration, through to national level.

The system has been developed as an open ended "add-on" to the broader CESI+ Country Statistics Monitoring System (CESTAT) developed during the IDWSSD[1] by WHO for the purpose of monitoring the water supply and sanitation sector and has therefore the potential for continuous modification, expansion and upgrading to correspond to specific country needs. The limited number of core indicators remain a permanent feature to ensure regional and global standardization.

The WASAMS computer application is an information management system developed on relational data base. It is primarily intended to facilitate water supply and sanitation sector monitoring, planning and management at country level. The system was developed in 1990-1991 in response to needs for enhancement of sector monitoring at country level identified during review of the sector situation at the end of the IDWSSD by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF).

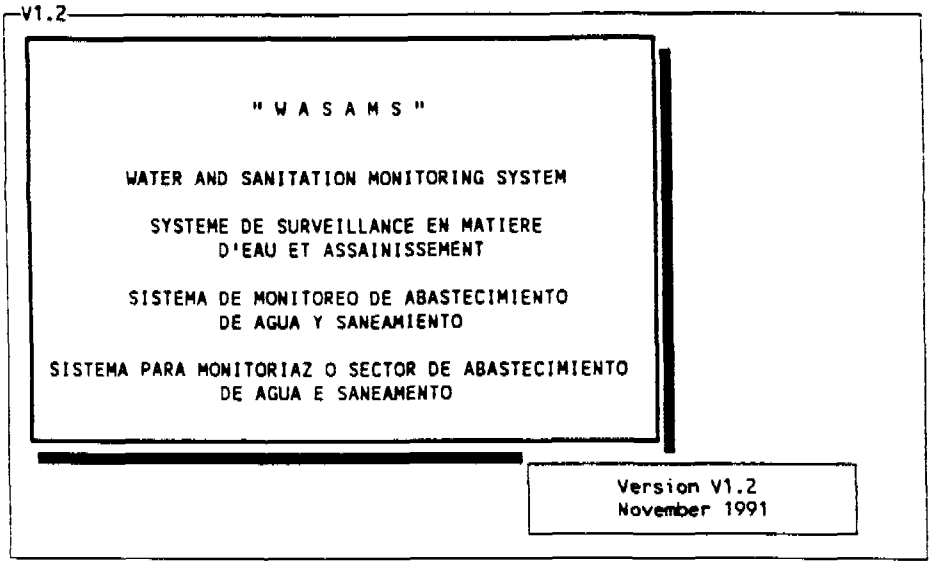
The microcomputer application is an on-line, interactive, real time and menu driven system. As a user you will find out that there are built-in controls and validations for most fields and there are also "look-up and/or select" functions to help you to enter or edit information.

The system operates on three data bases: PRODUCTION, SIMULATION and TEST/CONTROL. The "production data base" is where the verified data is stored. The "simulation data base" is a subset or full copy of the first one. It can be freely modified for analysing the resulting changes - simulations. The "test/control data base" is used to load data received and to examine it. Once it is checked and eventually corrected it can be moved to the "production data base".

To learn more about WASAMS functions and how to use the programme, a WASAMS tutorial is available, but to find out more about installation, operation requirements, logical and physical data base characteristics and other more technical issues, please refer to the TECHNICAL MANUAL.

---

[1] International Drinking Water Supply and Sanitation Decade



Press any key to continue...

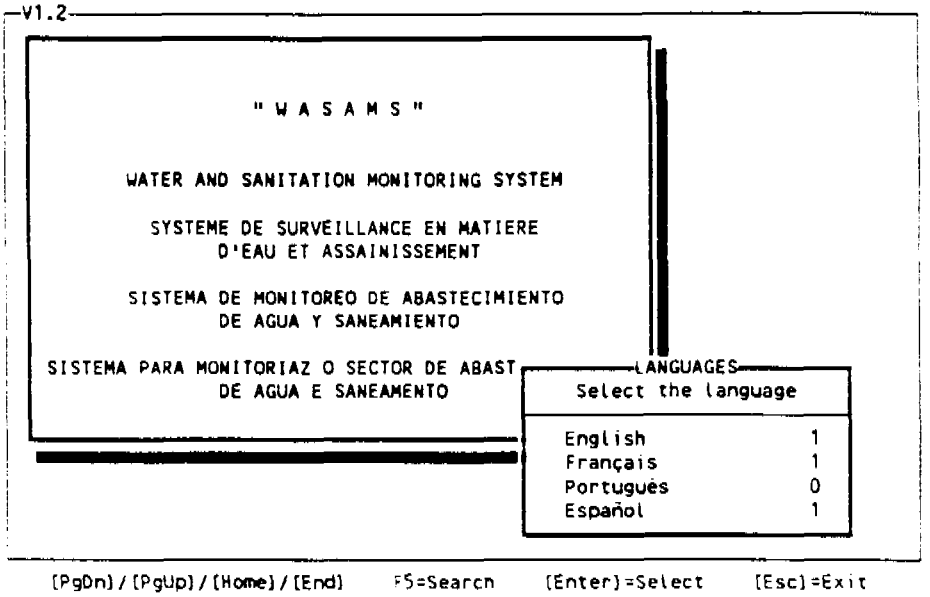
When the picture above appears on your screen you are running the Water and Sanitation Monitoring System "WASAMS".

"WASAMS" has been developed to store, maintain, process and present data collected in the countries reported to the higher administrative level, or to the WHO or UNICEF. It was developed in EHE/CWS, WHO Headquarters in Geneva in 1990-1991.

This manual will help you learn how to use "WASAMS" and it will introduce "WASAMS" functions to you step by step.

When running it, please read carefully the messages (usually at the bottom of the screen) and follow the instructions.

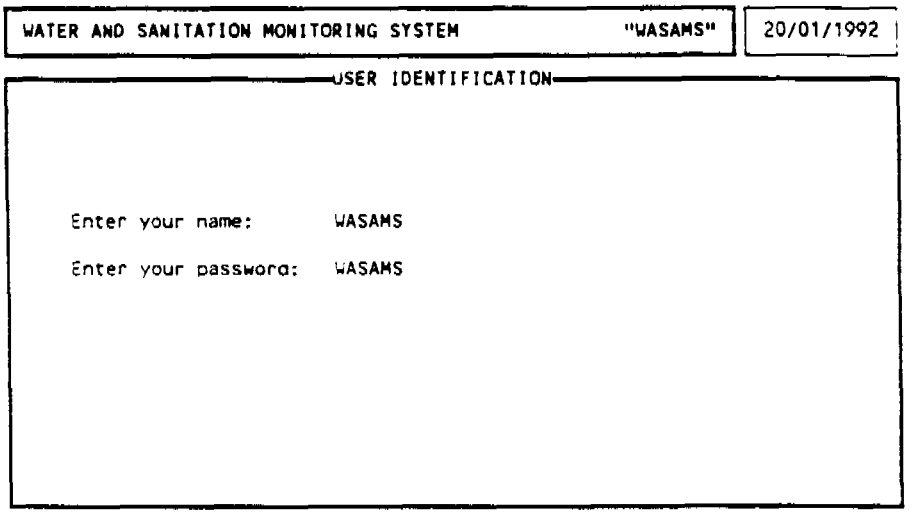
Remember also that the text you are reading refers, in most cases, to the picture on the same page.



"WASAMS" is a multi-lingual computer system. The first version developed, was English, but we work on French, Portuguese and Spanish versions. That means that all screens, messages and text in the reports will appear in the chosen language.

The status code (0 or 1) appearing in the Language selection window indicates if the language option is available or not. Options not available have a "0" status and cannot be selected.

Please select English to continue.

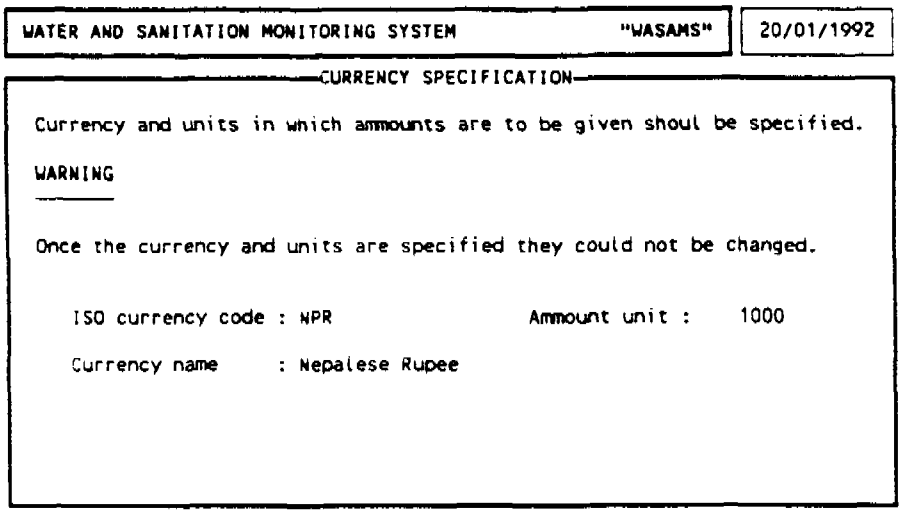


Enter your password (lower case distinct from upper case!).

To run "WASAMS" you should be authorized as a "WASAMS" user with your own user name and password. Your system administrator has probably done that for you.

If not, ask to become a "WASAMS" user.

Please enter your user name, press [Enter] key, enter your password (note the message) and press [Enter] again.



Enter the ammount unit (1, 10, 100, 1000, 10 000, 100 000 or 1 000 000).

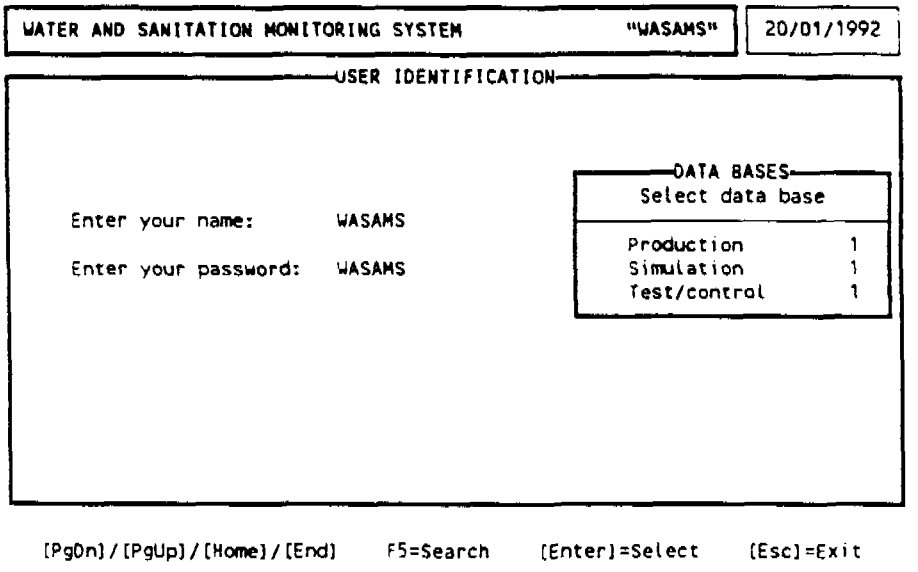
The currency and financial amount unit specification screen appears only when the system is run for the very first time.

User is expected to enter the ISO 3 letter currency code. Function key F4 is a look-up/select key which lists all available currency codes.

Ammount unit could be 1, 10, 100, 1000, 10 000, 100 000 or 1 000 000.

This specification is done only once. Specified values should not and could not be altered.

This feture gives users provision to enter financial figures in local currency so that reports are generated in local currency at the national and sub-national level.



Now you should choose between 3 available data bases. Move the colour bar up or down using arrow keys and select pressing [Enter].

Why the data base selection? It actually means that you can run the same programme(s) using different data sets - data bases.

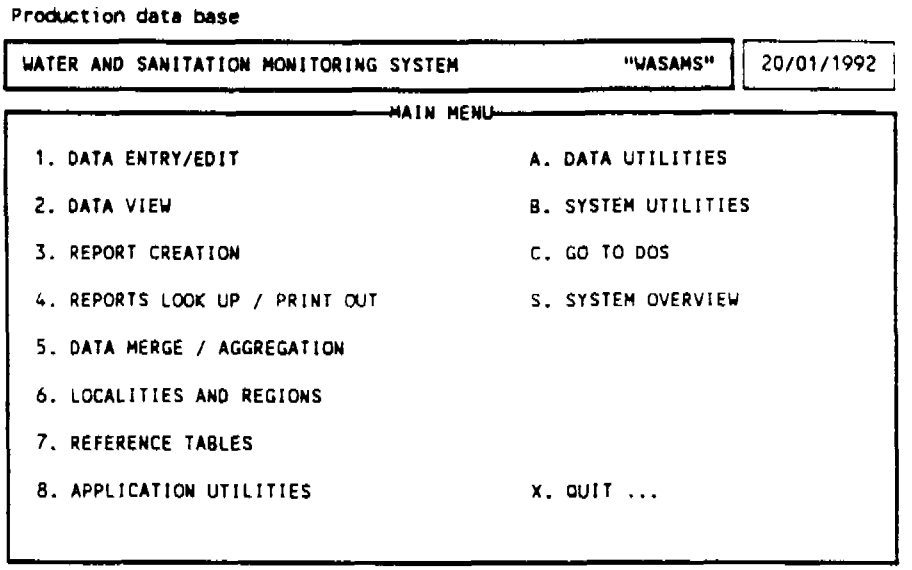
The "good" (verified) data is stored in the Production data bases. Select production data base to work with the "good" data.

Simulation data is the data you can modify - change. Do it and analyse the impact of your changes. Later you will learn how to create a new simulation data base as the copy of Production database.

Test/control data base stores data that you might wish to test/examine first, and then transfer to the production data base. That is the case when receiving data.

You will work with windows similar to "DATA BASE SELECTION" window very often. Already now you could test the functions indicated in the help (action) line at the bottom of the screen.

To continue select the Production database.



Finally, main menu.

Note the data base, top left corner of your screen.
Note the help (action) line at the bottom of the screen.

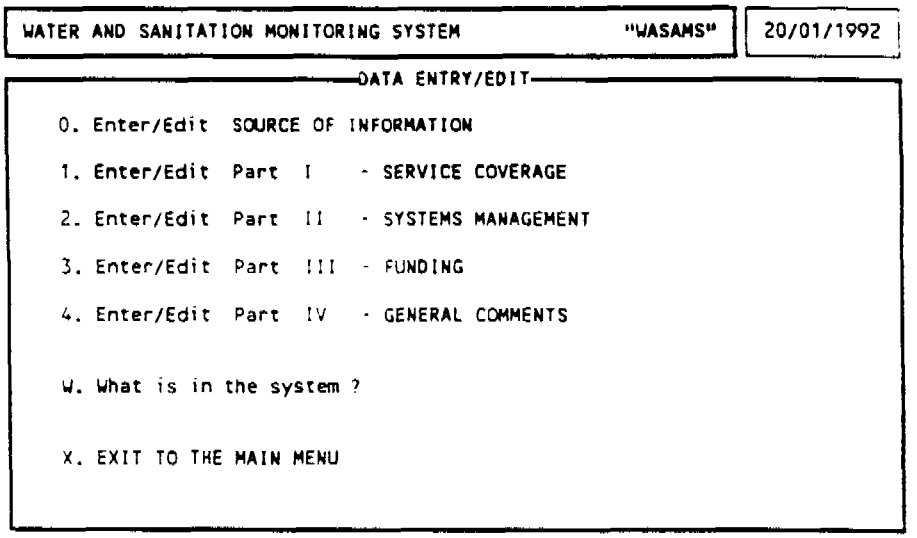
Test the movement of the colour bar by pressing arrow keys!

What should you do first? Which option should you choose?
You could choose any but in this manual we start from the beginning, with first option - 1. DATA ENTRY/EDIT .

The first thing you might wish to do is to look into the data base and see if any data has been entered. If there is something, you might wish to modify, change it. We say: "edit" data. You might wish to delete data or to enter new information.

Select "1. DATA ENTRY/EDIT" and press [Enter] key.

Production data base



Select option with arrow keys, number or letter and press [Enter].

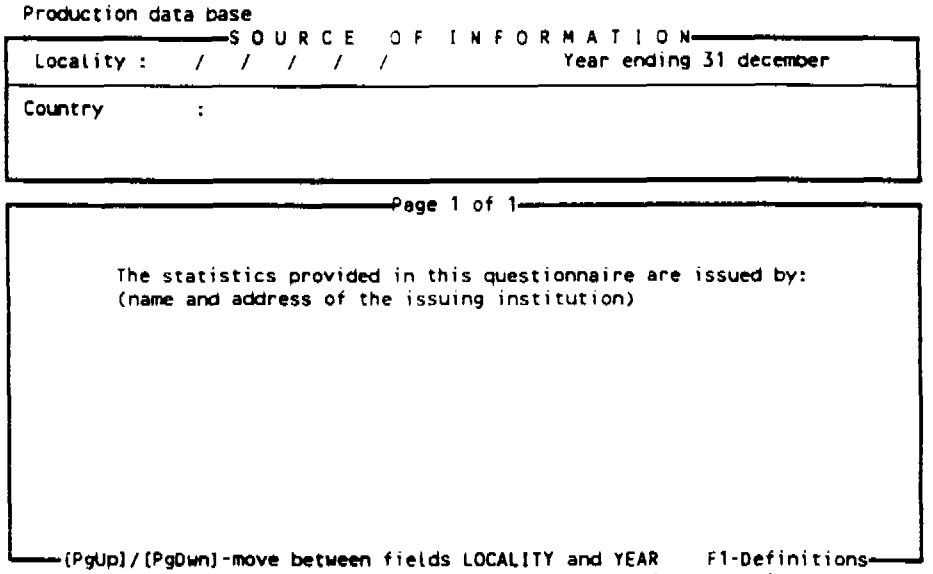
Now you are in the DATA EDIT/ENTRY menu.

There are 7 options here. Options 0 - 4 refer to Parts 0 - 4 in the "WASAMS" Water and Sanitation Sector Questionnaire. The sixth option is "W. What is in the system" and seventh is "X. Exit to main menu".

Test X. Exit to main menu, and select this menu again.

Start with the first option.

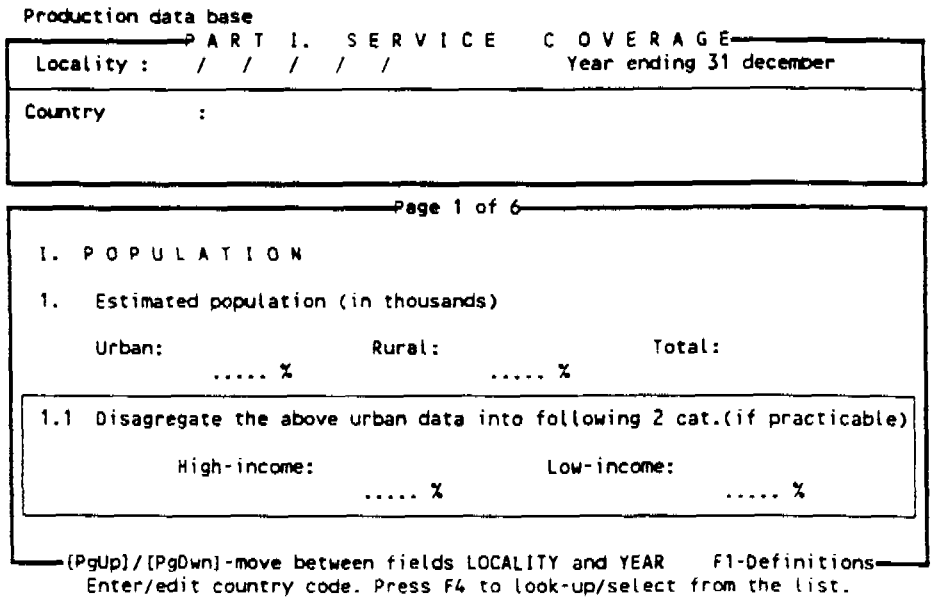
Select 0. and press [Enter].



This is the screen to enter/edit data from the cover page of the "WASAMS" Questionnaire, SOURCE OF INFORMATION.

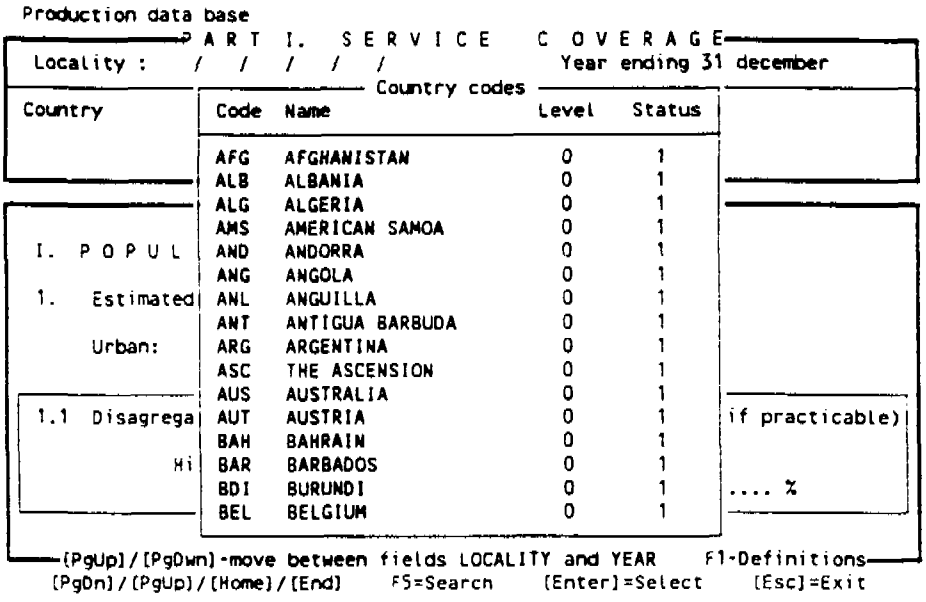
This is a reference information helping the National Monitoring Unit (NMU) to locate and identify the information source.

Press [Esc] to exit from the "SOURCE OF INFORMATION" screen and when back in the data entry/edit menu select the option 1. Enter/Edit Part 1 - SERVICE COVERAGE data.



This is the screen to enter/edit data from Part I - SERVICE COVERAGE of your "WASAMS" Questionnaire. This is page 1 of 4. It is used for entry/edit of the population information.

To enter/edit data you should first specify which locality and year you wish to work with. Cursor is in the field waiting for you to type locality code. It always starts with a 3 letter country code. You do not know country codes? Do not worry! There is a "look up/select" function assigned to the key F4. Press F4, watch the screen and turn to the next page.



All available country codes are now listed in the "look up/select" window.

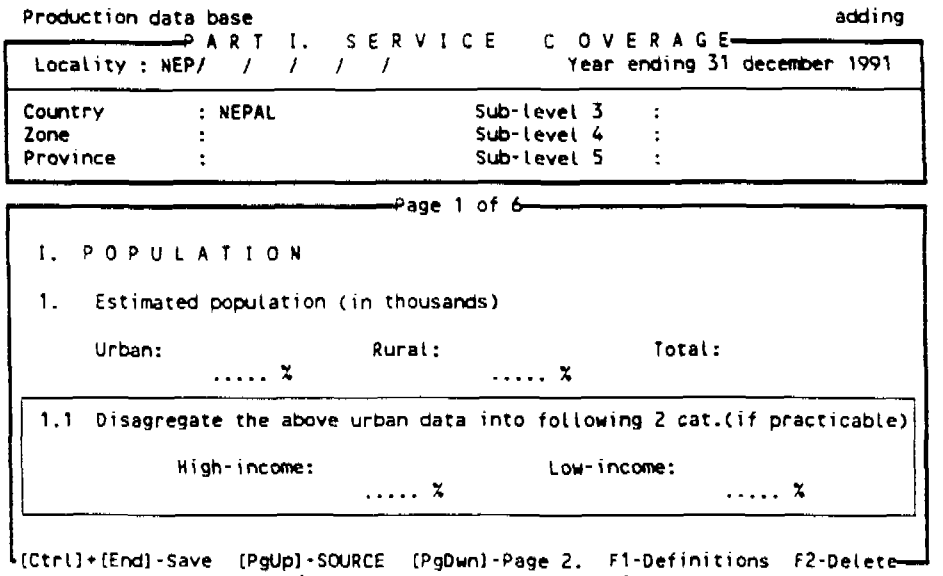
You can page up and down using [Page Up] or [Page Down] keys, you can go to the bottom of the list using [End] key or to the top with [Home] key. Test arrow keys. There is a search function too. Search for the country code which starts with a letter by simply pressing F5 and typing the letter. Use [Esc] to quit search.

Select one code pressing [Enter] key, that will bring it into the locality field.

Exit the window pressing [Esc] key. Test all options.

We continue this manual selecting "NEP" (Nepal).

Select "NEP" and press [Enter].



Country codes window will disappear and Nepal's code "NEP" will be displayed in the country field. Cursor will move to the next field waiting for sub-level code to be entered. There is validation (control) of all codes entered. Use F4 to list sub-level 1. components. Do not select any, instead press [Pg Dn] and enter year "1991"

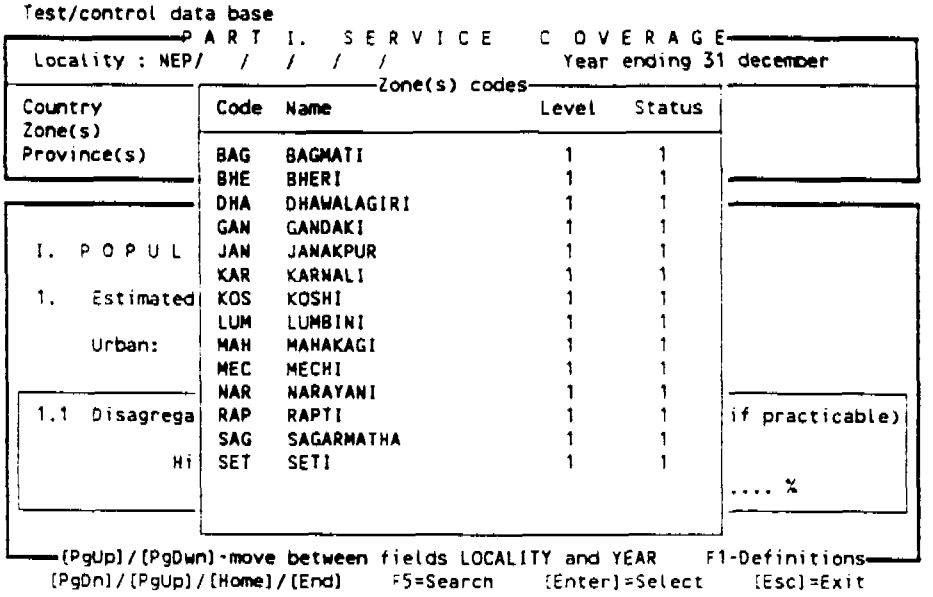
If there is no data existing in the data base for the specified combination of locality and year, in the top right corner of the screen the word "adding" will appear. That means that you are entering information for the specified locality and year for the very first time.

If the data has been entered (even blanks only) the word "updating" will appear and the data will be displayed.

Use [Esc] key to exit Part I, page 1. back to the DATA ENTRY/EDIT menu.

Question might appear in the box. Answer "YES".

Return to the Part I. Move to the second locality identification field and press F4.



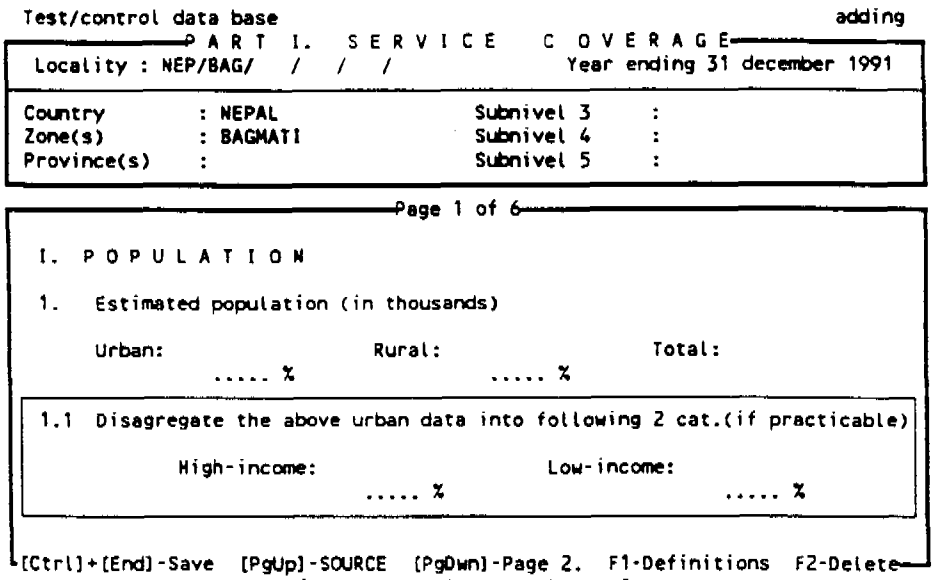
Here are those sub-level 1 components you can enter. Note the number "1" or "0" far right. That is the status we mentioned earlier. As you can see most of the components have status "1" - they are valid (available, open). If the status is "0" that means that the component is simply not valid (it is closed for usage, as if it does not exist).

An invalid locality is still kept in the reference table rather then deleted so that its name can be displayed or written out if needed.

Later when you look closer into the reference tables and their maintenance you will notice that there is no delete function available.

If a country or sub-level component is entered but should not be available (valid) set its status to "0". It can be easily deleted from the file if really not needed later by your system support.

Highlight a sub-level component "BAG" and press (Enter) to select it.



Population information on "NEP" + "BAG" for 1991 has not been entered.

If it was it would have been displayed together with the percentages.

Those percentages are being recalculated and redisplayed every time you change the population figures.

Two bottom lines indicate which commands are available.

F2 is used to delete the Part I from the data base.

If you would press it you would have to confirm the deletion.

F1 is used to read and/or write the Definitions to the Part I.

Test it. Press F1.

WASAMS QUESTIONNAIRE GUIDELINES (1)

To enable regional and global promotion and advocacy on behalf of the sector, there is need for standardization in the broadest sense of the terms used to define elements of the sector. This is of paramount importance. Therefore, the guidelines provided hereafter relate to the "core indicators" and must be considered as indicative only.

Guidelines to Definitions:

It is important to note that the "broad indicative definitions" described herein apply to the WASAMS "core indicators" which will be the only ones to be channelled upwards from national level for use at regional and global levels for advocacy and fund raising purposes.

You can only read the definitions whatever your user profile is.

However, there is no need to modify the definitions since they are indicative. If your definitions are different, please comment in Part IV.

Exit pressing (Esc).

Continue pressing (Pg Down) for the second screen of the Part I.

```
Test/control data base                                                    adding
-------------P A R T  I.   S E R V I C E   C O V E R A G E--------------------
 Locality : NEP/BAG/   /   /   /              Year ending 31 december 1991
-------------------------------------------------------------------------------
 Country        : NEPAL                  Subnivel 3     :
 Zone(s)        : BAGMATI                Subnivel 4     :
 Province(s)    :                        Subnivel 5     :
-------------------------------------------------------------------------------

---------------------------------Page 2 of 6-----------------------------------
 II. S A F E   W A T E R   S U P P L Y
 Population with access to functioning systems (in thousands)
                                          Urban                Rural
 house connections                          ..... %               ..... %
 yard taps                                  ..... %               ..... %
 public standpipes                          ..... %               ..... %
 boreholes with handpumps                   ..... %               ..... %
 protected dug wells                        ..... %               ..... %
 rainwater collection systems               ..... %               ..... %
 other high-cost technologies               ..... %               ..... %
 other low-cost technologies                ..... %               ..... %
 total served                               ..... %               ..... %
 total unserved                             ..... %               ..... %

[Ctrl]+[End]-Save  [PgUp]-Page 1.  [PgDwn]-Page 3.  F1-Definitions  F2-Delete
                     If entered value must be >= 0.
```

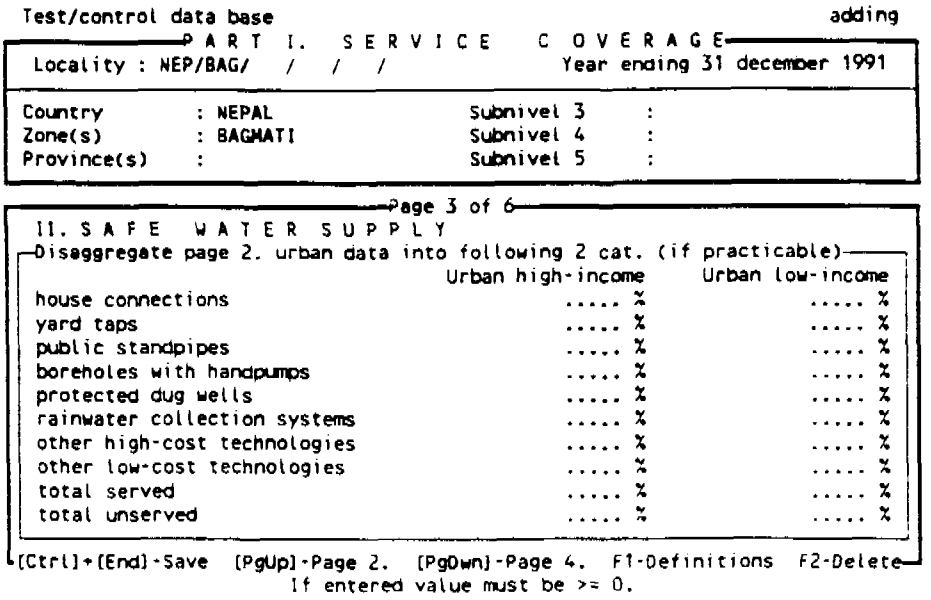
Functions of F1 and F2 keys are the same through all screens.

To go to the previous/next page you can use the [Page Up]/[Page Down] keys.

In screen 2 itself there are validation controls for almost all fields.

What is [Ctrl] + [End] used for? Very useful when changing some values in the form. When the changes are completed press [Ctrl] and [End] keys together. That will take you straight out of the entry/edit screen.

Press [Pg Down] to continue.



This is the 3rd screen of the "WASAMS" questionnaire PART I.

It contains urban water coverage break-down into urban high-income population figures and urban low-income population figures.

The controls are the same as on the previous page, commands available are standard.

Press [Pg Down] for Page 4.

```
Test/control data base                                                  adding
┌────────────PART I.  SERVICE  COVERAGE─────────────┐
│ Locality : NEP/BAG/  /  /  /              Year ending 31 december 1991 │
├───────────────────────────────────────────────────┤
│Country        : NEPAL              Subnivel 3    :                     │
│Zone(s)        : BAGMATI            Subnivel 4    :                     │
│Province(s)    :                    Subnivel 5    :                     │
└───────────────────────────────────────────────────┘
┌──────────────────────Page 4 of 6──────────────────────┐
│ III. S A N I T A T I O N  (sanitary means of excreta disposal)         │
│ Popul. with access to adequate excreta disposal facilities (in thousands)│
│                                          Urban            Rural        │
│ house connect. to conv.publ.sewers          ..... %          ..... %   │
│ house connect.to small-bore sewers          ..... %          ..... %   │
│ house connect. to septic tanks              ..... %          ..... %   │
│ latrines, wet (pour flush etc.)             ..... %          ..... %   │
│ latrines, dry (vent. improved pit)          ..... %          ..... %   │
│ latrines, dry (simple pit etc.)             ..... %          ..... %   │
│ other high-cost technologies                ..... %          ..... %   │
│ other low-cost technologies                 ..... %          ..... %   │
│ total served                                ..... %          ..... %   │
│ total unserved                              ..... %          ..... %   │
│                                                                        │
└[Ctrl]+[End]-Save  [PgUp]-Page 3.  [PgDwn]-Page 5.  F1-Definitions  F2-Delete┘
                  If entered, value must be >= 0.
```

This is the 4th screen of the "WASAMS" questionnaire PART I.

It contains sanitation coverage figures.

The controls are the same as on the previous page, commands available are standard.

Press [Pg Down] for Page 5.

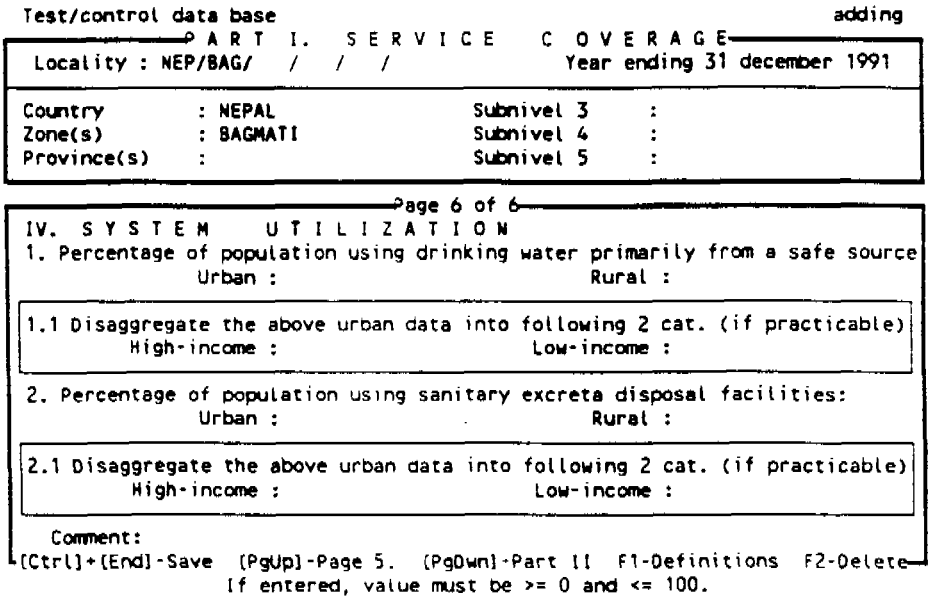
```
Test/control data base                                              adding
-------------P A R T  I.   S E R V I C E   C O V E R A G E-----------------
 Locality : NEP/BAG/   /   /   /              Year ending 31 december 1991
----------------------------------------------------------------------------
 Country        : NEPAL                    Subnivel 3     :
 Zone(s)        : BAGMATI                  Subnivel 4     :
 Province(s)    :                          Subnivel 5     :
----------------------------------------------------------------------------

-----------------------------------Page 5 of 6------------------------------
 III. S A N I T A T I O N  (sanitary means of excreta disposal)
-Disaggregate page 4. urban data into following 2 cat. (if practicable)----
                                  Urban high-income    Urban low-income
 house connect. to conv.publ.sewers           ..... %             ..... %
 house connect.to small-bore sewers           ..... %             ..... %
 house connect. to septic tanks               ..... %             ..... %
 latrines, wet (pour flush etc.)              ..... %             ..... %
 latrines, dry (vent. improved pit)           ..... %             ..... %
 latrines, dry (simple pit etc.)              ..... %             ..... %
 other high-cost technologies                 ..... %             ..... %
 other low-cost technologies                  ..... %             ..... %
 total served                                 ..... %             ..... %
 total unserved                               ..... %             ..... %
----------------------------------------------------------------------------
[Ctrl]+[End]-Save  [PgUp]-Page 4.  [PgDwn]-Page 6.  F1-Definitions  F2-Delete
                      If entered, value must be >= 0.
```

This is the 5th screen of the "WASAMS" questionnaire PART I.

It contains urban sanitation coverage break-down into urban high-income population figures and urban low-income population figures.

The controls are the same as on the previous page, commands available are standard.

Press [Pg Down] for Page 6.



The last, 6th page of the "WASAMS" questionnaire PART I contains system utilization data.

Commands are standard.

To continue exit pressing [Esc] key.

When back in Data Entry/Edit Menu press (W) to test "What is in the system" function.

Test/control data base

INFORMATION ON ENTERED QUESTIONNAIRES

Locality Code	Locality Name	Year	SOURCE INFO	Part IV
NEP/ / / / /	NEPAL	1990		
NEP/BAG/ / / /	BAGMATI	1990		
NEP/BAG/BHA/ / /	BHAKTAPUR	1990		
NEP/BAG/DHA/ / /	DHADING	1990		
NEP/BAG/KAT/ / /	KATHMANDU	1990		
NEP/BAG/KAV/ / /	KAVRE	1990		
NEP/BAG/LAU/ / /	LAUTPUR	1990		
NEP/BAG/NUW/ / /	NUWAKOT	1990		
NEP/BAG/RAS/ / /	RASUWA	1990		
NEP/BAG/SIN/ / /	SINDHU-PALCHOK	1990		
NEP/BHE/ / / /	BHERI	1990		
NEP/BHE/BAN/ / /	BANKE	1990		

REPORTING STATISTICS

NEPAL, 1990	Given	Summed	Projected	Estimated
Part I Coverage	63 %	... %	... %	... %
Part II Systems Management	81 %	... %	... %	... %
Part III Funding	81 %	... %	... %	... %

F5=Search Enter=Select Del=Delete Ins=Mark to prnt P=Prnt Esc=Exit/cancel prnt

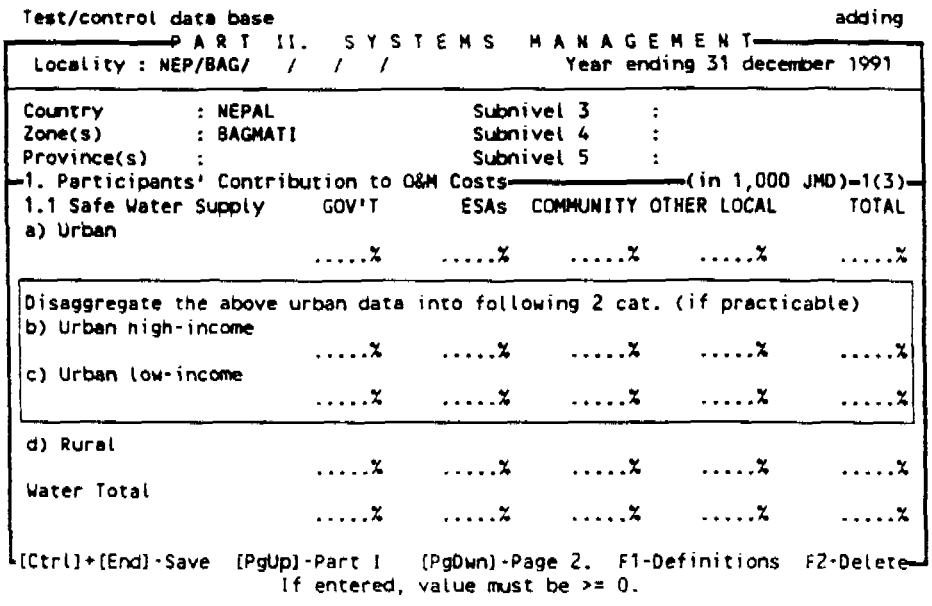
When you choose option "W" in the data entry/edit menu a new window will be opened.

It says "NOTHING" if no data exists in the data base or it lists entered localities and years. The "reporting statistics" information is being displayed in the bottom window with percentages of given, summed, projected or estimated data items in each part of the questionnaire.

Note the command line at the bottom of your screen and its print option for printing out a selected questionnaire

Remember that by pressing [Enter] you will select the highlighted locality and year to work with. The system will remember what you have chosen and you will not need to enter locality code and year when working with PARTS I - III unless you wish to change to another combination of locality and year.

Exit and select PART II to continue.



PART II records information on operation and maintenance costs.

Note that most data to be entered are to two decimal places.

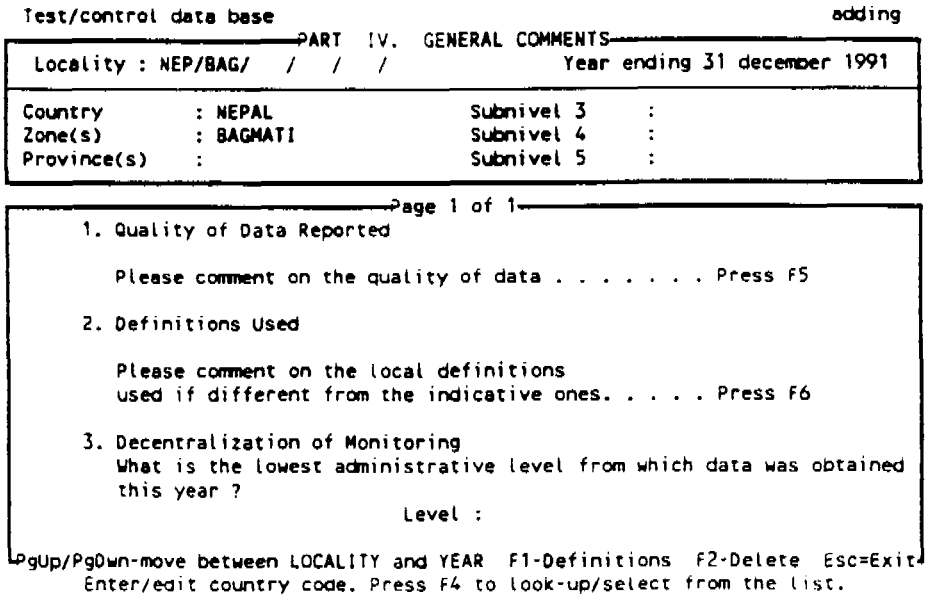
To let you leave it blank we defined all fields as character fields. That means that you can use [Ctrl] + [Y] to clear the field, [Del] or backspace key to delete one character at a time, [Home] and [End] to move to the beginning and the end of the field. Once a value is entered it is rewritten right justified with predefined number of decimals. The entry of the numerical values is being simulated.

Test usage of all these keys as well as entry/edit with and without [Ins] key being pressed.

Go through the second and third page at Part II to become familiar with the information, data control and commands.

Do the same with Part III. which has 4 screens.

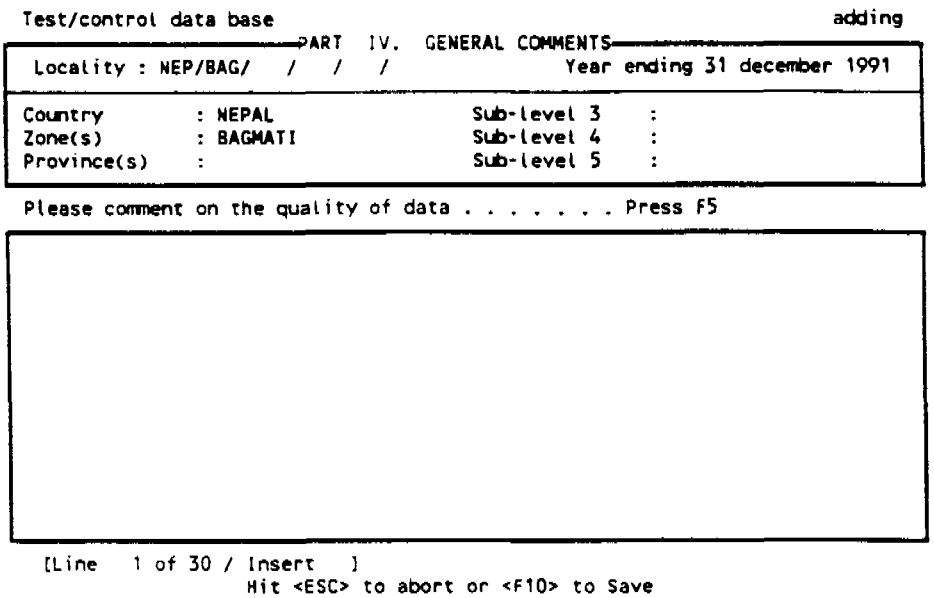
To continue this exercise return to DATA ENTRY/EDIT MENU and select the option "4. PART IV - GENERAL COMMENTS".



This is the PART IV to enter comments on data quality, and on definitions used if different from the indicative ones.

Pressing F5 or F6 key you will open a window and run a simple word processor to write comments. They will be saved in a text file for later retrieval and/or modifications.

Press F5.

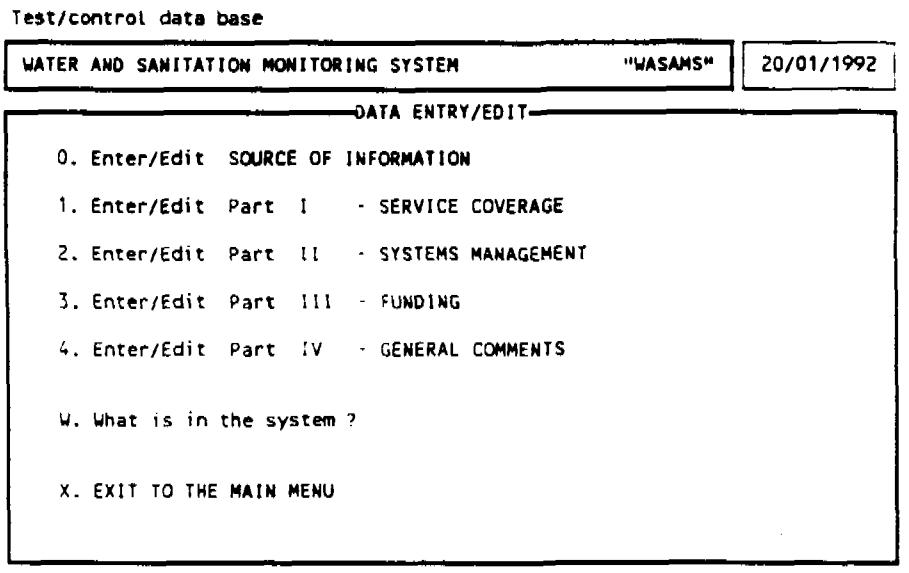


A window is being open to write comments on quality of data.

Please, test the word proccessor. Press "help" key F1 for the list of available commands.

To save text press F10, to cancel press [Esc].

To continue this exercise return to MAIN MENU and select the option "2. DATA VIEW".



The DATA VIEW menu is identical to the one for DATA ENTRY/EDIT.

You will have "read only" access to the information.

In addition to paging back and forward with [Pg Up] and [Pg Dn] keys, use [N], [T], [E] and [P] keys to move through data files and view the records.

To continue select option 3. and press [Enter]

Test/control data base viewing

PART III. F U N D I N G

Locality : NEP/ / / / / Year ending 31 december 1990

Country : NEPAL Subnivel 3 :
Zone(s) : Subnivel 4 :
Province(s) : Subnivel 5 :

1. Contribution to Capital Costs for NEW SYSTEMS (in 1,000 JMD)=1(4)
Average annual exchange rate : 1 US$ = national currency units.

1.1 Safe Water Supply	GOV'T	ESAs	COMMUNITY	OTHER LOCAL	TOTAL
a) Urban					
	.....%	.....%	.....%	.....%	.....%
Disaggregate the above urban data into following 2 cat. (if practicable)					
b) Urban high-income	2818.00	2088.00	465.00	10.00	5381.00
	52.3%	38.8%	8.6%	.1%	38.9%
c) Urban low-income	231.00	1085.00	65.00	0.00	1381.00
	16.7%	78.5%	4.7%	.0%	9.9%
d) Rural	3121.00	3057.30	774.00	120.00	7072.30
	44.1%	43.2%	10.9%	1.7%	51.1%
Water Total	6170.00	6230.30	1304.00	130.00	13834.30
	44.6%	45.0%	9.4%	.9%	75.5%

Press: T-Top of file E-End of file N-Next record P-Previous record X-Exit
[PgUp]-Page 1. [PgDwn]-Page 2. [Esc]-Exi

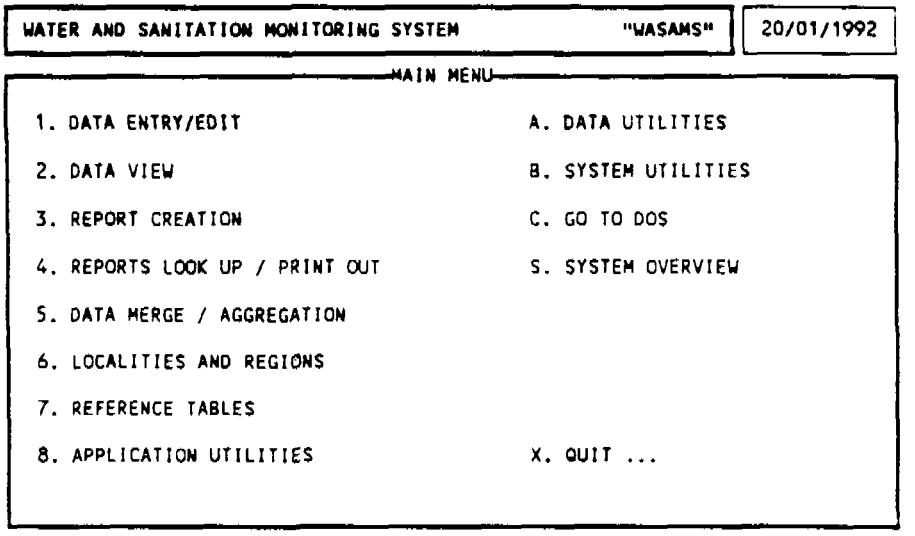
Picture above illustrates the data viewing of the Part III, page 1.

Note commands available and test them.

Continue exiting to the main menu.

t

Test/control data base



Select option with arrow keys, number or letter and press [Enter].

After completing Part IV, the whole Questionnaire was entered and it was time to generate (create) report(s).

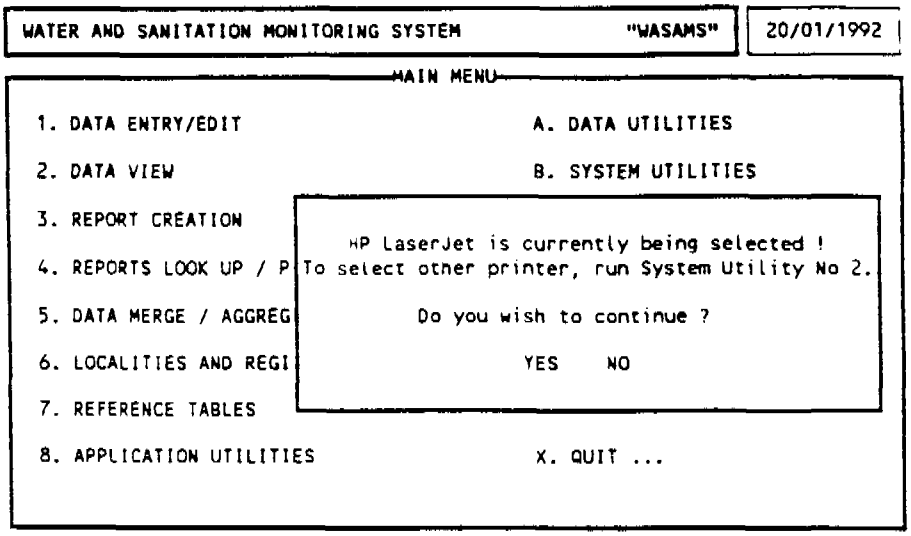
The system will give you a choice of national reports, regional, and local reports for the selected locality. They are "instant" - for a specific year.

The creation of report(s) takes a very short time. It takes less than a minute to generate a report but if you decide to generate more reports at the same time, then it will take more time.

When back in the main menu read the titles of the options 3. and 4. Next we will choose option 3. but remember you can always go directly to option 4. to check if there are any reports already generated.

Select option 3. and press [Enter].

Test/control data base



Select option with arrow keys, number or letter and press [Enter].

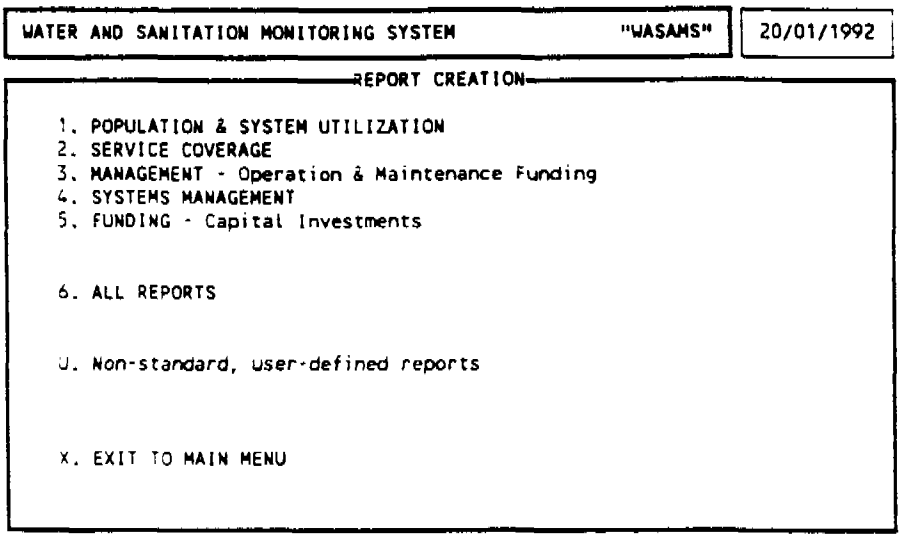
First, the system controls if the printer is being selected. The information will flash on your screen instructing you what to do.

It is important that the correct printer is selected. Reports generated "for" ex. HP Laser Jet, will not be sucessfulty printed on any other printer.

If you change the printer, remember to regenerate all reports you intend to print out.

Select "YES" and press [Enter] to continue.

Test/control data base



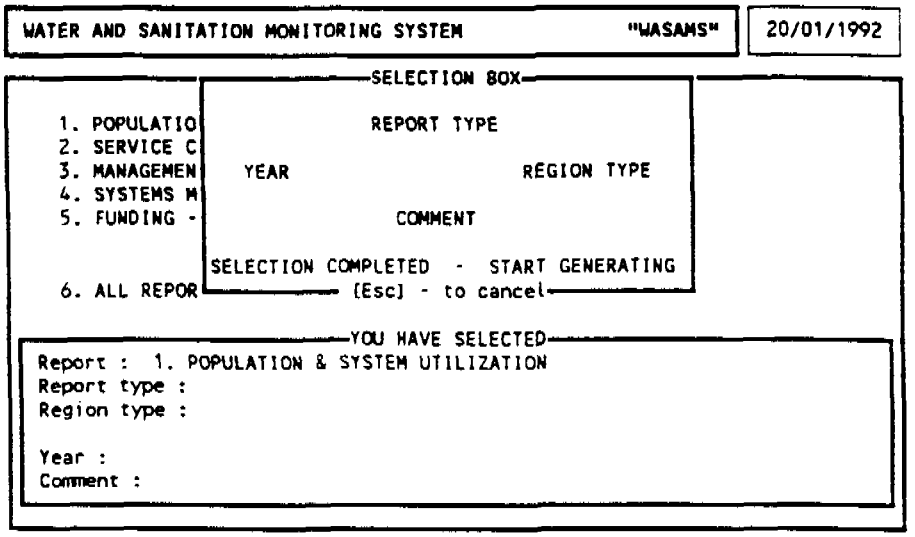
Here is the reports menu.

There are 5 reports in this group. You can generate one or all of them at the same time. This screen will be followed by a selection box.

If you decide to cancel report generation you can still do it while in the selection box.

Select 1. and press [Enter].

Test/control data base

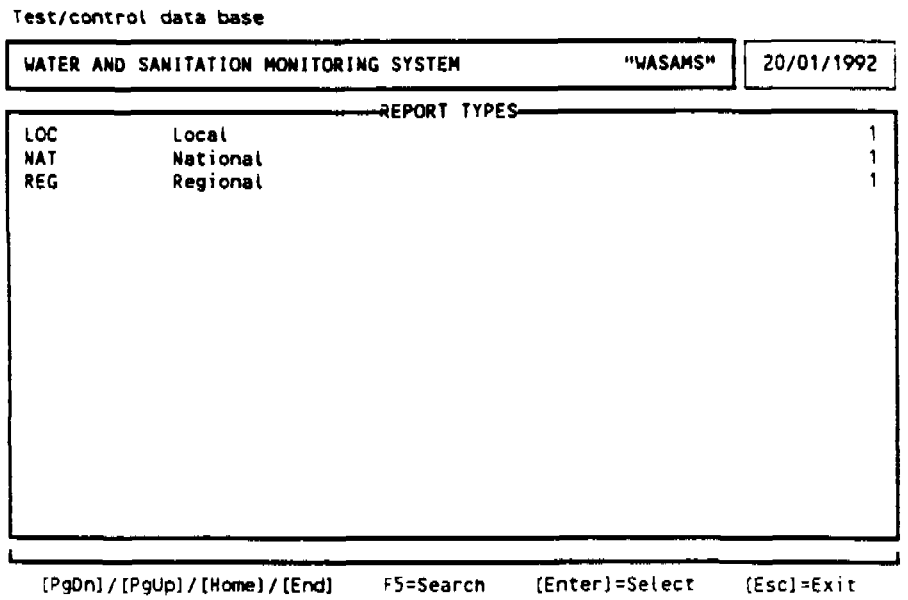


Select option with arrow keys, number or letter and press [Enter].

You are expected to specify 4 parameters. That is why there are 4 items in the selection box. Note the bottom window with the headline "YOU HAVE SELECTED".

There you are reminded of the parameters chosen.

You are generating Report No. 1. Now specify the parameters. Move the colour bar in the selection box using arrow keys, or initial letter (read the help line), select "REPORT TYPE" and press [Enter].



The available report types are listed in the window. There are 3 of them. National, Regional and Local reports are of the same type.

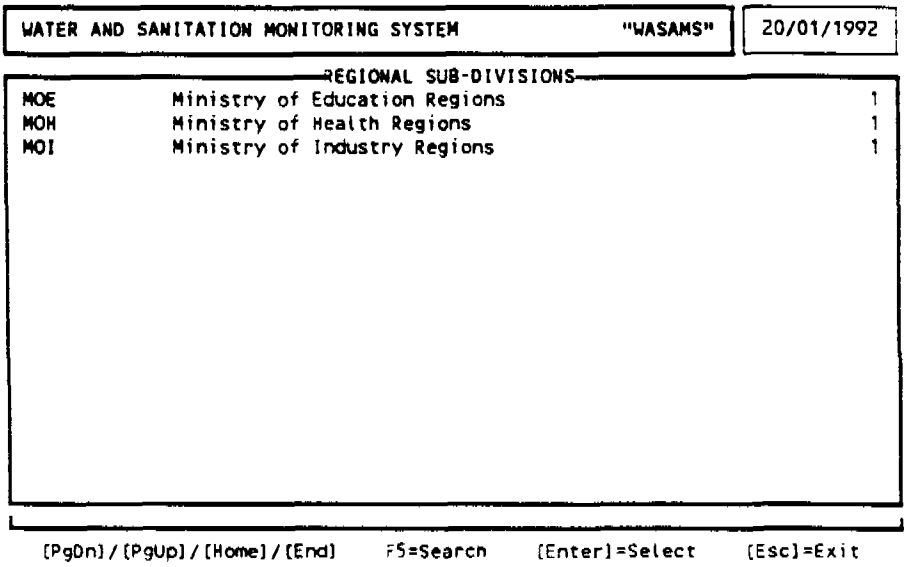
National reports give summarized information by country regions.

Regional reports give information by localities of the specified region.

Local reports give information by the components (localities) of the first lower sub-level, for specified locality.

Start with REGIONAL. Highlight the third line and press [Enter].

Test/control data base

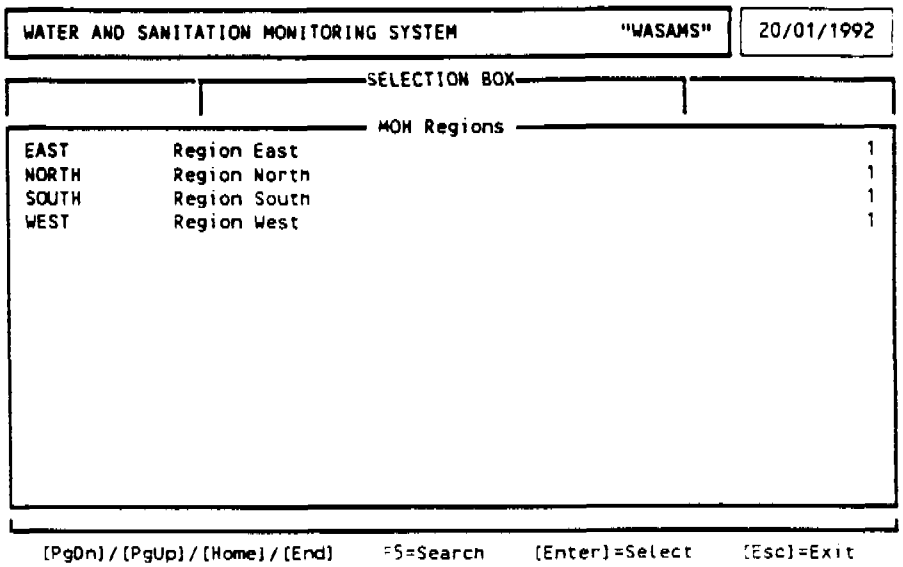


When back in the selection box choose item "REGION" and press [Enter].

New window will appear with the list of available region types. The reports could be created for any type of regional sub-divisions specified.

Select "MOH" and press [Enter].

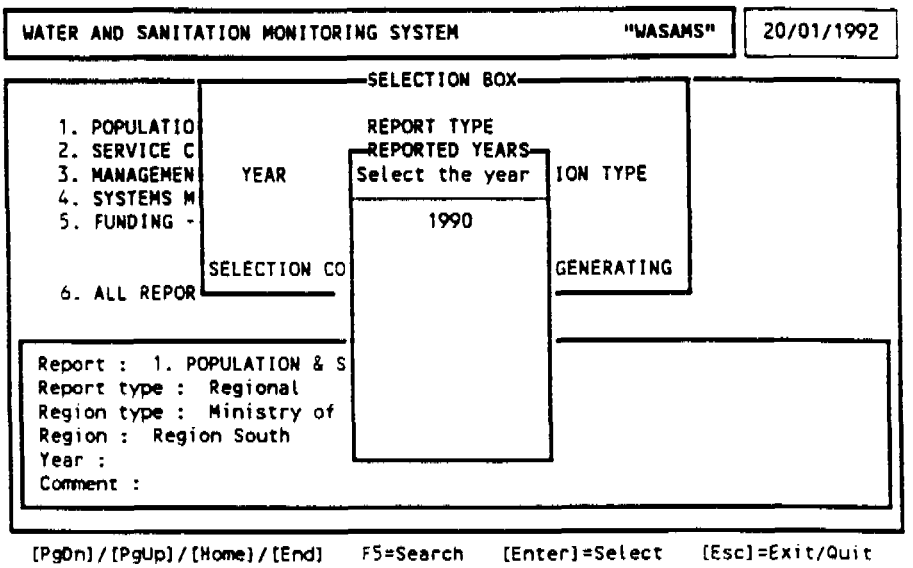
Test/control data base



All "MOH" regions with their codes and labels appear in the selection window. Move the colour bar up and down and select "Region South" to generate the report.

When back in the "selection box" move to the item "YEAR".

Test/control data base



You are back in the selection box. Read bottom window. It says that regional report is selected and it will be generated by "MOH" Region South localities.

Now select the year. If you try to run the report generating by highlighting line "SELECTION COMPLETE - START GENERATING" and pressing [Enter] a message will appear in the box informing you that all required parameters are not specified and that report generating cannot start.

Test it.

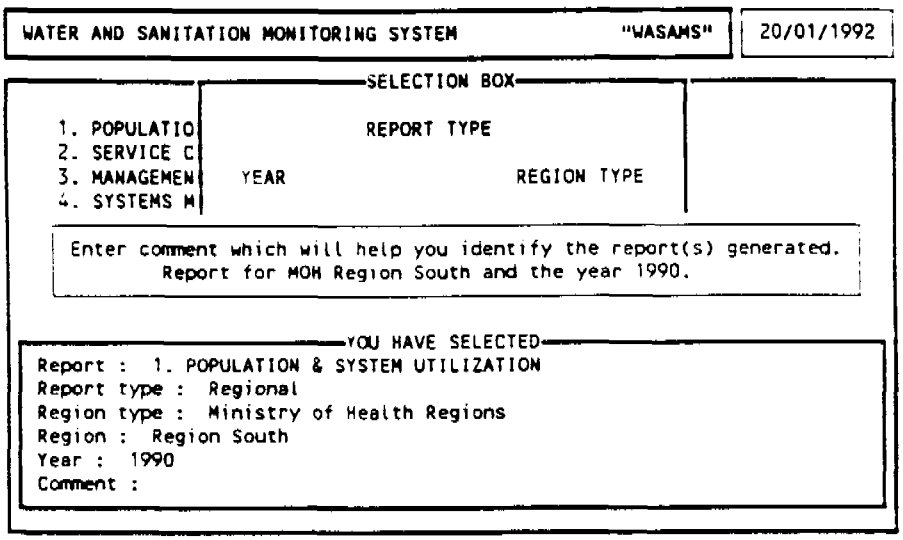
To select year highlight the item YEAR and press [Enter].
A window with reported year(s) will appear. You can select one of them.

Select 1990.

There is one more parameter to specify. Comment. This one will be saved and later displayed together with the name of the report. It will help you to identify the report generated.

Select item "COMMENT" and press [Enter].

Test/control data base



Enter value in highlighted area.

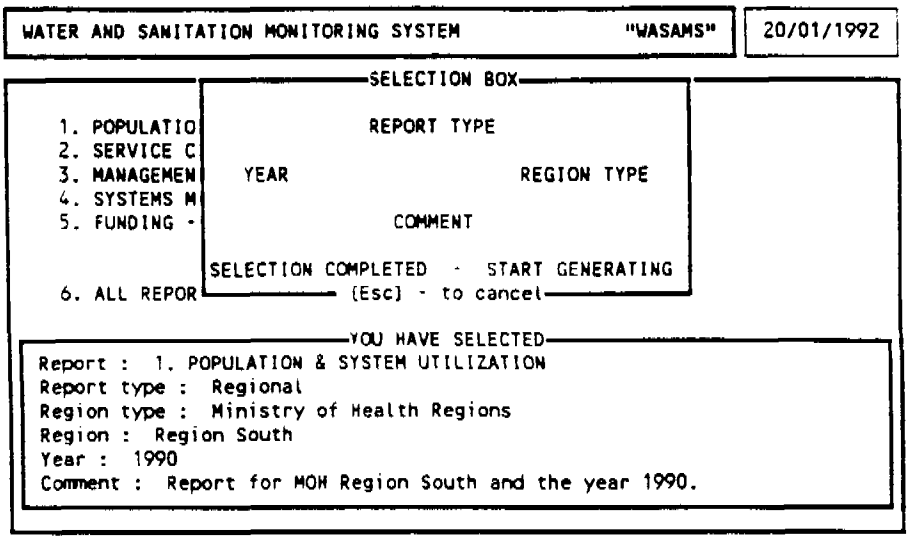
You can enter anything in this field.

The most useful information to enter would be the information about year specified and region. This information will not be built into the report name. More about report name later.

Let us enter "Report for MOH Region South and the year 1990".

Press [Enter].

Test/control data base



Select option with arrow keys, number or letter and press [Enter].

Now you can start generation. Do it by highlighting bottom line in the selection box and press [Enter].

You have selected regional report for 1990 by MOH Region South localities.

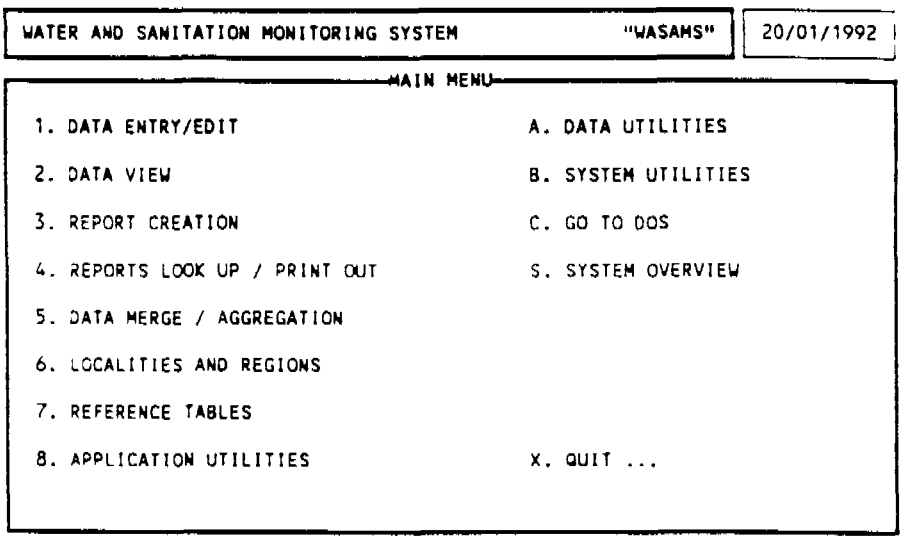
The message at the bottom of the screen will say

" ... please wait ... report generating in progress ... ".

There is no way to cancel the task. If you switch the computer off it could cause serious problems. Do not do it, instead wait.

When generating completed, return to the main menu.

Test/control data base



Select option with arrow keys, number or letter and press [Enter].

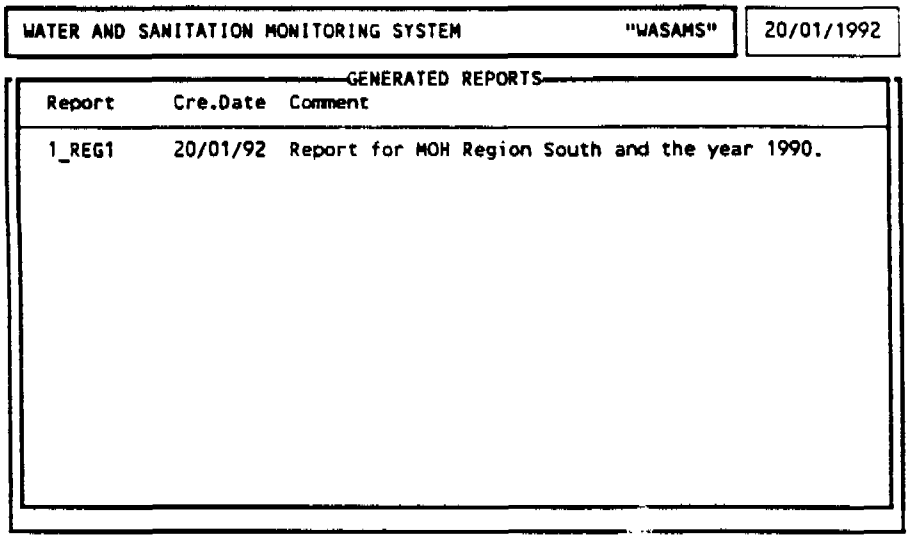
Option 4. report "look up/printout" as it says gives you the possibility to list all reports generated, to view them and print if wanted.

"WASAMS" reports are always saved in files for later printout. When no longer needed in the system they can be deleted.

All of these functions can be found in Option 4.

Select it and press [Enter].

Test/control data base



The list of existing reports is now on your screen.

Observe the report names.

They start with a number. The number corresponds to a report number in the menu. Then there is a 3 letter code : "NAT", "REG", or "LOC" which says what type of report it is: national, regional, or local report. Then comes the version number which means that you could have up to 999 versions of the same report. This is needed since you might wish to generate the same report for different years and/or different region types or regions. Also, when working with simulation data, in simulation data base, you might wish to run the same report many times after changing the various data items.

Bottom help line is slightly different from the ones you have seen before.

Let us start testing [Del] key. Press it, but do not delete the report.

To continue press F4 to look up the selected report.

Date report generated : 20/01/1992

Regional report

TABLE 1. - POPULATION AND SYSTEM UTILISATION (population in thousands; with

for the year 1990 and for MOH region Region South

Locality	P O P U L A T I O N				
	Total	Urban			
		Total	High	Low	
LUMBINI	1,237.00	55.00 (4)	5.00 (9)	50.00 (91)	1,
NARAYANI	909.00	72.00 (8)	12.00 (17)	60.00 (83)	
RAPTI	673.00	.00	.00	.00	

There is a "look up" function assigned to the F4 key. The report will be open for you to look at, not to write or change something. Test it.

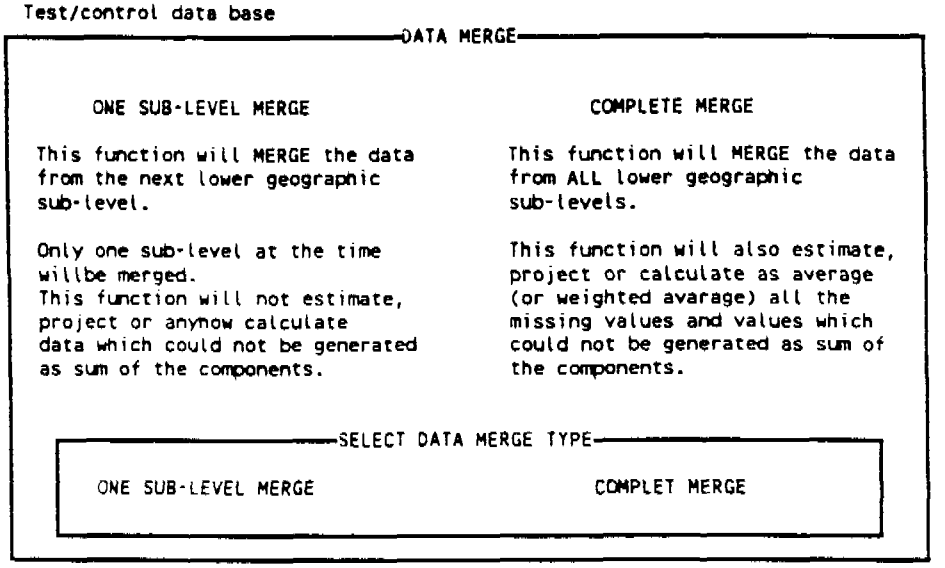
Picture above illustrates the report layout.

Now, please exit using [Esc] key, read the help line and test the other functions.

To print you should first select one or more reports for printing by pressing [Ins] key. Test. To cancel the selection use the same key. When at least one report is selected you can start the printout by pressing [P] key.

Check that the printer is on line, that there is enough paper and start printing. To cancel the printout press [Esc] key.

Exit back to the main menu and select option 5. to continue.



This is a data merge (aggregation) utility.

It is used when sector information is being collected on the sub-national level rather than the country level.

Use this utility to generate national data for specific year.

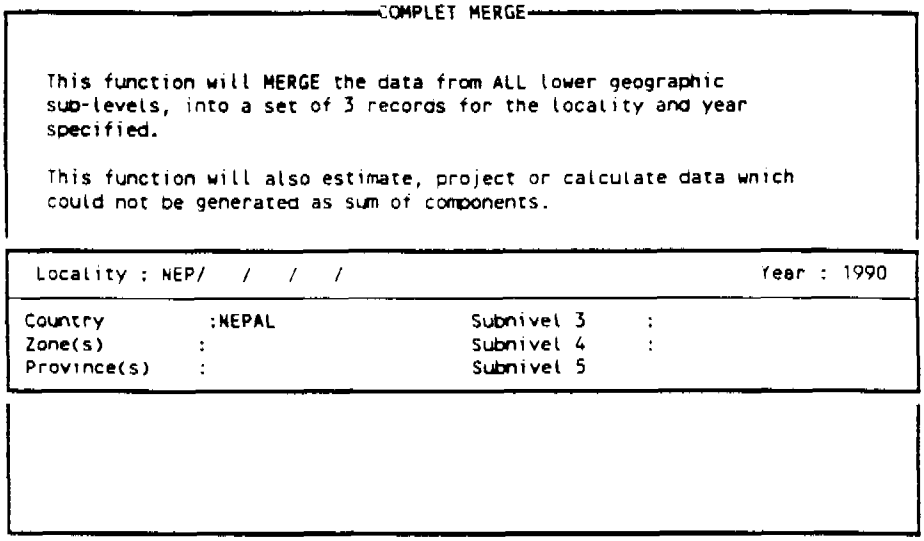
It will add up or calculate value for each of "WASAMS" Questionnaires data items.

There are two types of data aggregation. Select simple (one-level) aggregation. Test it on NEP for 1990.

If the data for selected locality and year already exists the WARNING text will appear on your screen instructing you what to do.

When successfully completed, select the complete aggretation.

Test/control data base



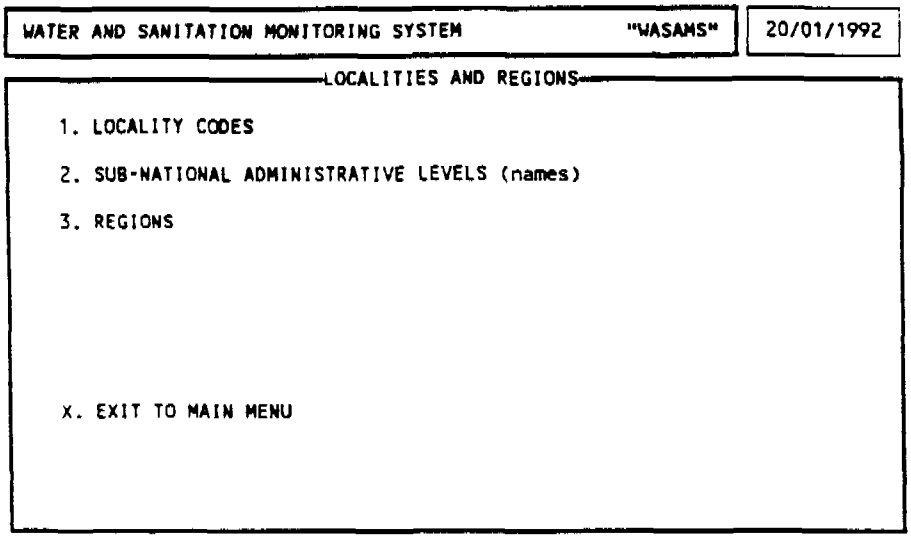
Enter year. Press F4 for the list.

Read carefully the instructions and continue.

Then return to the main menu and select the option "6. Localities and regions".

Press [Enter].

Test/control data base



Here is the "localities and regions" menu. There are 3 options listed. Most of reference tables have been mentioned before. You learned how to look up and select using the F4 key. You also learned that there is validation (control) and that only valid (open) codes, the ones with status "1", could be selected.

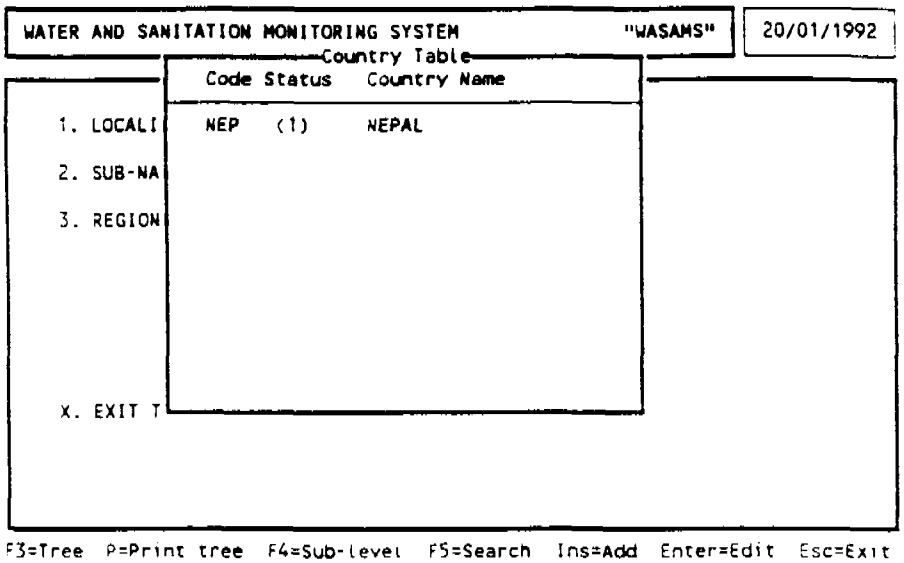
Now we are going to learn how to maintain sub-levels and regions.

Remember that there is no possibility to delete anything. We can only close some codes by changing their status to "0".

If there is really a need to delete please contact your system support.

Select option 1. to start with.

Test/control data base



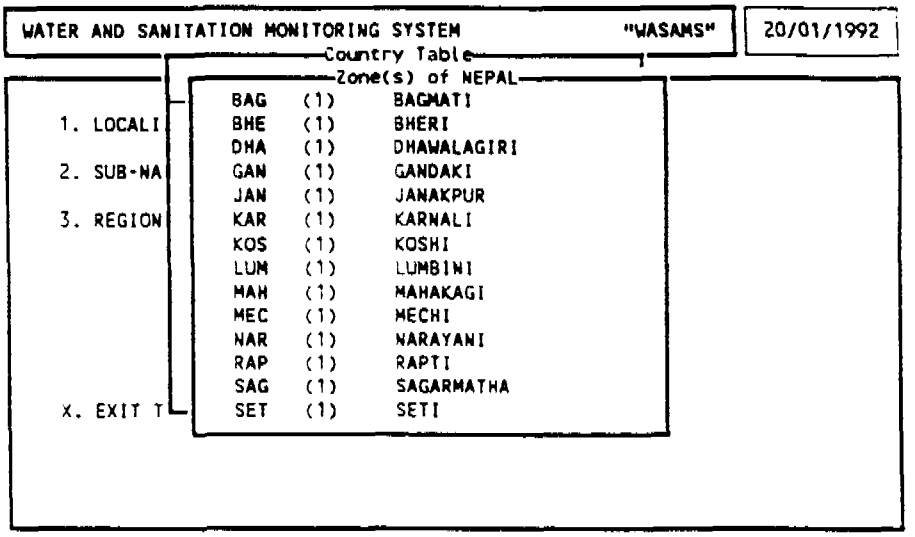
Here are country codes.
Please press [Enter] to edit the entire record. There is more than code, name and status in this record.

We have the information on development status, number of components in the sub-level and more.

Study the structure of the record, test the functions.

Select Nepal and press F4 for the country's first sub-level

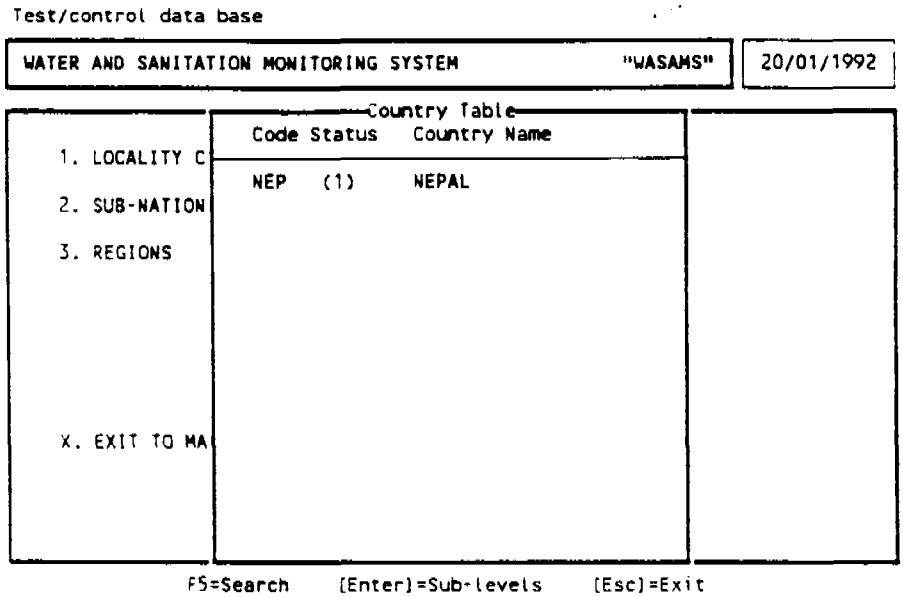
Test/control data base



New window displays zones of Nepal.

Note the command line. You could add a new zone, edit existing one or by pressing F4 move one sub-level down in the country's administrative hierarchy.

Exit all the way to the reference tables menu and select option "2. Sub-National administrative levels", to maintain sub-levels labels (names).

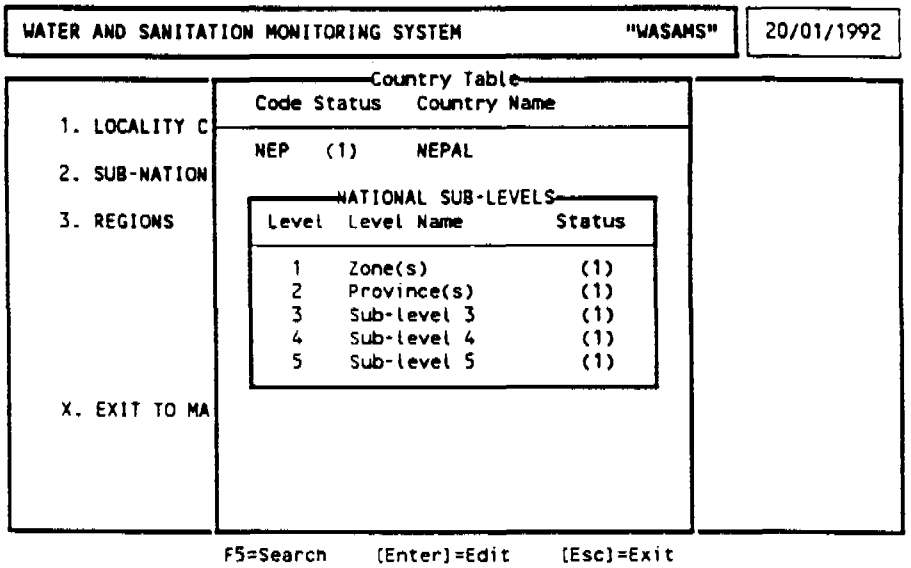


First, countries are listed. Use F5 to search for a desired country, or use [PgDn] or arrow keys to move colour bar.

Select Nepal to continue.

Once the country is selected, press enter to display sub-level names (labels).

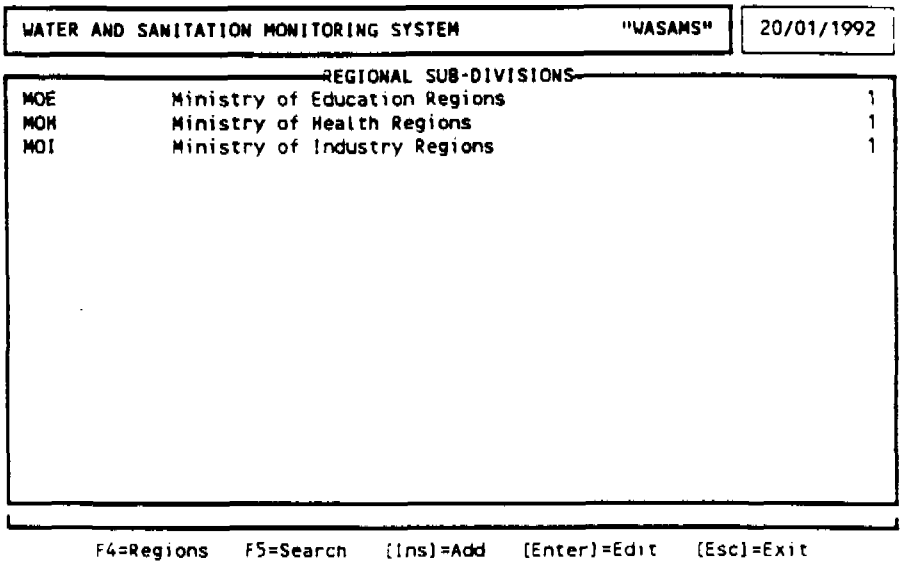
Test/control data base



Pressing [Enter] at the highlighted row, the level name will be edited (open) for changes. Similarly with the field status which indicates whether the level is valid or not.

Test the commands available and use [Esc] to Exit to the "Localities and Regions" menu. Once there, select option "3. Regions" to continue.

Test/control data base



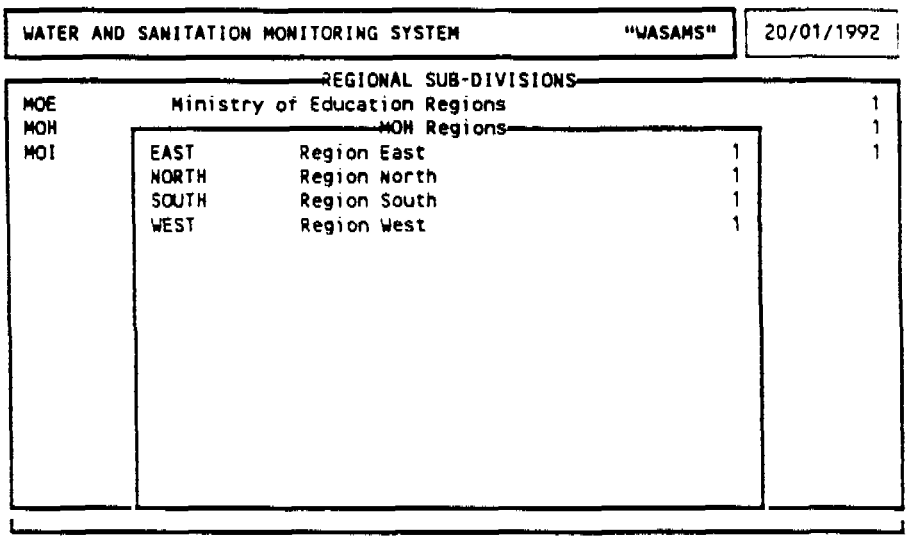
"WASAMS" is designed to let the user specify practically unlimited number of various regional subdivisions, e.g. Ministry of Health Regioning set-up, Ministry of Education Regioning, etc.

Already specified regional sub-divisions are being listed.

The commands available would let you add new region type, edit the existing one, search and work with the selected region type.

To continue, move colour bar to the MOH regions and press F4.

Test/control data base



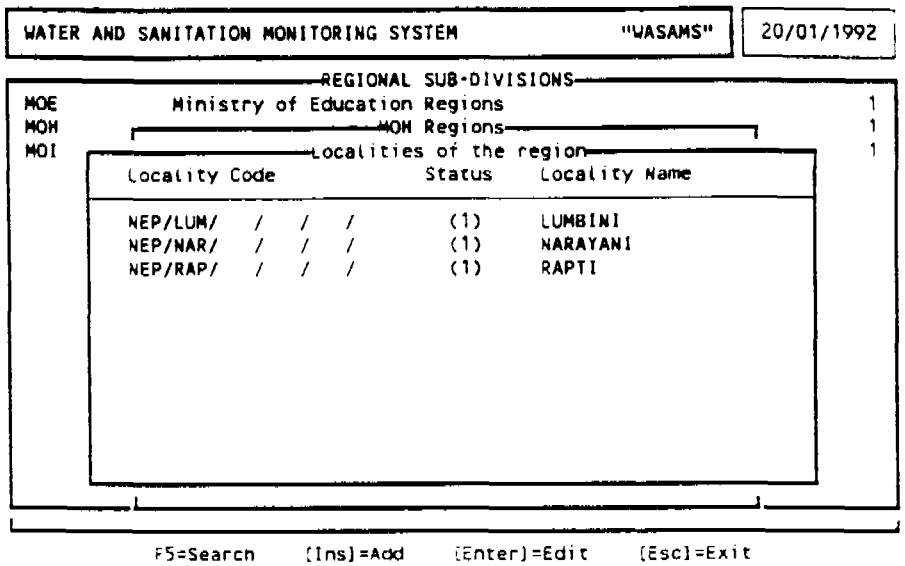
MOH regions with their code, label and status are being listed.

This is a standard maintenance programme with standard functions.

Test them.

To continue select the region "SOUTH" and press F4 to list Regions localities.

Test/control data base



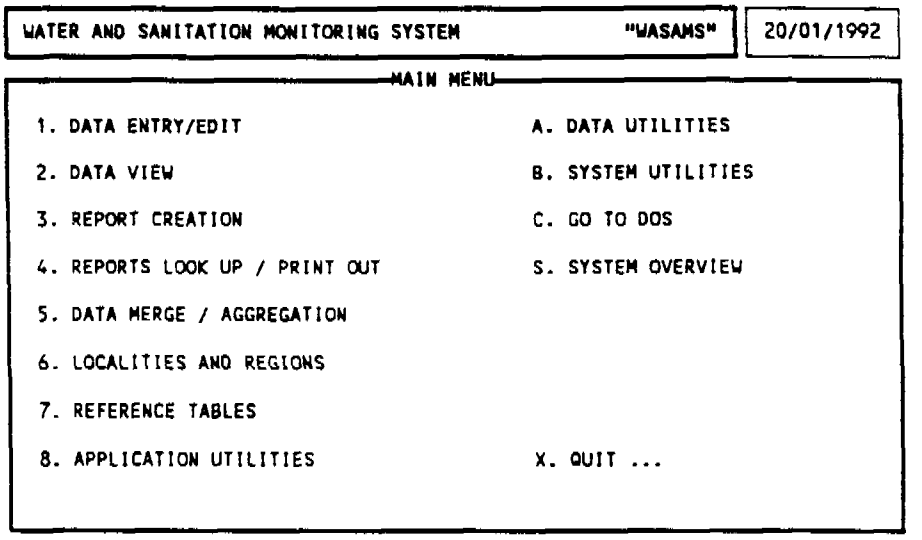
Region Sourth localities will be listed if already specified.

Commands are standard since this is the file maintenance programme.

Test them all.

Otherwise press [Esc] key to exit to the main menu.

Test/control data base

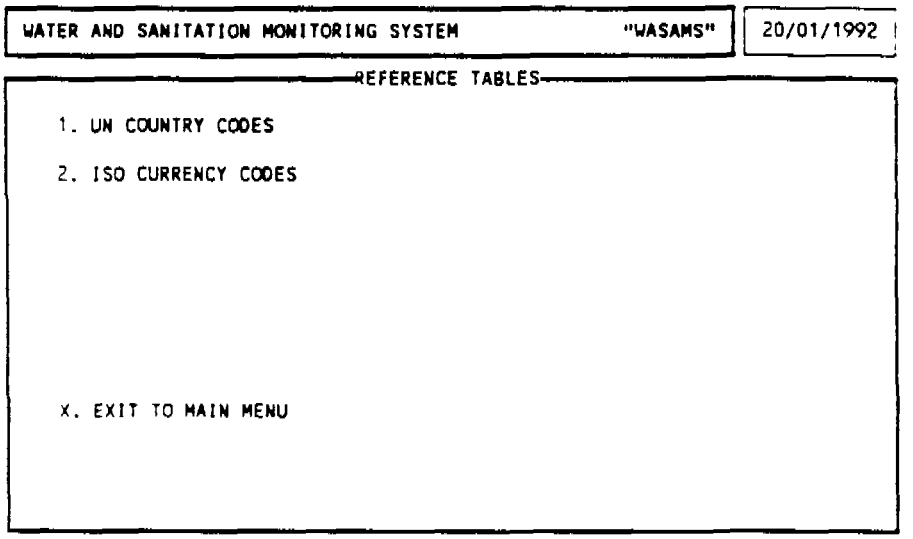


Select option with arrow keys, number or letter and press [Enter].

The next option to look closer at, is option No. 7. REFERENCE TABLES.

Select it and press [Enter].

Test/control data base



Select option with arrow keys, number or letter and press [Enter].

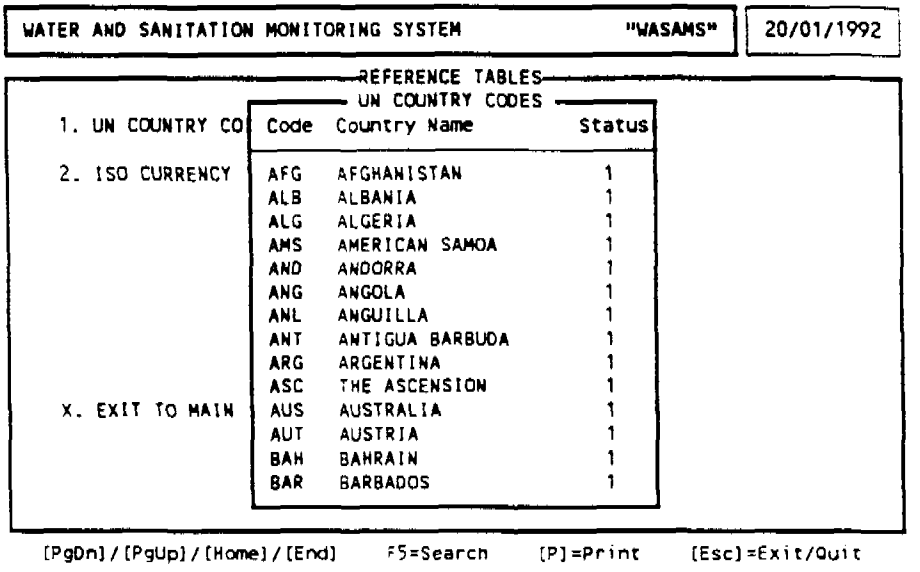
There are two tables (files) used as reference tables by WASAMS computer system :

- UNITED NATIONS standard COUNTRY CODES, and
- ISO CURRENCY CODES

These tables are used for look-up/selection, and for validation control when entering/editing country or currency code.

Select option 1. to display UN Country Codes.

Test/control data base

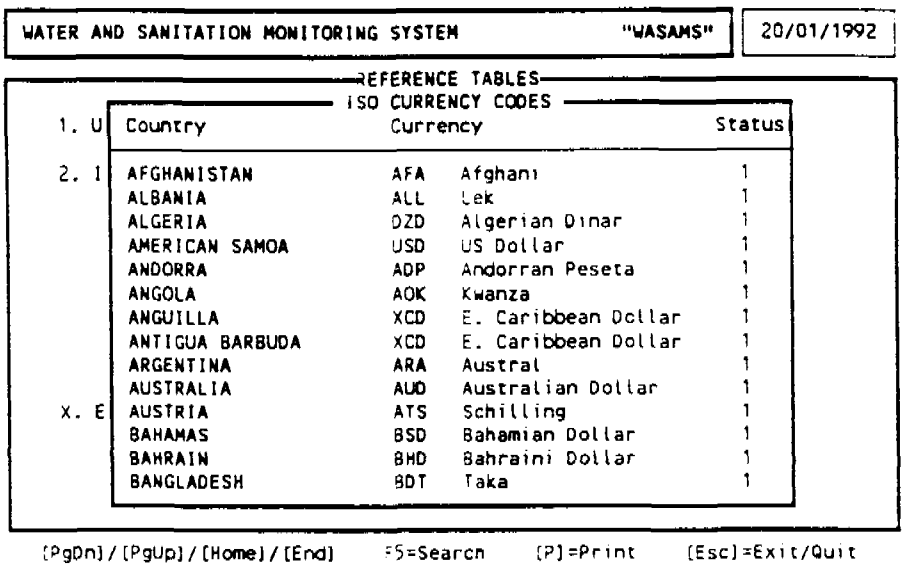


UN Country Codes are unique 3 letter codes. Code status displayed far right indicates if the code is valid (1) or non-valid (0).

Commands available are indicated in the command line at the bottom of the screen. Note the command [P] for the printout of the list.

Exit this function pressing [Esc] key and when back in REFERENCE TABLES menu, select the option 2. ISO CURRENCY CODES.

Test/control data base

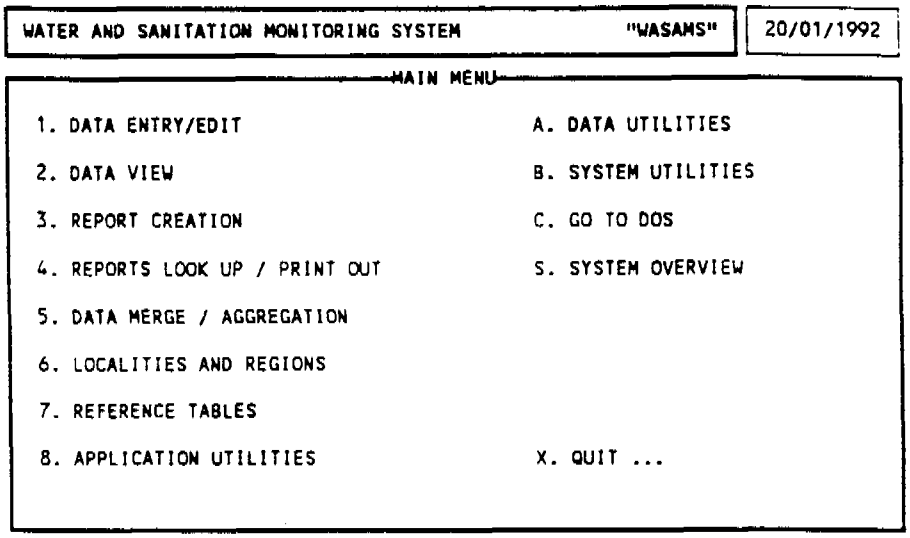


ISO CURRENCY CODES are also unique 3 letter codes. This table includes country name, currency code and name, and the currency status.

Commands available are display function standard, including [P] for the printout.

Exit this function pressing [Esc] key, and exit the REFERENCE TABLES menu selection the option X. EXIT TO MAIN MENU.

Test/control data base



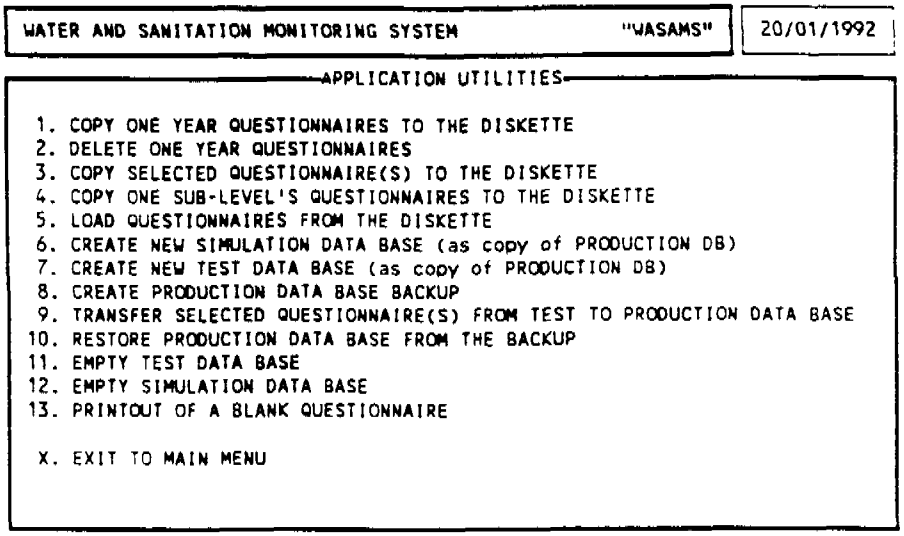
Select option with arrow keys, number or letter and press [Enter].

The next and the last application option discussed in this tutorial are APPLICATION UTILITIES.

These are help programmes to download, upload or archive data, to "clean up" data bases or create a hard disk back up.

To list and test all of them select option 7. and press [Enter].

Test/control data base



Here are the utilities.

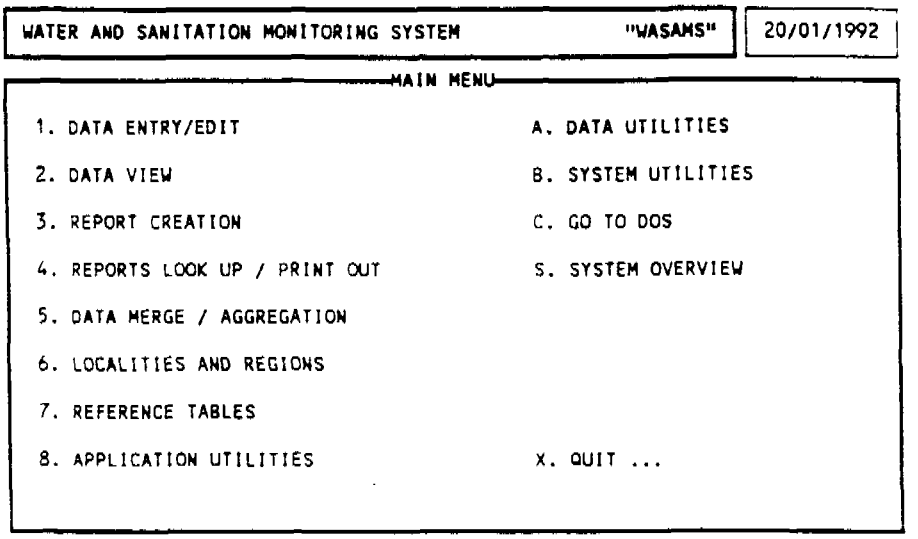
Remember that when running some of the options the formatted diskette must be inserted in the drive on your computer.

It is recommended to test all of the options to become familiar with all the functions which "WASAMS" offers.

Please read very carefully the notes and instructions.

To continue exit to the main menu.

Test/control data base

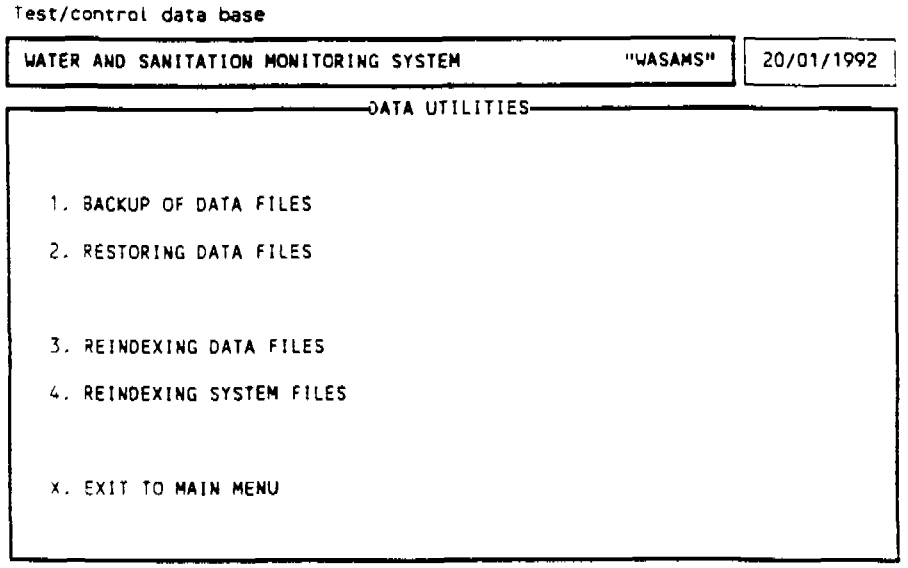


Now is the time to learn about standard system facilities listed on the right side of your main menu.

The WHO development tool ASHELL incorporates a number of built-in facilities.

You should use them to backup data, restore your data, reindex it and more.

Please start with option A. DATA UTILITIES.



The picture above illustrates the DATA UTILITIES (FILE MANAGEMENT) MENU.

This menu provides general file management utilities. First two are functions for back up and restoring data files.

If you select 1. BACK UP OF DATA FILES the procedure issues DOS commands to back up to drive specified all the files found in the current application directory.

Option 2. issues DOS commands to restore data files from drive specified to the current application data directory.

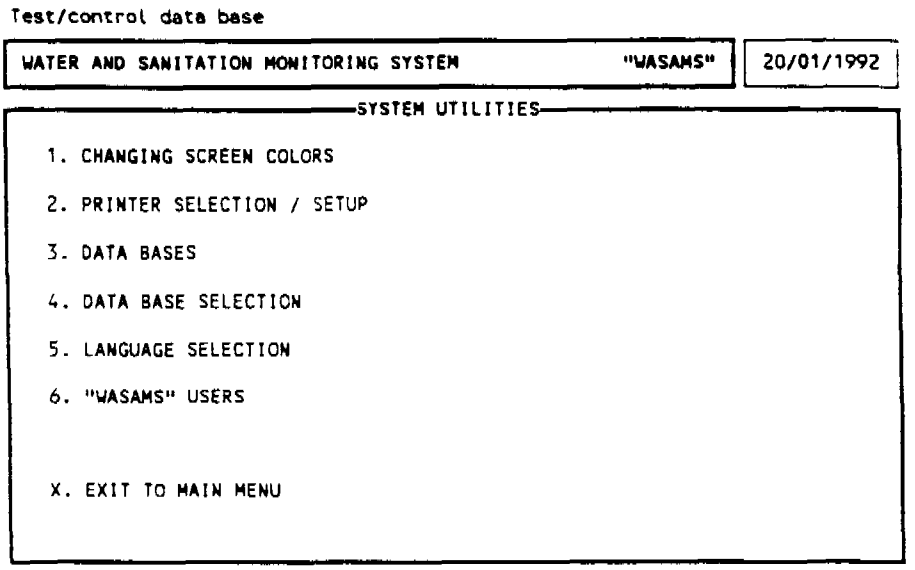
The options A. and B. are used to reindex data and system files.

Procedure A. REINDEXING DATA FILES reindexes all the local or remote data files. It issues information messages at the start and completion of indexing.

Procedure B. REINDEXING SYSTEM FILES reindexes all the local or remote files of the type "S" - system files.

The indexing procedures include a PACK operation which removes from the files all records which have been marked as deleted.

Test option A. or B. and exit with [Esc] back to the main menu.



Next option to look closer at is option 8. SYSTEM UTILITIES.

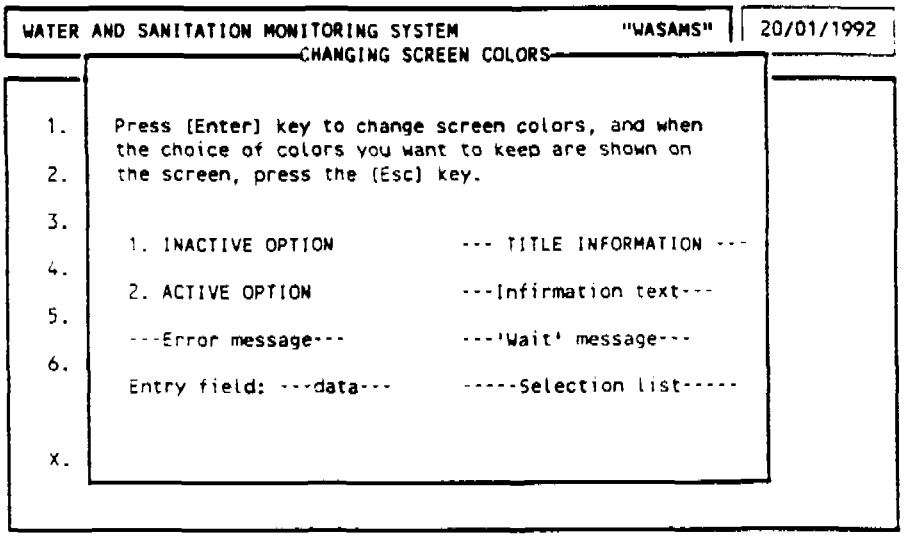
Select 8. and press [Enter].

System utilities' menu provides procedures for changing screen colours, printer selection/setup, maintaining of the application users, data base selection and language selection.

Let us start with option 1. CHANGING SCREEN COLOURS.

Select 1. and press [Enter].

Test/control data base



[Enter] = select new color, [Esc] = confirm choice and exit.

This option allows the user to change screen colours.

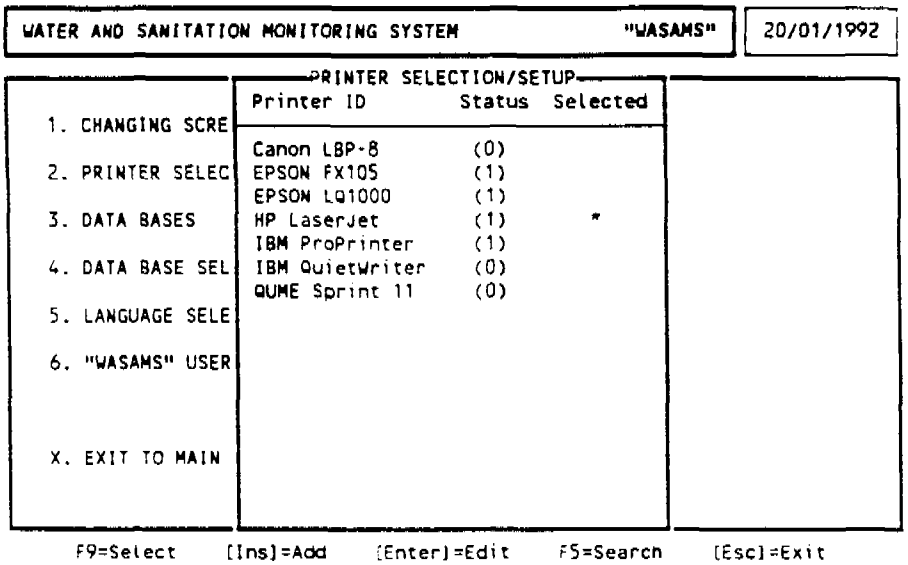
The colour pattern is chosen by rotating through four fixed pallets including monochrome. Pressing [Enter] will move you to the next pallet.

When desired pallet is reached press [Esc] to record your choice.

The choice is kept in system variable and saved for future sessions.

Test the colour choice, select one colour combination and [Esc] back to the system utilities where you should select option 2. PRINTER SELECTION/SETUP.

Test/control data base



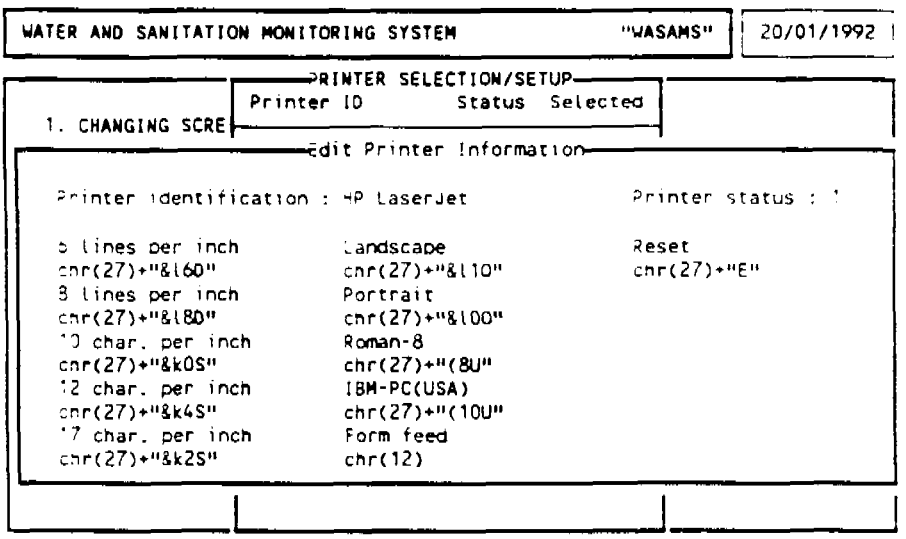
The printer setup procedure will list the printers initially specified. Read the list of the available printers and select one pressing F9 key.

Remember that only printer with status 1 could be selected.

Once the printer is selected all the control codes needed are being saved in the memory variables to be later used for controlling the printer.

By pressing [Enter] you would edit printer control codes. Test it. Press [Enter] to continue.

Test/control data base

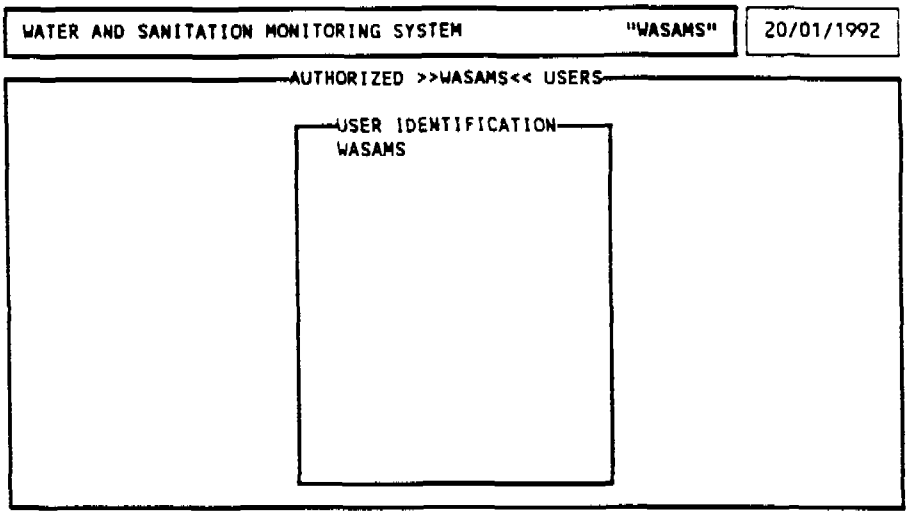


These are HP Laser Jet control codes used by our system to control the printer. Control codes themselves can be found in the printer manual.

Your system support will help you add new printer control codes.

To continue exit to the system utilities menu and select option 3. "WASAMS" USERS.

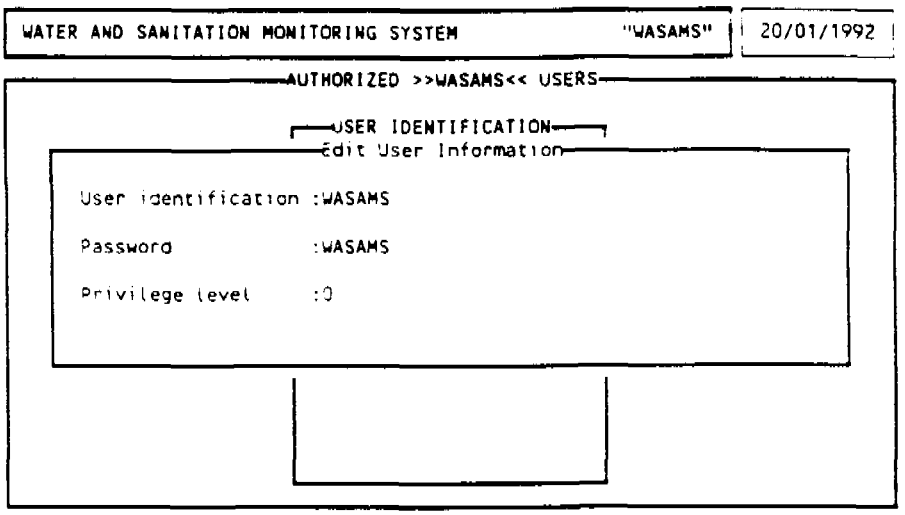
Press [Enter].



This procedure displays the list of authorized users and allows users with the administrators privileges to update the list.

Administrator can add the new user, delete existing or change the existing user's profile.

Select editing by pressing [Enter] key.



Enter/edit privilege level ('S', '0', '1', '2' or '3').

A new window with instruction "Edit User Information" appears on your screen.

Note the items "privilege level".

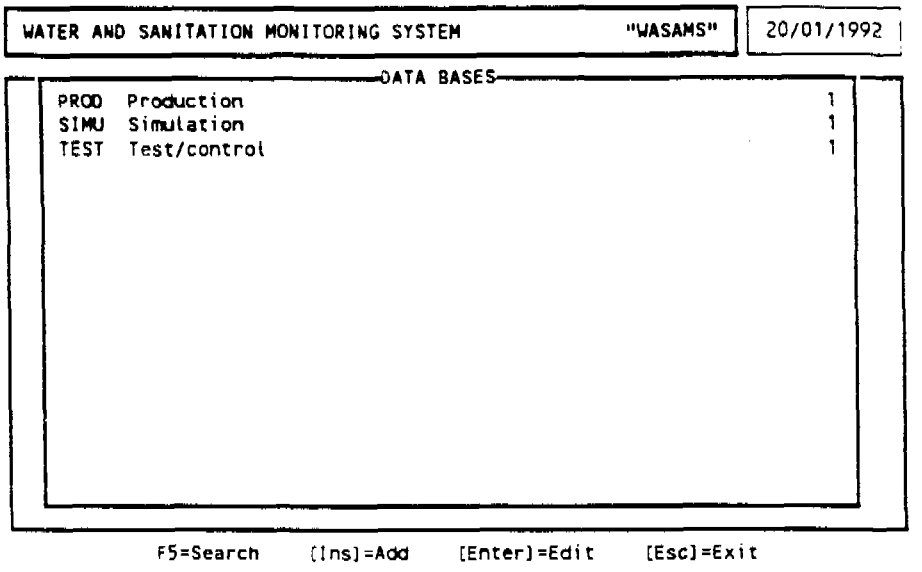
The values allowed are:

S - for a single-user
0 - for a multi-user with administrators privileges
1 - for a multi-user, may read and update all data
2 - for a multi-user, may read all data but update only local
3 - for a multi-user, may read all data

Read more about privilege levels in the Technical Reference.

Now please exit the system utilities back to the main menu.

Test/control data base



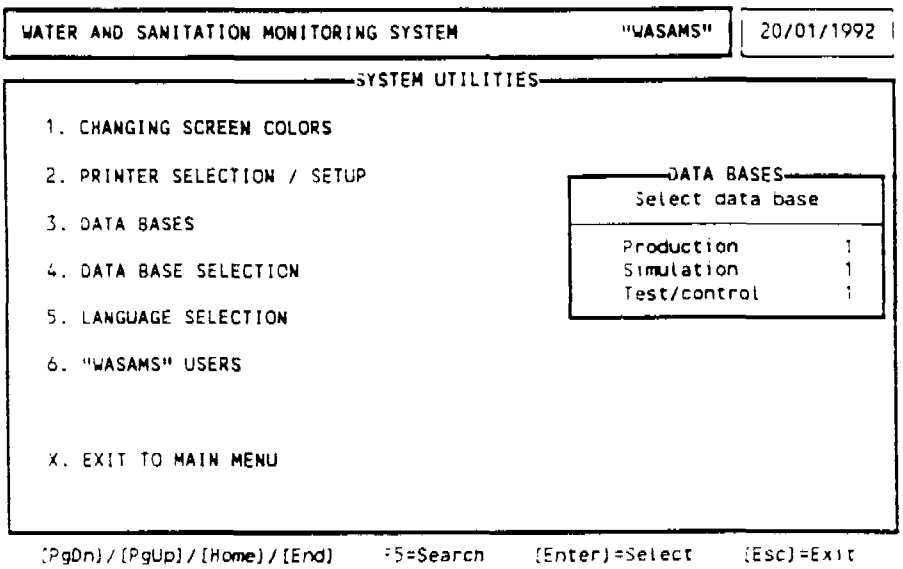
Data bases were mentioned earlier. Here is a maintenance routine.

It is a standard reference table maintenance programme. Functions available are standard.

The change of the status to "0" results in the respective data base being closed for access.

Exit with [Esc] and select Option "4. Data Base selection".

Test/control data base

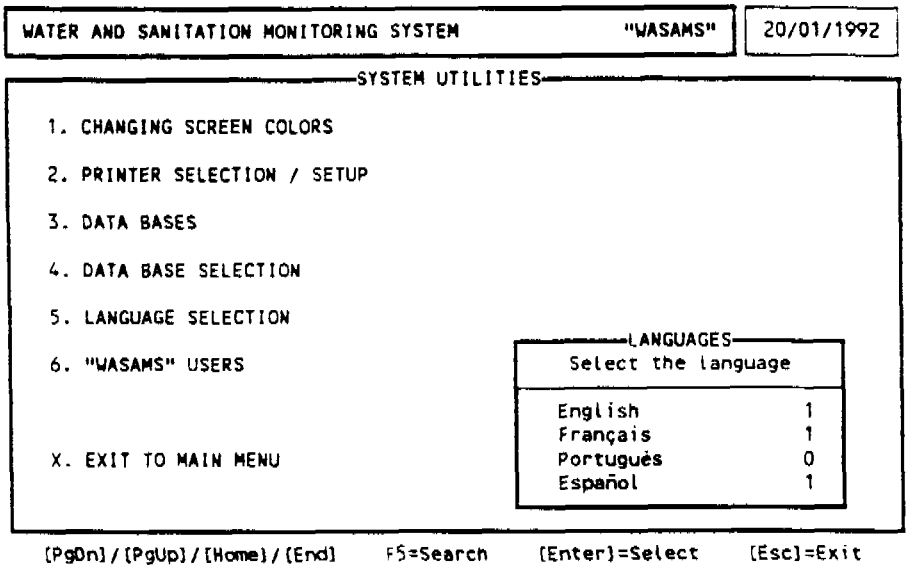


This is the "Data base selection" window. We described Data bases at the very beginning of this manual.

You can change the data base while running "WASAMS". It simply means that you wish to work with another data base than the one you chose when you started. Data base is always indicated in the top left corner of your screen.

Select a data base or quit with [Esc].

Test/control data base



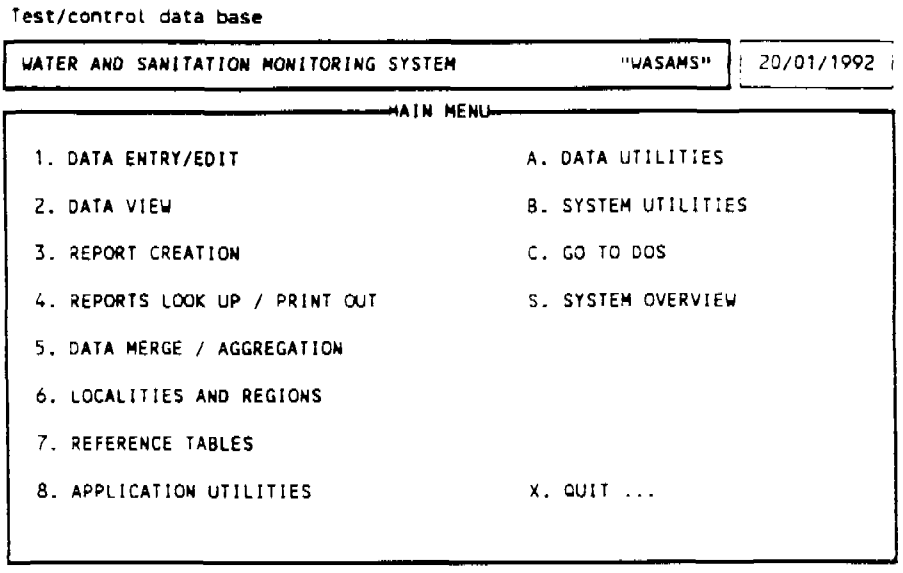
"WASAMS" is designed as a multi-lingual application.

It is planned to work in four languages.

The code on the right of the Language in the selection window indicates if the language version is available.

Select a new language (if available).

Exit to the main menu.

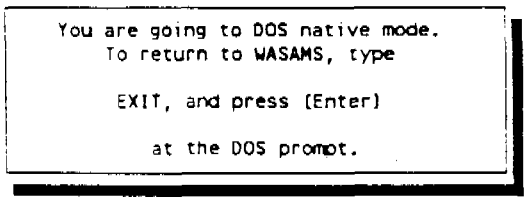


Next option to test is "C. Go to DOS"

It is sometimes needed to leave the system and run a DOS command.

We created this option to let the user leave WASAMS without quitting (which would require startup from the beginning) and executing a second copy of DOS.

Test it. Select C. and press (Enter)



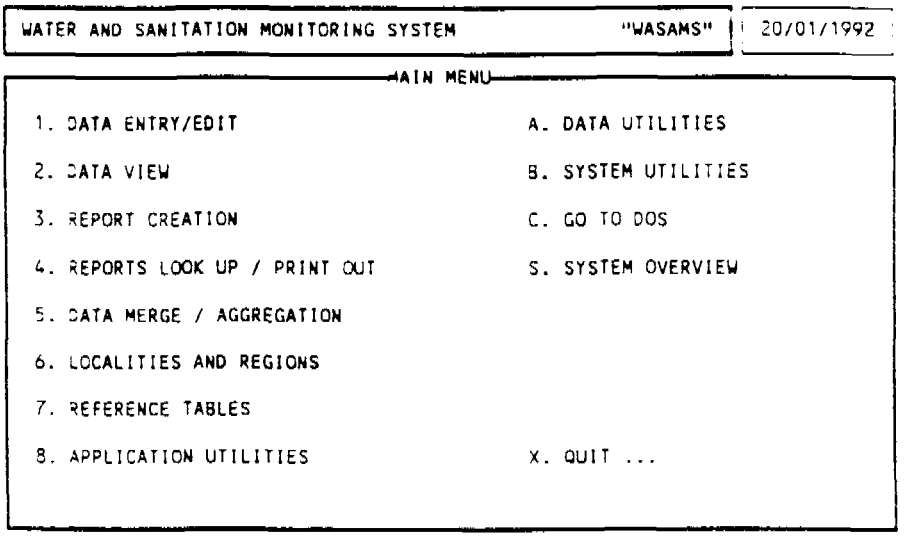
Press any key to continue ...

Yes, you are going to DOS.

Remember to type EXIT to return to the "WASAMS".

Press any key to continue and return with EXIT.

Test/control data base



Select option with arrow keys, number or letter and press [Enter].

Back in main menu.

The second last option is S. SYSTEM OVERVIEW.

This is a procedure to read/write a system overview text.

Administrator has the privileges to write the text, others can only read.

Select the option S. and press [Enter].

WASAMS COMPUTER SYSTEM

WASAMS is a sector management tool. It has been developed to improve monitoring at the country level through systematic coordinated reporting within the framework of sector strategies and goals. It was designed to facilitate the collection and aggregation of data from the lowest level of administration, through to national level.

The system has been developed as an open ended "add-on" to the broader CESI+ Country Statistics Monitoring System (CESTAT) developed during the IDWSSD (International Drinking Water Supply and Sanitation Decade) by CWS/EHE/WHO for the purpose of monitoring the water supply and sanitation sector and has therefore the potential for continuous modification, expansion and upgrading to correspond to specific country needs. The limited number of core indicators remain a permanent feature to ensure regional and global standardization.

The WASAMS computer application is an information management system based on relational data base. It is primarily intended to facilitate water supply and sanitation sector monitoring, planning and management at country level. The system was developed in 1990-91 in response to needs for enhancement of sector monitoring at country level identified

This is page 1. of the "WASAMS" overview.

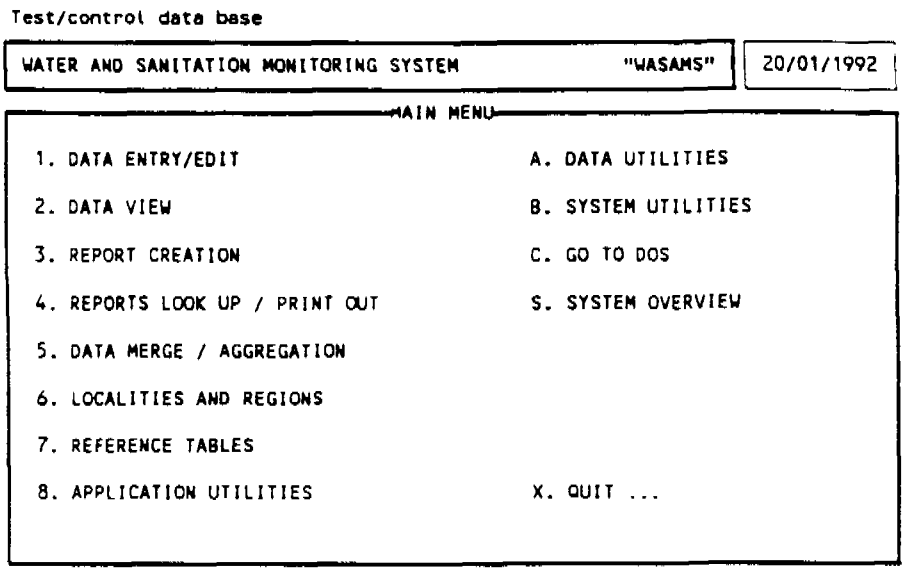
This monitoring system was developed in WHO HQ in Geneva as part of the WHO/UNICEF Joint Monitoring Programme.

The system is a FOXBASE application and since WHO has an unlimited distribution licence for the FOXBASE runtime version, you are allowed to freely distribute "WASAMS" to other users.

In the Technical Reference you can read more about installation and system requirements.

(Note that in FOXBASE editor F1 is a help key.)

Exit the system overview.



Now you are back in the main menu.

Most likely you have already learned how to exit the system.

Similar to moving up through the menu structure using the option X., to exit "WASAMS" use X. QUIT ...

Thank you.

WATER AND SANITATION MONITORING SYSTEM

W A S A M S

Version 1.3

(January 1992)

WHO/UNICEF JOINT MONITORING PROGRAMME

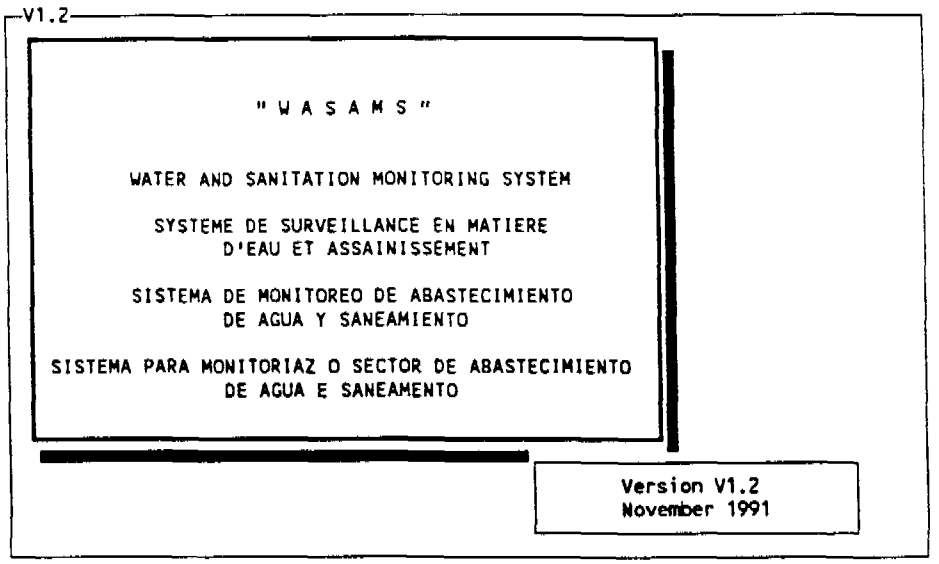
T E C H N I C A L M A N U A L

WORLD HEALTH ORGANIZATION

Community Water Supply and Sanitation Unit
1211 Geneva 27
Switzerland

Tel: (41) 22 791 2111

UNITED NATIONS CHILDREN'S FUND
Water and Sanitation Section
UNICEF House (H-11F)
3 United Nations Plaza
New York
New York 10017 USA
Tel: (212) 326-7120/21



Press any key to continue...

WASAMS COMPUTER SYSTEM

WASAMS is a sector management tool. It has been developed to improve monitoring at the country level through systematic coordinated reporting within the framework of sector strategies and goals. It was designed to facilitate the collection and aggregation of data from the lowest level of administration, through to national level.

The system has been developed as an open ended "add-on" to the broader CESI+ Country Statistics Monitoring System (CESTAT) developed during the IDWSSD[1] by WHO for the purpose of monitoring the water supply and sanitation sector and has therefore the potential for continuous modification, expansion and upgrading to correspond to specific country needs. The limited number of core indicators remain a permanent feature to ensure regional and global standardization.

The WASAMS computer application is an information management system developed on relational data base. It is primarily intended to facilitate water supply and sanitation sector monitoring, planning and management at country level. The system was developed in 1990-1991 in response to needs for enhancement of sector monitoring at country level identified during review of the sector situation at the end of the IDWSSD by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF).

The microcomputer application is an on-line, interactive, real time and menu driven system. As a user you will find out that there are built-in controls and validations for most fields and there are also "look-up and/or select" functions to help you to enter or edit information.

The system operates on three data bases: **PRODUCTION**, **SIMULATION** and **TEST/CONTROL**. The "production data base" is where the verified data is stored. The "simulation data base" is a subset or full copy of the first one. It can be freely modified for analysing the resulting changes - simulations. The "test/control data base" is used to load data received and to examine it. Once it is checked and eventually corrected it can be moved to the "production data base".

To learn more about WASAMS functions and how to use the programme, a WASAMS tutorial is available, but to find out more about installation, operation requirements, logical and physical data base characteristics and other more technical issues, please refer to the TECHNICAL MANUAL.

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[1] International Drinking Water Supply and Sanitation Decade

The WASAMS monitoring system is a computer system to enter, store, maintain, exchange, process and present Water Supply and Sanitation Sector information.

The information is collected in the countries or any administrative, political or data collection sub-level and forwarded on a questionnaire (or on a diskette) to the national level (National Monitoring Unit).
This information, some 290 data items, is the input to the computer system, WASAMS, and provides the basis for national, regional or local reporting and analysis.

WASAMS works with three databases: PRODUCTION, SIMULATION and TEST/CONTROL. The PRODUCTION database contains the actual data. The SIMULATION database is a subset, or a complete copy, of the PRODUCTION database. It can be freely modified for any purpose, such as training, or for analysing various assumptions about possible changes - simulations. The TEST/CONTROL database is used to load data received from a "sub-level", and to examine it. Once it is verified (and corrected), it can be transferred to the PRODUCTION database, or sent back for appropriate corrections.

WASAMS is adapted to fit the country's administrative structure. Some countries have a number of administrative sub-levels (eg. states, republics, regions) which collect sector information. The data from any sub-level within a country can be merged to produce the appropriate data record for the next higher administrative level.
The country record should periodically be sent to a WHO or UNICEF regional office and/or to the headquarters.

WASAMS is a user-oriented computer sysyem. It is completely menu driven and has many help features and an extensive validation mechanism which reduces data entry/edit errors. There are also "look up" and/or "select" functions (window overlays) to help with data entry and with making selections.

To learn more about WASAMS functions and how to use the system, read the WASAMS TUTORIAL and the WASAMS USER GUIDE.

There is a number of options to choose from the WASAMS main menu, providing the user with all that is needed to store, maintain, search, analyse and present the sector information.

Some of the main WASAMS features are:

- An extensive built-in validation mechanism, to help prevent errors during data entry/edit.
- A merge facility, which creates a record as the sum of the existing records at the next lower administrative level.
- Reference tables of national sub-level names and locality codes.
- Reference tables of regional groupings (for reports).
- A number of standard reports, as well as the provision to to create user defined reports.
- Graphics, statistical analysys and maping.
- Programme generator for system extentions.

Subsystems

The system was designed to give the user quidelines even in its main menu. The order of the modules or subsystems (main menu options) is actually the task order when using the system.

The subsystems (main menu options) are:

1. Data entry/edit
2. Data view
3. Report creation
4. Report lookup/printout
5. Data merge/aggregation
6. Localities and regions
7. Reference tables
8. Application utilities

A. Data utilities
B. System utilities
C. Go to DOS
S. System overview

X. Quit

Data entry/edit module

Countries which don't use the WASAMS system can provide the information by completing a questionnaire which will be sent to them by WHO or UNICEF.
Those countries which are using WASAMS will be able to use the data entry/edit module to enter and maintain their information. The download utility program can be used to copy selected data to diskette which can then be mailed to higher or lower administrative level, WHO or UNICEF regional office and/or to the headquarters.

At any level, the data will be entered manually if it is received on a form, or uploaded from a diskette if WASAMS computer system is in operation.

The DATA ENTRY/EDIT module is divided into 5 parts. Each part is very similar to the corresponding part of the questionnaire. The screens are almost identical to the questionnaire parts, the only restriction being the size of the screen and for that reason additional screens are used.

In addition, there is a review function to check what has so far been entered into the system. This function provides the option to print a questionnaire for specified country and year with all the data entered.

There are also a number of features availabe using "F" (function) keys.
F1 is for reading a special definitions (comments) to the questinnaire parts. F2 is used for deleting a form. F4 invokes a lookup/selection feature. For example, when entering/editing a 3-letter country code, pressing F4 will cause a window to appear giving a list of the valid codes from which a selection may be made.

Data view module

The data view option is very similar in appearance to the data entry/edit option, but no changes are allowed, and it is much faster. There is one major difference. In the view option, one can move around (view different localities) in only one file at a time (next, previous, first or last record) corresponding to a specified form part (0, 1, 2, 3 or 4). In the entry/edit option, one can move between the different parts of one form for a specified locality.

In either case, one can move between the various screens for each part of the questionnaire (part 0. has 1 screen, part 1. has 6 screens, part 2. has 3 screens, part 3. has 4 screens, and part 4. has 1 screen.)

Report creation module

Once the data is entered reports can be generated. All the reports generated by the system are saved for later viewing and/or printout. Each report takes several pages. Many reports can be generated and saved. A systematic use of file names facilitates retrieving the reports. Reports can be deleted when when they are no longer needed.

There are five standard reports:

- Population and System Utilization
- Coverage
- Management (operation and maintenance costs)
- Number of Systems Managed
- Funding

The reports can be national, regional or local. Local reports show the data for all of the localities at the next lower sub-level. Regional reports show the data for all of the localities in a specified (user defined) region. National reports show the data for all localities grouped by the user defined regions.

Data merge module

The data merge option is another important feature of the system.

The data records for any locality (except at the lowest administrative sub-level) can be created by merging (aggregating) the data from the next lower sub-level.
For example, the data for the states of India can be merged to create the Indian country record. The system provides for up to five sub-levels below the country level. The names of the sub-levels (for example: state, county, zone, municipality and precinct) must be entered into the data base by the user, and also the 3-letter codes and locality names within each sub-level (for example, there might be 50 states, 900 counties, 3,000 zones, 12,500 municipalities and 100,000 precints in a large country).

Application utilities

The utilities subsystem consists of a number of functions used in everyday work, like creating backup copies of the data. Note the utilities for data download and upload, which are used for data export and import (for sending and recieving data between sub-levels within a country and for a country to send data to a WHO or UNICEF regional office or to the headquarters).

System utilities

One of the utilities, "database choice", is used to switch between the different databases (production, simulation and test/control).

When data is received on a diskette, it should first be uploaded into the test/control database and examined there. Once the data is confirmed as correct (after it is corrected), it can be transfered to the production database.

Sub-national administrative levels

The feature of specifying country sub-national levels and their components, and monitoring water and sanitation indicators on any level, makes the WASAMS country-oriented management information system.

This module is in detailes described in the WASAMS TUTORIAL.

Regional sub-divisions

WASAMS computer system allows the user to specify unlimited number of different regional sub-divisions (set-ups) eg. Ministry of Health Regioning, Ministry of Education Regioning, Water Commission Regioning, etc.

Then reports could be generated for any region type by its regions or for any region by its localities.

Statistics, Graphics and Maps

WASAMS incorporates WHO EPI INFO's modules for statistical analysis and graphical presentation of the sector information as well as maping module EPI MAP.

Full documentation on those modules is available on request.

General Information

The WASAMS computer system is a FOXBASE application. The database files have the extension ".dbf" and the index files have the extension ".idx". Some of the database files are permanently indexed, while others are indexed (or re-indexed) as needed.

Since a FOXBASE record is limited to 128 fields, it was necessary to split the data. In fact, it was decided to have five main data files, corresponding to the five parts of the data collection questionnaire. They are 0_part.dbf (source of information), 1_part.dbf (service coverage), 2_part.dbf (management), 3_part.dbf (funding) and 4_part.dbf (comments)

The unique index key for each record is its (concatenated) locality code plus the year. Although only a 3-letter code is specified for each new locality (and need not be unique within the national structure), this code is appended to the codes for all of the levels above it and thereby becomes unique. In fact, a full 18-character code is kept for every locality, even though up to 15 characters could be blank.
Therefore, there will be no confusion between, say, IND\KER and INO\KER, or between NEP\AAA\CCC and NEP\BBB\CCC. This unique index key also insures a one-to-one correspondence between the records in the three main data files.

In addition to the five main data files, there are a number of other files to store related information (codes, etc.), which have differently defined indexes (and sometimes multiple indexes).

Logical structure

An analysis of the proposed data collection questionnaire and the data items resulted in an OBJECT-RELATION type data model.

Further analysis of the system requirements gave the final structure of a normalized form database.

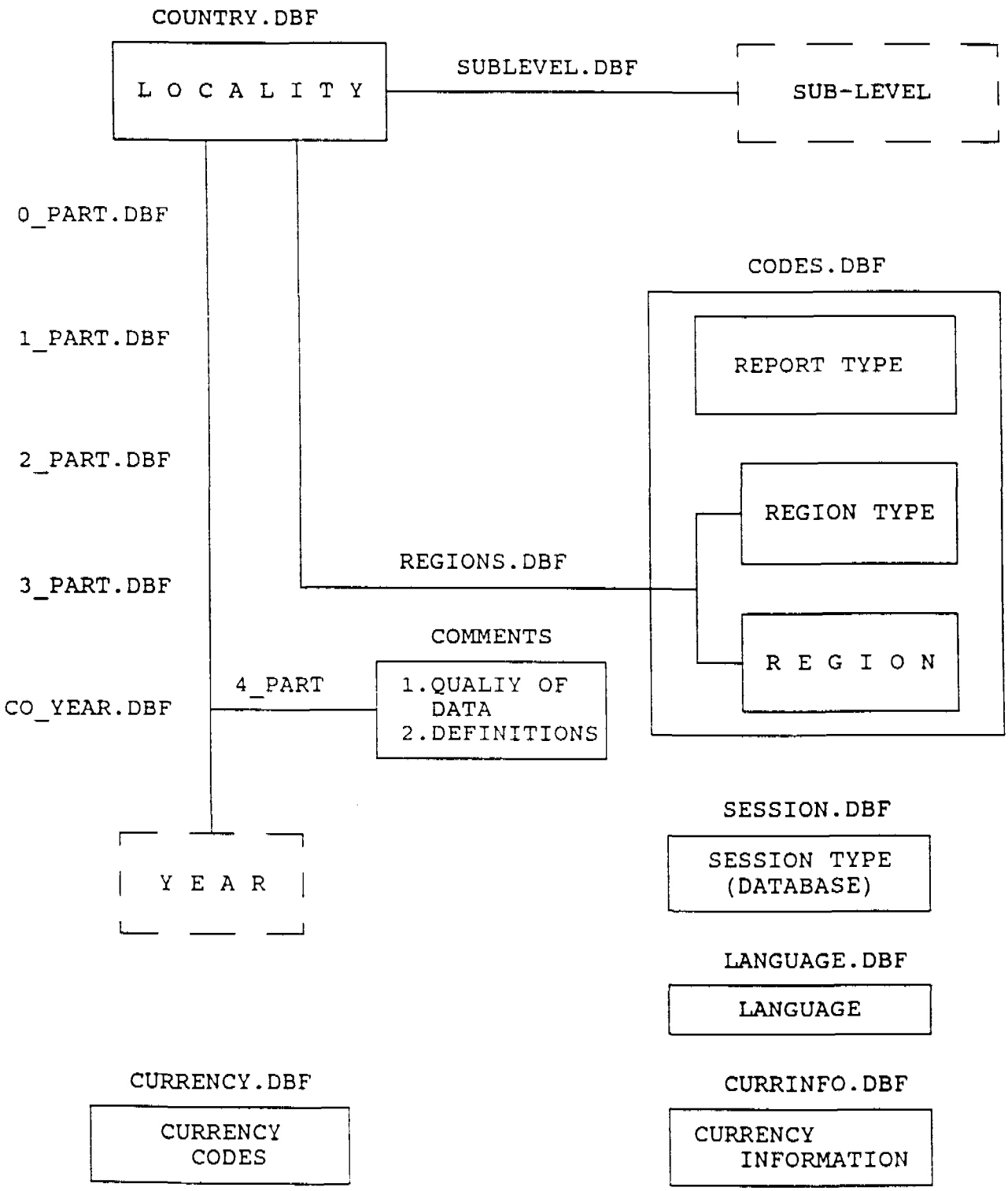
The data model shown on the next page is an OBJECT-RELATION type model.
The OBJECTS are data items with unique identifiers, like sub-level (name), report type and region. They all have a unique identification code. One of the most important OBJECTS in the WASAMS system is the locality itself. Each locality has a unique 18-character identification code: its own 3-letter code, prefixed by the codes for all of the levels above, and padded at the end with blanks.

To "describe" each object a database file is needed. The object's unique identifier is the record key field while the rest of the information on the object are attribute fields.

The objects are related to each other. Each relation results in a file with a key inherited from the object files. For technical reasons, some relations will result in more than one file. For example, the relation COUNTRY <-> YEAR is described in the four files: 0_PART, 1_PART, 2_PART and 3_PART. In each of them, the key is: LOCALITY + YEAR.

This data modelling technique helped achieve a stable structured database, unaffected by changes in data processing procedures or output requirements.

Data model


COUNTRY.DBF
L O C A L I T Y
SUBLEVEL.DBF
SUB-LEVEL
0_PART.DBF
1_PART.DBF
2_PART.DBF
3_PART.DBF
CO_YEAR.DBF
CODES.DBF
REPORT TYPE
REGION TYPE
REGIONS.DBF
R E G I O N
COMMENTS
4_PART
1.QUALIY OF DATA
2.DEFINITIONS
Y E A R
SESSION.DBF
SESSION TYPE (DATABASE)
LANGUAGE.DBF
LANGUAGE
CURRENCY.DBF
CURRENCY CODES
CURRINFO.DBF
CURRENCY INFORMATION

Physical characteristics

All the fields of the WASAMS database are character fields. They are defined as such to permit the entry of blanks, if the value is not known.

Conversion takes place where needed from character to numeric.

The database files to store the data are:

0_PART.DBF - SOURCE OF INFORMATION
1_PART.DBF - PART 1. data (population and service coverage)
2_PART.DBF - PART 2. data (maintenance)
3_PART.DBF - PART 3. data (funding)
4_PART.DBF - PART 1. data (comments on data quality and definitions used)

General Information

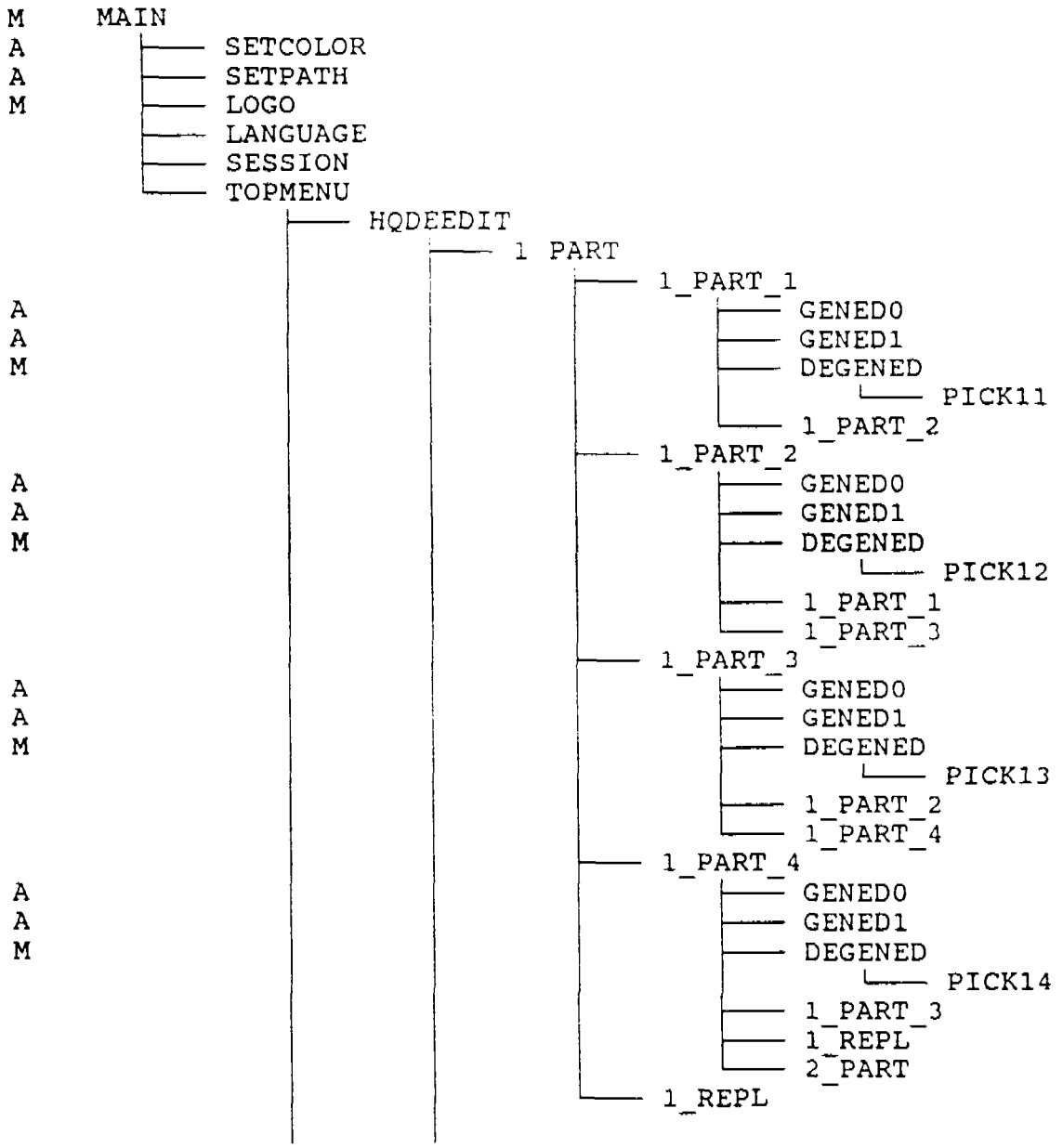
WASAMS is a FOXBASE application. The package of subroutines, ASHELL, developed at WHO headquarters, has been used in the development of WASAMS.
Some ASHELL facilities were used without modidifications, while others were adapted to meet specific system requirements. WHO programming standards were followed.

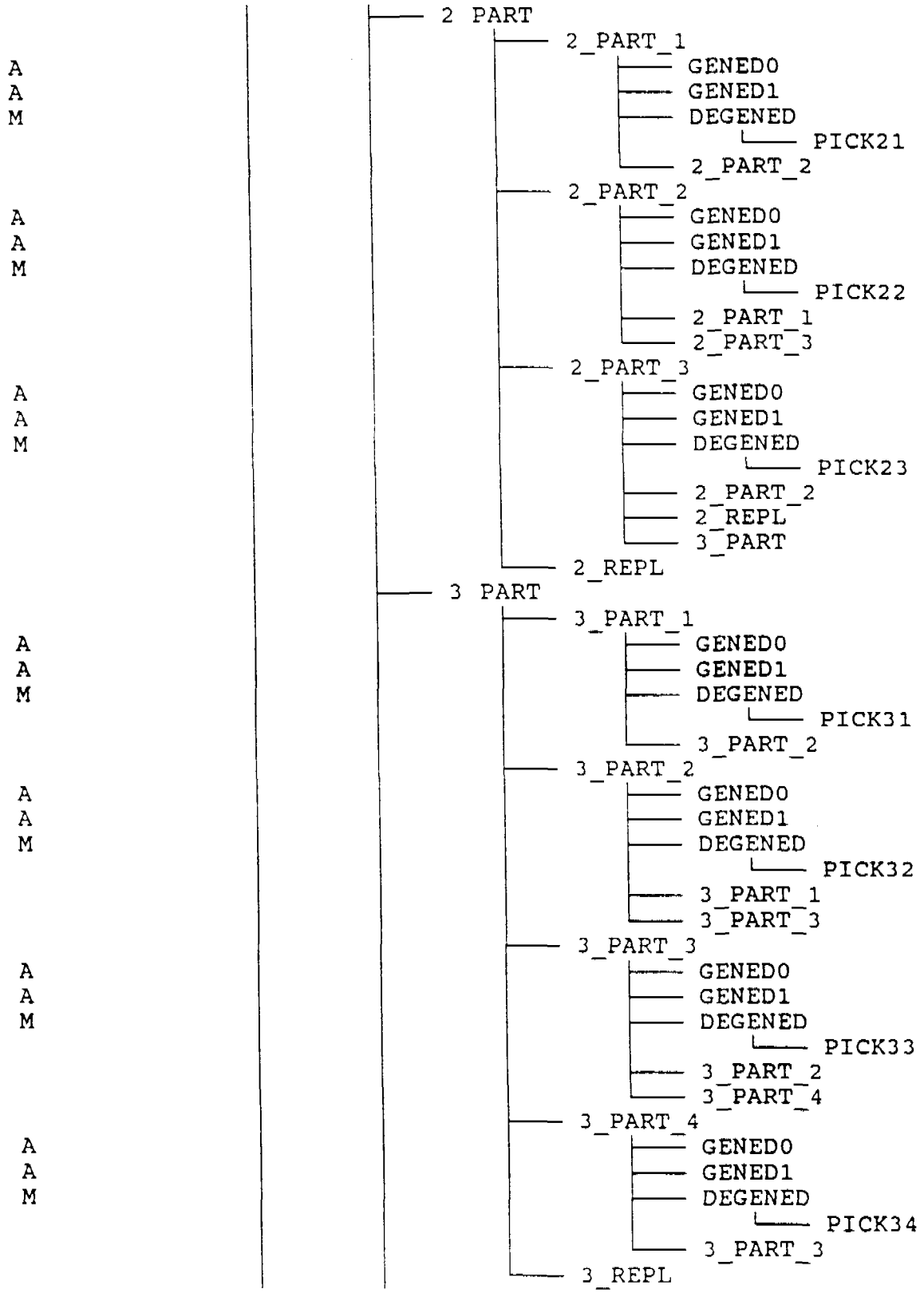
All ASHELL subroutines come in one file named GENPROC.PRG
It consists of a number of procedures and functions.

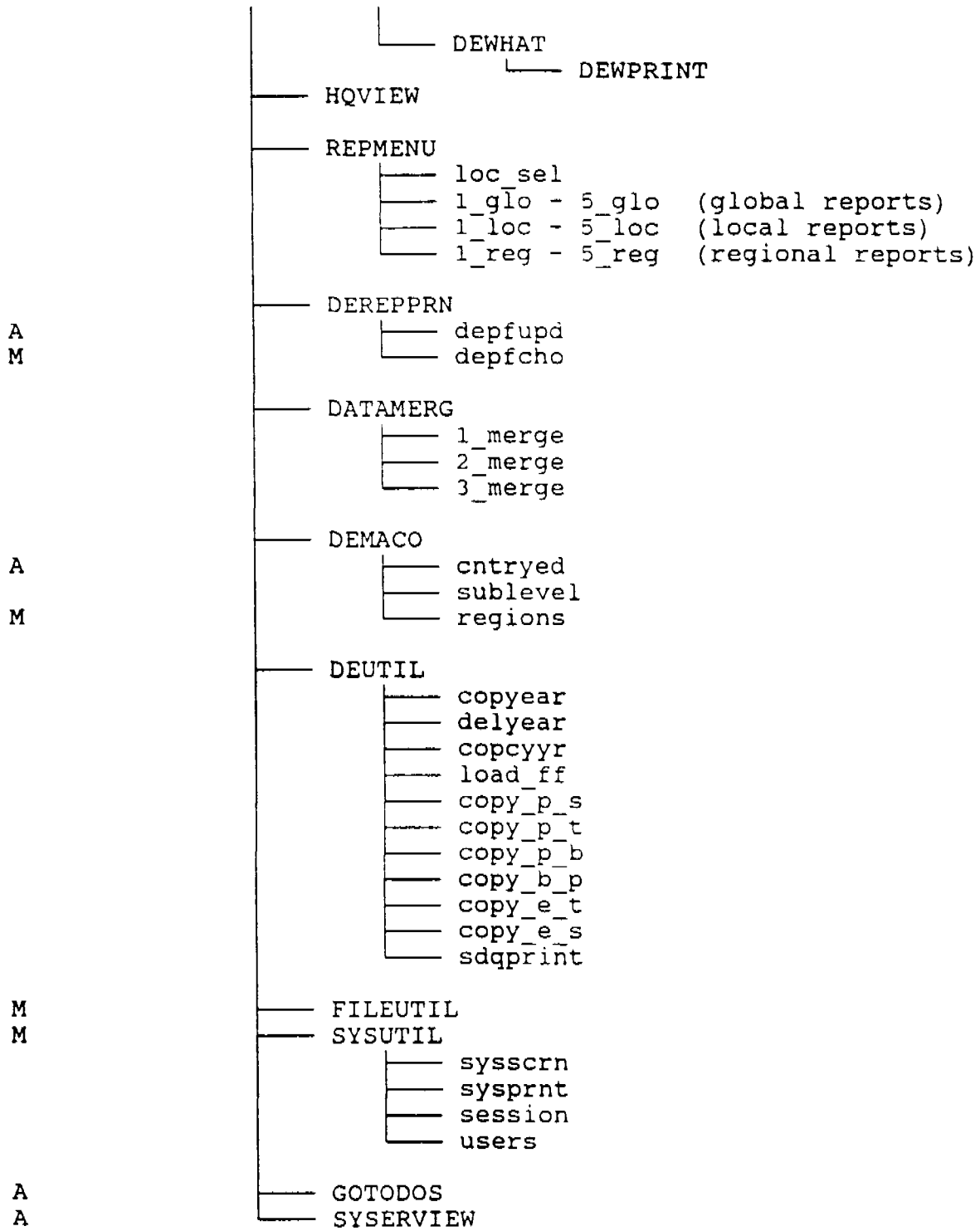
WASAMS features a number of design solutions to achieve a high degree of independence between the application programs and the data.

Another feature to help ensure the integrity of the data is the use of status codes. These codes have values 1 or 0 to indicate that the item is valid (open) or non-valid (closed). Thus the data is actually kept even when it is being "deleted". Actually, there is no DELETE function; instead, the item could only be marked as non-valid (closed).

Program tree structure (main parts only)




2 PART
2_PART_1
GENED0
GENED1
DEGENED
PICK21
2_PART_2
2_PART_2
GENED0
GENED1
DEGENED
PICK22
2_PART_1
2_PART_3
2_PART_3
GENED0
GENED1
DEGENED
PICK23
2_PART_2
2_REPL
3_PART
2_REPL
3 PART
3_PART_1
GENED0
GENED1
DEGENED
PICK31
3_PART_2
3_PART_2
GENED0
GENED1
DEGENED
PICK32
3_PART_1
3_PART_3
3_PART_3
GENED0
GENED1
DEGENED
PICK33
3_PART_2
3_PART_4
3_PART_4
GENED0
GENED1
DEGENED
PICK34
3_PART_3
3_REPL



A
M
A
M
M
M
A
A

A = ASHELL routine, procedure or function
M = modified ASHELL routine, procedure or function

List of programs with a brief description

1_DISP_1	Rapid display of screen for part 1, page 1
1_GLO	Global report No 1.
1_INIT_A	Init. all 1_part memory variables to blank
1_INIT_B	Init. all 1_part memory variables to database values
1_LOC	Local report No 1.
1_MERGE	Perform the merge for all 1_part.dbf data
1_PART	Part 1, data entry/edit.
1_PART_1	Part 1, page 1, data entry/edit.
1_PART_2	Part 1, page 2, data entry/edit.
1_PART_3	Part 1, page 3, data entry/edit.
1_PART_4	Part 1, page 4, data entry/edit.
1_PCNT_1	Compute & display percents for part 1, page 1.
1_REG	Regional report No 1.
1_REPL	Replace all database fields in the 1_part.dbf record.
1_VIEW	Part 1, fast data view
1_VIEW_1	Part 1, page 1, fast data view
1_VIEW_2	Part 1, page 2, fast data view
2_GLO	Global report No 2.
2_LOC	Local report No 2.
2_MERGE	Perform the merge for all 2_part.dbf data
2_PART	Part 2, data entry/edit.
2_PART_1	Part 2, page 1, data entry/edit.
2_PART_2	Part 2, page 2, data entry/edit.
2_PART_3	Part 2, page 3, data entry/edit.
2_REG	Regional report No 2.
2_REPL	Replace all database fields in the 2_part.dbf record.
2_VIEW	Part 2, fast data view
2_VIEW_1	Part 2, page 1, fast data view
2_VIEW_2	Part 2, page 2, fast data view
2_VIEW_3	Part 2, page 3, fast data view
3_GLO	Global report No 3.
3_LOC	Local report No 3.
3_MERGE	Perform the merge for all 3_part.dbf data
3_PART	Part 3, data entry/edit.
3_PART_1	Part 3, page 1, data entry/edit.
3_PART_2	Part 3, page 2, data entry/edit.
3_PART_3	Part 3, page 3, data entry/edit.
3_PART_4	Part 3, page 4, data entry/edit.
3_REG	Regional report No 3.
3_REPL	Replace all database fields in the 3_part.dbf record.
3_VIEW	Part 3, fast data view
3_VIEW_1	Part 3, page 1, fast data view
3_VIEW_2	Part 3, page 2, fast data view
3_VIEW_3	Part 3, page 3, fast data view
3_VIEW_4	Part 3, page 4, fast data view

	4_GLO	Global report No 4.
	4_LOC	Local report No 4.
	4_REG	Regional report No 4.
	5_GLO	Global report No 5.
	5_LOC	Local report No 5.
	5_REG	Regional report No 5.
M	CDFCHO	Browse file and select record
	CDFCHO_	Sub-level maintenance - main programme
	CDFUPD	Sub-level maintenance
	CDFUPD_	Sub-level maintenance
	CNTRY	Country codes maintenance - cursor movement control
	CNTRY1	Sub-level 1. maintenance - cursor movement control
	CNTRY2	Sub-level 2. maintenance - cursor movement control
	CNTRY3	Sub-level 3. maintenance - cursor movement control
	CNTRY4	Sub-level 4. maintenance - cursor movement control
	CNTRY5	Sub-level 5. maintenance - cursor movement control
M	CNTRYED	Country codes maintenance - main programme
	CNTRYED1	Country codes maintenance - subroutine
	CNTRYSEL	Country codes selection
	CNTRYVAL	Country codes validation
	COPCYYR	Copy selected forms (records) to a diskette
	COPY_B_P	Copy backup data base to the production data base
	COPY_E_S	Copy empty data base to the simulation data base
	COPY_E_T	Copy empty data base to the test data base
	COPY_P_B	Copy production data base to the backup data base
	COPY_P_S	Copy production data base to the simulation data base
	COPY_P_T	Copy production data base to the test data base
	COPYEAR	Copy all forms (records) for one year to a diskette
	DATAMERG	Merge (aggregate) data from one sub-level to the one above
M	DEGENED	Data entry/edit using GENED
	DELYEAR	Delete one year of forms
	DEMACO	Reference tables menu
M	DEMENUB	Display boxes for menu screen (short version)
M	DEMENUF	Display boxes for menu screen (complete version)
	DEPFCHO	Reports maintenance and print out - main programme
M	DEPFUPD	Reports -display file with update
	DEPFUPD_	Reports maintenance and print out - subroutine
	DEREPPRN	Display list of existing reports with printout
	DESFCHO	Selection window - main programme
	DESFCHO_	Selection window - subroutine
	DEUTIL	Application utilities menu
	DEVIEW	View (browse) the text file
M	DEWFCHO_	Browse file, select record and printout form
M	DEWFUPD	Display file with update
M	DEWFUPD_	Display file with update
	DEWHAT	Display what has been entered
	DEWPRINT	Printout selected questionnaires, including the data
	DMPICK	Data merge locality specification - cursor movement

	FILBKUP	Data backup (DOS backup)
M	FILEUTIL	File utilities menu
	FILREST	Data restore (DOS restore)
A	GENED0	Initialize GENED processing
A	GENED1	Define entry fields
	GENPROC	General procedures
A	GETOPT	Read option input for menu
	GETPWD	Logon (user ID and password)
A	GOTODOS	Start second copy of DOS
	HQDEEDIT	Data entry/edit menu
	HQVIEW	Data view menu
	LANGUAGE	Language selection
	LOAD_FF	Load data from the diskette
	LOC_INFO	Locality information
	LOC_SEL	Report parameters specification
	LOCSEL	Locality selection
	LOCVAL	Locality validation
M	LOGO	Display system logo
M	MAIN	System main program
	NATIVEDB	Go to DOS
	NEWSIMUL	Create new simulation database as copy of production
	OPALL	Open all data files
	P11CONT	Part 1, page 1, screen redisplay for new locality/year.
	P21CONT	Part 2, page 1, screen redisplay for new locality/year.
	P31CONT	Part 3, page 1, screen redisplay for new locality/year.
	PEST2	Corsor control
	PICK1	Part 1, page 1, locality and year validation procedure
	PICK11	Part 1, page 1, data entry/edit validation procedure
	PICK12	Part 1, page 2, data entry/edit validation procedure
	PICK13	Part 1, page 3, data entry/edit validation procedure
	PICK14	Part 1, page 4, data entry/edit validation procedure
	PICK2	Part 2, page 1, locality and year validation procedure
	PICK21	Part 2, page 1, data entry/edit validation procedure
	PICK22	Part 2, page 2, data entry/edit validation procedure
	PICK23	Part 2, page 3, data entry/edit validation procedure
	PICK3	Part 3, page 1, locality and year validation procedure
	PICK31	Part 1, page 1, data entry/edit validation procedure
	PICK32	Part 1, page 2, data entry/edit validation procedure
	PICK33	Part 1, page 3, data entry/edit validation procedure
	PICK34	Part 1, page 4, data entry/edit validation procedure
	PRNT	Printer selection and specification - cusor control
A	PROMMENU	Display and process color bar menu
A	PROMPT0	Initialize menu processing
A	PROMPT1	Defines menu prompt line

	QCTON	Right justify data (string vars.), without decimals
	QCTOND	Right justify data (string vars.), with decimals
	QCTONM	Right justify data during merge, mixed no. of decimals
	QCTONX	Right justify data for part 1 data, variable decimals
	REGCTY	Region's countries maintenance - main programme
	REGCTYE	Region's countries maintemance - subroutine
	REGCTYD	Region's countries display only
	REGE	Region's countries coursor control
	REGEN0	Redefine country maintenance initial screen
	REGEN1	Redefine sub-level 1. maintenance initial screen
	REGEN2	Redefine sub-level 2. maintenance initial screen
	REGEN3	Redefine sub-level 3. maintenance initial screen
	REGEN4	Redefine sub-level 4. maintenance initial screen
	REGEN5	Redefine sub-level 5. maintenance initial screen
	REPMENU	Report menu
M	REPORTA	User defined reports (CREATE REPORT) - main programme
M	REPORTA1	User defined reports (CREATE REPORT) - subroutine
M	REPORTAC	User defined reports (CREATE REPORT) - subroutine
M	REPORTAD	User defined reports (CREATE REPORT) - subroutine
M	REPORTAL	User defined reports (CREATE REPORT) - subroutine
M	REPORTAM	User defined reports (CREATE REPORT) - subroutine
M	REPORTAU	User defined reports (CREATE REPORT) - subroutine
M	REPRTAC1	User defined reports (CREATE REPORT) - subroutine
	SDQPRINT	Print blank Form
	SESSION	Select the session type (database to work with)
	SETCOLOR	Set screen colors
	SETPATH	Issue path setup string
	SUBLEVEL	National sub-levels (names) - main programme
	SUBLEV1	National sub-levels (names) - subroutine
	SUBLEV11	National sub-levels (names) - subroutine
	SYSPARM	System PARAMETERS
	SYSPRNT	Printer selection and specification - main programme
	SYSPRED	Printer selection and specification - subroutine
	SYSSCRN	Colour selection
M	SYSUTIL	System utilities menu
	SYSVIEW	System overview
	TOPMENU	Main menu
	USERS	Users maintenance - main programme
	USERS1	Users maintenance - subroutine
A	WAITMSG	Issue "wait" message
	YRSEL	Year selection
	YRVAL	Year validation - main programme
	YRVALID_	Year validation - subroutine

The WASAMS computer system requires:

* An IBM/AT or PS/2 (or compatible) with a printer.
* Runtime Foxbase Plus (supplied with the installation diskette).
* At least 11 MB of space on the hard disk for the application programs, data files and reports.

Note:

Your CONFIG.SYS file should contain the following statements:

FILES = 40 (or more)

BUFFERS = 10 (more is usually not efficient; they become too small)

Important note:

The WASAM programs utilize the three DOS commands : CHKDSK, BACKUP and RESTORE, and expects to find them on drive C: in a subdirectory \DOS. If your DOS commands are not in C:\DOS, then please create this directory and copy the three above mentioned .COM files to it.

Finally, to run WASAMS a run-time FOXBASE is needed. WHO has a license for an unlimited number of run-time FOXBASE copies. One copy of the multi-user run-time FOXBASE comes on the WASAMS installation diskette.

The CWS Unit at WHO Headquarters, Geneva, Switzerland, prepares the installation diskette with all of the necessary programs, reference tables and country codes. The main data files are initally empty.

To install WASAMS, do the following:

Put the installation diskette in your diskette drive. At the DOS prompt, switch to the installation drive (normally A: or B:), type "INSTALL" and press [Enter]. It is essental to use the install program because the installation diskette contains compressed programs that will not work if they are merely copied to your hard disk.

For example, type:

A:	and press [Enter]
INSTALL	and press [Enter]

The program will prompt you to enter the drive letter where you want WASAMS to be installed, and will also prompt you to confirm this choice (type the same letter again). The WASAMS application drive will normally be C:, but WASAMS will work just as well from another hard disk partition, or even from a Bernoulli drive (any letter from C: to K: may be entered).

To run WASAMS, type:

c:	press [Enter]	OR	d:	press [Enter]
cd c:\WASAMS-C	press [Enter]		cd d:\WASAMS-C	press [Enter]
wasams-c c:	press [Enter]		wasams-c d:	press [Enter]

Note that it is necessary to include the letter of the drive on which WASAMS is installed as a parameter.

Note that your config.sys file should include the two statements:

```
FILES   = 40

BUFFERS = 10
```

The WASAM programs utilize the three DOS commands: CHKDSK, BACKUP and RESTORE, and expects to find them on drive C: in a subdirectory \DOS.
If your DOS commands are not in C:\DOS, then please create C:\DOS and copy the three above mentioned .COM files to it. Otherwise, the backup, restore and download options will not work (will produce DOS errors).

Also note that WASAMS, when run, will reset your path.

To set it back to original status, we recommend to create a path setup batch file in the root directory of the C: drive (call it SETPATH.BAT).
That file should include only your path statement, and it should be called from AUTOEXEC.BAT and also afther the WASAMS session.

Then, your batch file to run WASAMS and reset path to original should include following statements (suppose WASAMS is being installed on your drive C:):

```
c:
cd c:\WASAMS-C
wasams-c c:
call c:\setpath
```

NOTE

WASAMS should be installed usig installation diskettes.

If it is being copied from one micro computer to the other, all files but one should be copied.

The file that MUST NOT be copied is \WASAMS\DEFS\SYSPARM.MEM

When running Water and Sanitation Monitoring System Wasams for the very first time, follow the steps listed below:

1. Use user identification "WASAMS" and user password "WASAMS".

2. Specify currency and unit (1, 10, 100, 1000, ...) in which financial figures will be given.

   NOTE

   Once the currency and unit are specified they cannot be altered.

3. Run SYSTEM UTILITY No 1. CHANGING SCREEN COLORS and select color patern.

4. Run SYSTEM UTILITY No 2. PRINTER SELECTION / SET- UP to select the printer you have available with your computer, or to add new printer to the list (printer control code could be found in the printer manual).

5. Run SYSTEM UTILITY No 6. "WASAMS" USERS to change the password or add new users.

Normaly the work on Water and Sanitation data entry proceeds with :

6. MAIN MENU option No 6. LOCALITIES AND REGIONS. Run the option No. 2. SUB-NATIONAL ADMINISTRATIVE LEVELS (names) to specify sub-level names (states, districts, provinces etc.).

7. MAIN MENU option No 6. LOCALITIES AND REGIONS. Run the option No. 1. LOCALITY CODES to specify country sub-national administrative/political/data collection structure.

8. MAIN MENU option No 6. LOCALITIES AND REGIONS. Run the option No. 3. REGIONS to specify of different region set-ups.

9. MAIN MENU option No 1. DATA ENTRY/EDIT to enter data.

The WASAMS application incorporates a number of facilities of general utility.

One of these is a facility to obtain and check the user's identification and to maintain a file of authorized users.

To be able to start WASAMS, a user must enter an authorized name and password. These will be checked against the list of authorized users.

The list of users is maintained by the application administrator who has the authority to add and delete users or change password or privilege level.

When adding a new user a user name, password and privilege level should be provided.

The privilege level can be any one of the following:

S = Single-user mode

0 = Multi-user mode, administrator's privileges (may read and update all data, shared and local, and controls the list of authorized users)

1 = Multi-user mode, level 1 privileges (may read and update all data, shared and local)

2 = Multi-user mode, level 2 privileges (may read shared and local data, but may update local data only)

3 = Multi-user mode, level 3 privileges (may read all data but has no update privilege)

Modifications to the WASAMS monitoring system may occur in the future.
For example, there could be a need for new reporting routines.
It is also possible that among the many thousands of lines in the WASAMS programs there are errors (bugs) which have not been discovered during the extensive tests performed at WHO headquarters.

Any program modifications, enhancements, and/or corrections, will be done at WHO/EHE/CWS and a new version, with an explanation, will be sent to registered users.

Users will receive the diskette with any new and/or revised programs and they will simply need to copy them into the subdirectory where the FOX (compiled programs) files are located (\WASAMS-C\PROC).

For example, insert the "WASAMS Update Diskette" into drive A: and type the following commands:

A:	and press	[Enter]
UPGRADE	and press	[Enter]

The upgrading procedure will prompt you to enter the drive letter where WASAMS is being installed, and will also prompt you to confirm.
The upgrading procedure will simply copy all new/upgraded programmes from the diskette to the drive specified.

The WASAMS monitoring system consists of over 400 programs, functions and procedures.

It is possible that among its many thousands of source code lines there may be errors which were not detect during extensive tests performed at WHO headquarters.

In case of an error occuring, please stop the operation and read the error messages carefully. If the printer is available, please make a hard copy of the screen. If not, write down the error messages.

This information is of great importance to our development team for making corrections. Please, send it to WHO/UNICEF with a detailed description of the situation when the error occurred and also any remarks or suggestions.

When an error occurs, it may be possible to CANCEL the operation. Do this rather then trying to IGNORE. Ignoring the error may allow the program to continue execution, but the error may be introduced into the data file and/or reports.

Beta test version. Not for further distribution

(DRAFT)

Epi Map

A Mapping Program for IBM-compatible Microcomputers

Program design by Jeffrey A. Dean, Anthony H. Burton, and Andrew G. Dean,

Programming by Jeffrey A. Dean

Manual by Andrew G. Dean

October 1991

This program for IBM-compatible microcomputers was produced through collaboration between:

The Surveillance, Forecasting, and Impact Assessment Unit
Office of Research
Global Programme on AIDS
World Health Organization
Geneva, Switzerland

and

The Division of Surveillance and Epidemiology
Epidemiology Program Office
Centers for Disease Control
Atlanta, Georgia 30333

This manual and the programs are in the public domain and may be copied and distributed without restriction.

Suggested citation:

Dean JA, Burton AH, Dean AG. Epi Map: a mapping program for IBM-compatible microcomputers. XXXXXXXXXXXXXX, 1991.

Acknowledgements

Notes

These programs were produced by the Surveillance, Forecasting, and Impact Assessment Unit, Global Programme on AIDS, World Health Organization, and the Epidemiology Program Office, Centers for Disease Control. They are provided for use by the public health community. You are encouraged to give copies of the programs and the manual to your friends and colleagues. No warranty is made or implied for use of the software for any particular purpose.

Trade names are used for identification only or for examples; no endorsement of particular products is intended or implied. The use of trade names or trademarks in this manual does not imply that such names, as understood by the Trade Marks and Merchandise Marks Act, may be used freely by anyone.

Telephone Assistance Line

Limited amounts of telephone assistance will be provided if a problem is not solved by reference to the manual. The Epi Map technical assistance telephone in the U.S. is (404) 728-0545.

Please send **comments and suggestions** to:

Andrew G. Dean, M.D.
Epidemiology Program Office
Mailstop C08
Centers for Disease Control
Atlanta, GA 30333, U.S.A.
Telephone (404) 639-1326

FAX (404) 639-1546

Anthony H. Burton
Surveillance, Forecasting,
and Impact Unit
Global Programme on AIDS
World Health Organization
1211 Geneva 27, Switzerland
Telephone 41-22-791-4525
(From the U.S.A., dial 011 first)
FAX 41-22-791-0746

Contents

What Is Epi Map?

Introduction to Epi Map

Epi Map is a program for IBM-compatible microcomputers that produces maps from geographic boundary files and data values entered from the keyboard or supplied in Epi Info or dBASE files. The data may be counts, rates, or other numeric values. In *Color/Pattern* maps, the values are represented as shading or color patterns for each geographic entity. In *Dot Density* maps, randomly placed dots proportional in number to the values are placed in each entity. Epi Map also produces *Cartograms*, in which the value for each geographic entity is allowed to control the size of the entity. Thus, a state or country would appear small on the map if the value being represented (e.g., cases of AIDS) was small, but large if the number was large.

Outline maps like those supplied with Epi Map can be created or edited within Epi Map. They consist of a series of numbers representing the coordinates of the entities in the map. These entities, whether countries, provinces, states, counties, or cities, are all polygons with complete boundaries, a number of vertices, and a name recorded in a special format in the boundary or .BND file.

Epi Map is designed to work independently or as a companion to Epi Info, a system of computer programs for public health work that is available in the public domain (Dean AD, Dean JA, Burton JH, Dicker RC. Epi Info, Version 5: a word processing, database and statistics program for epidemiology on microcomputers. Centers for Disease Control, Atlanta, Georgia, U.S.A., 1990). Geographically related data that can be numerically tabulated can be entered in Epi Info, manipulated and analyzed, and then sent to Epi Map for display and printing in map form. Data values may come from any Epi Info file that contains a variable giving the names of polygons in an available boundary file, (e.g. FRANCE, GERMANY, SWITZERLAND), and one or more fields with numeric data for display, such as CASE COUNT. Epi Info will produce such a file from individual case records with commands such as:

```
READ WEEK2
SELECT DISEASE = "HEP B"
ROUTE  HEP.REC
```

OUTPUT FREQ COUNTRY

This produces a summary file, with one record for each country, and a field called COUNT representing the number of cases of hepatitis for each country.

Completed maps are often complex entities, and Epi Map offers a number of tools for further enhancing a simple map. You can select the type of map, patterns of shading or color, number of dots per unit value, and color and thickness of boundaries, and add three-dimensional shading, titles, legends, text, boxes, or lines. Both data and boundary files can be edited from within Epi Map. Maps can be changed in size and several different maps can be displayed on the same screen. Labels for geographic entities can be displayed or not displayed, and edited in a variety of ways. Details of the finished product, a Map, is stored in a .MAP file for later display or for printing. Since Epi Map supports dot matrix, laser, and Postscript printers and Hewlett-Packard compatible plotters, the final map may be printed in color or black and white in a form suitable for publication. Maps may be sent to files in the CGM (Computer Graphics Metafile) format so that they can be imported into Harvard Graphics, Lotus Freelance, or other commercial programs for further enhancement or combination with other graphics.

For regular use, as in a disease surveillance system, programs may be written so that Epi Info will produce data files for mapping and new data will automatically be sent to Epi Map for display and printing in a previously constructed map format.

Epi Map and this manual are not copyrighted and may be freely copied for use by others. The U.S. boundary files supplied with the system are licensed for use only with Epi Map, and they may be freely distributed and used with the program. The others may be distributed without limitation.

Using This Manual

A few simple rules apply to reading the manual. Keys on the computer's keyboard are indicated by "< >." Thus, <Enter> is the key labeled "Enter." Material that you type is shown in boldface. If you are instructed to type:

A:\> **COPY A:*.* B:**

the computer will have supplied "A:\>". You should type "COPY A:*.* B:" and press the <Enter> key. The <Enter> key is almost always needed to mark the end of an entry, although this will not be shown in the manual each time. Since programs may be run from a variety of disk drives, the drive letter in front of the

DOS prompt will be omitted in this manual. If your copy of Epi Map is on drive C, then the instruction to run Epi Map,

>EPIMAP

may actually appear on your computer as:

C:\EPIMAP\>**EPIMAP**

after you have typed "EPIMAP."

Menu choices in Epi Map and file names are shown in UPPER CASE LETTERS.

Chapter 1

Installation

Tutorial

Start the computer as usual. Place the Epi Map disk in drive A. From the DOS prompt, C:\>for example, type
>A:
and then
>INSTALL

For a quick introduction to Epi Map, read Chapter 2,

Hardware and Software Requirements

Epi Map will run on any IBM-compatible microcomputer with 640 K. of random access memory (RAM) and a graphic display. The graphic adapter may be of the types known as CGA, EGA, VGA, AT&T, Hercules monochrome, or IBM 8514. In order to print maps, software is supplied to work with Epson/IBM dot matrix printers, Hewlett-Packard plotters (7470, 7475, 7550), Hewlett-Packard Laserjet compatible printers, Postscript printers, and Hewlett-Packard PaintJet and DeskJet printers. Epi Map will produce files in the Computer Graphics Metafile format, meaning that they can be imported into Lotus Freelance, Harvard Graphics, Word Perfect, and many other commercial programs, and thereby sent to a number of other devices to produce colored slides or printed images. Methods for photographing the screen with an ordinary camera are also given in Chapter 10.

A hard disk is useful, but not required for Epi Map, and many laptop computers with graphics displays will run Epi Map comfortably. Since the program and many boundary files will fit on a single floppy disk, disk space is not usually a limitation. The program itself occupies about XXX 300 K and boundary files (map outlines) of typical states or countries occupy 4 to 20 K each.

Epi Map runs under DOS and does not require Windows or other special software. Although it is designed to work with data from Epi Info files, it can also be used with dBASE files or as a stand-alone program, in which data values are entered directly from the keyboard. .

Mice

Epi Map works with, but does not require, a mouse to move the cursor and choose commands on the screen. If you have a Microsoft-compatible mouse, be sure to run the mouse driver before running Epi Map. If you have other programs that use a mouse, it is likely that the driver is run automatically when your computer "boots up." If not, the most common way to activate the mouse is to type "MOUSE" from the DOS prompt. If this fails to produce a message about the mouse, consult your mouse manual for further instructions.

The mouse is a convenience but not a necessity. You will be able to make maps very well in Epi Map using the function and cursor keys to control the program. The mouse makes it easier to make new maps or to edit the resulting graphics, but anything that can be done with a mouse can also be done from the keyboard.

Many commands require that you move the cursor with the mouse to the correct spot and then click the left mouse button briefly. In Epi Map, it is generally not necessary to hold the mouse button down, as clicking it again has the same effect as releasing the button in other programs. Since the middle and right buttons are not used in Epi Map, "mouse button" in this manual means "**left** mouse button."

Changes in AUTOEXEC.BAT and CONFIG.SYS Files

In order to facilitate use of Epi Map from any directory on the computer, statements should be added to the AUTOEXEC.BAT and CONFIG.SYS files in your root directory (Often the "\" directory on the C: disk). To add them manually with an editor such as EPED in Epi Info, the statements are as follows:

To the PATH command (if any), add the proper drive letter and ":\EPIMAP".

Thus if your AUTOEXEC.BAT file contains the following PATH statement:

PATH C:\DOS;C:\EPI5

change it to:

PATH C:\DOS;C:\EPI5; C:\EPIMAP

In CONFIG.SYS, statements should appear with at least the following values:

FILES = 20
BUFFERS = 20

If the numbers are already higher, they should be left as they appear. FILES gives the maximum number of files that can be open at one time and BUFFERS specifies the size of a buffer that operates with the hard disk. Usually BUFFERS values of 15 or 20 give the maximum speed with a hard disk, but this varies with the type of computer and is often set in the CONFIG.SYS file that came with the computer.

Running Epi Map

To run Epi Map, simply type EPIMAP any time a DOS prompt is visible:

>EPIMAP

The words "Epi Map" will appear on the screen in large letters. The main menu at the top of the screen contains the following items:

Map Boundary Data Map Type Annotations Output Setup F10-Quit

The menu can be made to disappear by pressing <Esc> and will reappear if you press <Esc> again. Throughout Epi Map, either <Esc> or <F10> may be used to indicate that you are done with a particular screen. To avoid confusion, it is best to use <Esc> for this purpose except when leaving the program.

The next chapter contains a quick tutorial so that you can learn to make maps almost immediately. The other chapters describe the remaining items on the menu and the underlying principles of mapmaking in more detail. If you are in a hurry to get started, turn to the next chapter and make some maps. If you are a more experienced computer user or like to proceed systematically, you may prefer to turn to the chapter on Printing and set up the file and printer configurations with the Setup menu before beginning to make maps.

Chapter 2

A Quick Introduction to Epi Map

Tutorial

For a quick introduction to Epi Map, run the program, choose the MAP menu by typing "M," and then press <F1> to choose CREATE MAP FILE. Subsequent screens will lead you through the process of choosing a boundary file (choose AFRICA.BND) and a data file (choose MAPDEMO.REC), and a field within the data file (choose either field). Other screens can be accepted as supplied by pressing <Esc> until the completed map appears.

Choose MAP TYPE again, and then DOT DENSITY. On the option screen that appears, enter 10 for the DOT VALUE and press <Esc> to display the dot map. Now choose MAP TYPE a third time, and CARTOGRAM and then <Esc> to display a cartogram. Explore the other menus to see how the maps can be altered.

Overview

A map in Epi Map is stored in three types of files. *Boundary files* contain the basic outline of the map. *Data* (.REC or .DBF) *files* are Epi Info or dBASE files containing summary data to be plotted on the map. Depending on the type of map chosen, the data will determine patterns and colors, densities of randomly-distributed dots, or the size of the features (polygons) that make up the map. The names of the boundary and data files and the details of titles, legends, extra lines, or other annotations are contained in *Map files* (.MAP).

To make a map, the usual process is to specify a boundary file (AFRICA.BND),

and a data file (MAPDEMO.REC) and to choose a field within the data file that is to be mapped. Each map displays data similar to that found in a frequency table in Epi Info, with a single summary figure, such as "number of cases," for each geographic entity in the boundary file.

Identifying a boundary file, a data file, and a field is sufficient to display a map with the standard (default) settings of Epi Map. The map will show the data in patterns and colors by quartile for the values in the data file. The best way to discover the other features of Epi Map is then to experiment with Map Types and with the choices on the Annotations menu to see how the map can be varied. Further details are contained in the rest of this manual; this chapter offers a guided tour of the most commonly used features.

A Guided Tour

The following instructions will provide a quick tour of Epi Map:

1. Run Epi Map by typing EPIMAP from the DOS prompt.

2. Choose the MAP menu by typing M or pressing <Enter>.

3. Choose CREATE MAP by pressing C, <F1>, or <Down arrow> and then <Enter>.

4. Choose and load the boundary file AFRICA.BND by pressing <Enter> twice.

5. Choose the data file MAPDEMO.REC by pressing <Enter>.

6. Choose one of the two fields in the file, CUM. ESTIMATE or CUMULATIVE CASE, moving the cursor bar with the <Down arrow> or the mouse and pressing <Enter> or the mouse button to confirm.

7. Bypass the RANGES and MAP OPTIONS screen for now by pressing <Esc>.

8. Accept the default values on the TITLES screen by pressing <Esc>.

9. The map will be displayed.

The tour continues with a brief explanation of the operations you may want to perform most often in Epi Map.

To see and edit a boundary file:

1. From the main menu choose BOUNDARY and then EDIT BOUNDARY.

2. Choose SELECT.

3. Select a country by placing the cross hairs over the country and pressing <Enter> or the mouse button. The country should turn blue. Press <Esc> to bring the menu back.

4. Now choose MOVE and follow instructions to move the selected country into one of the ocean areas. Press <Esc> to bring the menu back.

5. Choose EDIT. Press <F7> and follow instructions to enlarge an area on the map. Place the cross hairs over a country and click or press <Enter>. The boundaries and "corners" or vertices of the country polygon should be highlighted. Place the cross hairs over one of the vertices and press <Enter> or click the mouse button. Now drag the point to the right or left and release it with another <Enter> or click. If you like, change the shape of the polygon in several ways before pressing <Esc> to bring the menu back. Press <Esc> to return to the main menu.

At this point, you could save the results by choosing SAVE BOUNDARY from the BOUNDARY menu and then giving a name to the newly edited file.

To see and change values in the data file:

1. From the main menu, choose DATA and then EDIT DATA. The countries of Africa are displayed with the name in the first column and the two available data fields in the second and third columns. The values are actually contained in an Epi Info .REC file behind the scenes. Note that there is only one set of values for each country; this is a summary file produced for mapping purposes and is analogous to two frequency tables rather than to a file of individual cases.

2. Move the cursor to column 2 or 3 with the <Right arrow> and change one of the values to something much larger. Press <Esc> to display the map and observe that the value represented has changed.

The Edit data feature can be used to enter data from the screen if there is no suitable data file. Once a boundary file has been loaded, choose EDIT/ENTER DATA. Epi Map allow you to enter a data value for each country or other polygon in the boundary file. If you choose SAVE DATA and give a name for the file, it will become a permanent file in the Epi Info format.

To display a dot-density map:

1. Return to the main menu. Choose MAP TYPE. There are three choices. The maps displayed so far are Color/Pattern maps.

2. Choose DOT DENSITY. On the screen that appears, change the DOT VALUE from 1 to 10. Press <Esc> to display the map. The dots are randomly scattered within each country, with each dot representing 10 cases.

To display a cartogram:

1. Choose MAP TYPE again and this time select CARTOGRAM. On the CARTOGRAM OPTIONS screen, change MINIMUM SIZE to 10% so that countries with low values will be somewhat identifiable. Press <Esc> to display the map.

A cartogram is probably not the best way to display the data in MAPDEMO.REC, but this method does at least highlight the countries with the most cases.

To edit the titles or legends:

1. From the main menu, choose ANNOTATIONS and then TITLES or LEGEND.

2. Change the wording of the titles or legend heading.

3. Press the <Tab> key and then change other features such as SIZE, FONT, or COLOR.

4. Press <Esc> to display the map.

To display labels:

1. From the main menu, choose ANNOTATIONS and then LABELS.

2. Turn DISPLAY LABELS ON.

3. Change any other features of the label text that are available.

4. Press <Esc> to display the map and see the labels.

To change the patterns and colors:

1. From the main menu, choose MAP TYPE and then COLOR/PATTERN.

2. Press <F8> for COLORS.

3. Each range of values is displayed at the left of the screen with its own color and pattern. Move the marker to the first value with the <PgUp> key. Now select another pattern and color by positioning the highlighted square on another pattern and color. Do the same for the other values if you like.

4. Press <Esc> twice to display the map.

To change the location, size, color, or font of annotations, and to draw additional lines arrows, markers, boxes, or text on the map:

1. Choose ANNOTATIONS and EDIT ANNOTATIONS.

2. Move the cursor until it lies over one of the country labels, such as ETHIOPIA.

3. Click the mouse button or press <Enter> twice. A dotted rectangle will appear around the label. Now move the cursor. The label moves with it. When you have positioned the label in a new location, click again or press <Enter> to release the label. Try the same thing with one of the titles.

4. Select a label or title with a single click or <Enter>. Now move the cursor to the OPTIONS menu and click or <Enter> again. Choose one of the options and then select a new color, size, or font.

5. Try the "tools" represented as a cursor arrow, a text character, a line, a rectangle, and a bullet or marker above the left side of the map. After selecting one of the tools other than the cursor arrow, you can draw the represented object on the screen and "decorate" the map as you wish. Experiment with these tools until you are skillful.

To print a map:

1. Before printing, use the Setup menu to select the proper settings for your printer,

as described in Chapter 9. From the Setup screen, press <F2> to save the settings.

2. From the main menu select the OUTPUT menu. Choose the printer desired for output. You may have to make or confirm another choice about the resolution and size of the image to be printed. The first time, choose low or medium resolution until you see that everything works. Then experiment with the other choices until you have a feeling for the tradeoff between print quality and the time it takes the printer to produce the image.

This concludes the introductory tour of Epi Map. You have become acquainted with the major features of the program. Many more refined operations, such as producing shadowed maps, multiple maps on a screen, producing your own boundary files, and setting up Epi Map to display a new data file whenever it is altered, are explained in the next few chapters. Even now, however, you know enough to produce some very useful maps. Congratulations!!

Chapter 3

Boundary Files

Tutorial

Choose BOUNDARY from the main menu and then LOAD COMPLETE. Choose the AFRICA boundary file and press <Enter> twice. A map of Africa will appear. Several contiguous maps can be loaded by giving several names to LOAD COMPLETE.

Suppose, however, that you want to show only two countries from the map. Choose BOUNDARY from the main menu again, and then LOAD PARTIAL. Choose the AFRICA boundary file and press <Enter> twice. A list of the countries of Africa will appear. All have been selected. Deselect all by pressing <F4>. Choose ETHIOPIA and SOMALIA by moving the bar cursor and pressing <+> when it is on the correct choices. Press <Esc>. Only these two countries will appear on the screen.

Choose EDIT BOUNDARY from the BOUNDARY menu. A new menu appears at the top of the screen. Choose EDIT and then place the cross hairs over Ethiopia. Press the mouse button or <Enter>. The vertices ("corners") of Ethiopia are highlighted. Place the crosshairs on one of these or on a line and click or press <Enter>. Now move the cursor to a new location and you will see the line or point follow. Click again to place it permanently in its new location. Experiment further with the EDIT feature, pressing <Esc> to return to the editing menu when done.

Choose SELECT and then click when the crosshairs are over Ethiopia. The entire interior of the country will be

highlighted. Press <Esc>. If you choose DELETE at this point, the country will be deleted from the map, but choose MOVE instead. Now click on the selected country and move the crosshair cursor to a new location. The country will also move. Click again to finalize the new position.

Countries can be combined into a single region, such as East Africa by loading the complete Africa map, selecting the East African countries, and using the COMBINE command to produce an East African map, with or without the internal boundaries between countries. Values (shading or dots) for East Africa will then apply to all these countries equally.

Choose NEW from the edit menu. Give the name NEW COUNTRY to the new entity. Now move the cross hairs to the starting point for drawing a new country and click or press <Enter>. Move to the next point and click or press <Enter> again, repeating this until the outline of the country is complete except for the last segment. Then click or press <Enter> again to close the polygon and finalize the new country. This is the method you would use to draw a new map. Common boundaries are handled as explained in the section on "Creating a New Boundary File" in this chapter. Note that your new map might be any area containing closed polygons, and the "countries" might be townships, houses, or hospital rooms.

Overview

Boundary files are the basic skeletons from which complete maps are built. They consist of numbers and labels describing polygons. The polygons may represent countries, states, provinces, counties, blocks, rooms, buildings, or any other entities that can be represented as closed spaces. Epi Map contains facilities for creating, editing, displaying, and printing boundary files with or without associated shading or dots. The BOUNDARY program supplied with Epi Map transforms boundary files in a number of ways, including simplifying those too detailed to display efficiently, changing formats for greater display speed, and performing "projections" to make the map appear to be viewed from a different perspective or

with a different treatment of the earth's curvature. Using the BOUNDARY program is described in Chapter 8.

Epi Map saves boundary files in an efficient "binary" format, but files in ASCII form (readable with the DOS TYPE command) are also accepted. The boundary files supplied with Epi Map include each country in the world with subdivisions of larger countries and every state in the United States by county. Additional boundary files can be obtained from public or commercial sources or entered into Epi Map with a digitizer tablet, a mouse, or even (with patience) by using the cursor keys.

The Structure of Boundary Files

Boundary files are supplied as files with names like AFRICA.BND. The suffix or file name extension .BND is suggested but not required. Each part of a boundary file such as the one for AFRICA consists of a label like MADAGASCAR, then a number telling how many points (vertices or "corners") make up the polygon called MADAGASCAR. In the example below, there are 17 points in MADAGASCAR, and the 17 lines that follow contain 2 numbers each describing these points. When Epi Map draws AFRICA on the screen, each of these number pairs represents a horizontal (X) and vertical (Y) location on the screen. Epi Map constructs straight lines between the points to draw the map. Here is the first part of the AFRICA.ASC file distributed with Epi Map.

```
"Madagascar",17
23.35544,8.71676
23.49856,8.27213
23.41380,8.07204
23.39852,8.08872
23.22344,7.41759
22.90386,6.79233
22.66487,6.74647
22.49396,6.89515
22.50647,7.35229
22.57733,7.39675
22.62041,7.48707
22.58150,7.85111
22.70933,8.11651
23.06504,8.26240
```

```
23.19287,8.45137
23.22066,8.58198
23.35544,8.71676
"Namibia",22
18.25464,8.07621
18.40610,8.08038
18.52698,8.02341
etc.
```

The numbers here represent arbitrary coordinates rather than latitude and longitude, but many boundary files, such as those for the States of the U.S., contain latitude and longitude. Note that the last two numbers under MADAGASCAR are the same as the first, thus closing the polygon.

Most of the files distributed with Epi Map are in the "binary" or compiled format rather than the plain vanilla or ASCII format shown above. The binary format looks like garbage ("hearts and faces") when displayed on the screen or in a word processor, but is more efficient and therefore faster when being loaded into Epi Map. The BOUNDARY program, described later, will convert files to either binary or ASCII format.

Loading and Viewing Boundary Files

Epi Map can display all or part of a boundary file, and several boundary files, such as those for adjacent countries in a region, can be displayed on the screen at once. The following choices are contained in the BOUNDARY menu that pops down when you type B from the main menu or place the cursor over the word BOUNDARY on the menu and click the left mouse button:

```
Load  Complete..     F2
Load   Partial..
Edit   Boundary..
Save   Boundary..
```

LOAD COMPLETE allows you to load one or more boundary files in complete form. In the U.S., for example, you might want to load the State of Georgia, contained in the boundary file GA.BND by itself, but you could also load adjacent states, FL.BND (Florida), AL.BND(Alabama), TN.BND(Tennessee), NC.BND (North Carolina), and SC.BND(South Carolina) to produce a regional map. To

perform either task, choose LOAD COMPLETE from the menu and then enter the name(s) of the boundary files desired, pressing <Enter> twice after the last one. To see the available files press <F1> from the LOAD screen and a list will appear. You can choose one or more files from the list by moving the cursor and pressing enter or the mouse button.

LOAD PARTIAL presents a list of the subdivisions within a boundary file so that you can choose those that are to be displayed on the screen. If you give the names of several boundary files, the subdivisions of all are displayed. You are then invited to select or deselect subdivisions with the <+> and <-> keys. You could make a map of East Africa, for example, by selecting only the countries in this region from AFRICA.BND.

Editing a Boundary File

The EDIT BOUNDARY choice from the BOUNDARY menu will show the current boundary file in a frame, with a new menu displayed across the top. The menu contains the items:

```
New   Edit   Select   Delete   Combine   Move   Utilities   eXit
```

With the boundary file AFRICA.BND loaded, the menu commands are used as follows: (Note: If you are not using a mouse, the instruction "click" means press the <Enter> key.)

NEW The command "Enter Boundary Name:" appears. Supply the name of a new geographic entity to be added to the map. This might be "New Island." Move to an area of the map not already occupied and click the mouse. Move the cursor to the next vertex of the intended polygon and click again. Proceed in this way to trace the entire outline of the new "country." When you have marked the last point, but not yet closed the polygon, click an extra time and Epi Map will complete the polygon by drawing a line to the first point. Additional countries can be added in the same way.

EDIT This command is used to alter boundaries that have already been drawn. After choosing EDIT, place the cursor within any polygon and click the mouse button. The points around the periphery of the country will be highlighted. Now click on one of the points and drag it to a new location. Clicking again will release it. Clicking on a line will create a new point that can also be moved.

During editing, the image can be enlarged by pressing <F7> to "zoom in," and then

selecting the upper left and lower right corners of the rectangle to be enlarged. <F6> moves an enlarged image of the currently highlighted boundary to the center of the screen. <F8> "zooms out" to the normal sized image.

Note that <F7> may be used repeatedly to give great enlargements for great precision in editing or entering points. At the upper right side of the screen appear the name of the boundary file, the number of polygons, the name of the one currently being edited, the number of polygons with the same name, the number of vertices in the current polygon, and the X and Y coordinates of the current cursor location. These features allow very fine control in editing or drawing a map if necessary.

SELECT Before polygons can be moved, deleted, or combined, they must be selected using this command. Choose the command and then move the cursor over the first area desired. Click once and the polygon (country) will be filled with a lined pattern. Repeat this for other countries if desired. Press <Esc> to return to the menu. Now you are ready to give a MOVE, DELETE, or COMBINE command.

DELETE After a polygon has been selected, DELETE will cause it to be erased. If this is done for a country on the interior of the continent like Ethiopia or Sudan, the effect will not readily be seen because the boundaries of neighboring countries still remain, but deleting more than one adjacent country or a coastal country will show the effect better. In all cases, however, the name of the country will be deleted from the edited boundary file and data intended for that country will not be shown on a completed map.

MOVE After selecting a country, choose this command and then click on the country again. Now drag it to another location and click once more. The country has been repositioned.

COMBINE Select two or more adjacent areas with the Select command. Then choose Combine. Give a name to the new region, such as "Horn of Africa." You are then asked to choose whether to retain the boundaries between countries in the region. In order to see the effects, it is best to say "N," but in practice you may prefer to leave the boundaries intact.

Values in a data file may be entered for either a country or a region or both. Suppose that you combine Somalia, Ethiopia, Djibouti, and Kenya to form the region called "Horn of Africa." In a data file, if case counts are entered for each individual country, they will override the value for the Horn of Africa. Any of the four countries without its own case count, however, will have the shading or dot pattern given for the Horn of Africa. COMBINE can therefore be used to give

alternative names to a single country, so that data given under either name will be mapped. This might be useful when a country has recently changed its name.

UTILITIES SET MAP SCALE allows you to change the scale of the map, but not the size of the image. If you are using the numeric coordinates at the upper right corner of the screen, this allows control of the coordinates of the lower left and upper right corners of the map.

EDIT BOUNDARY NAMES brings up the list of names for all the polygons in the current boundary file and allows you to change them if desired. The changes become permanent if you save the file.

CONFIGURE DIGITIZER is described below in the section on using a digitizer.

Creating a Boundary File

You can make a boundary file from the beginning in Epi Map. This is useful in mapping an outbreak in a community for which no computerized map was available, or in making a "map" of a hospital or other building where illness had occurred.

To make a new boundary file, return to the main menu by pressing <Esc> or choosing EXIT. Choose BOUNDARY and then LOAD COMPLETE. Give a name for the new boundary and then press <Enter> twice. Epi Map will "load" the empty boundary file and display an empty screen. Now choose EDIT BOUNDARY. You will be asked for the X and Y coordinates of the lower left and upper right corners of the screen. These are useful when working from a grid with known dimensions or a map with latitude and longitude, but they may also be accepted as presented if you will draw the map freehand.

Constructing the map is the same whether you use a mouse or the cursor keys to move the cursor, although it is easier with a mouse. Choose NEW from the EDIT BOUNDARY menu, give the first geographic entity a name, and draw a polygon to represent it on your map, clicking at each corner or vertex. Press <Enter> or click twice to complete the figure and draw the last side.

Adjacent polygons usually share a common boundary and it is very difficult to trace this exactly in drawing the second polygon. Epi Map provides a technique for drawing common boundaries automatically. To create a common boundary, first draw the non adjacent parts of a new polygon. Then press the </> key (forward slash). A menu will appear. Choose COPY COMMON and follow the instructions

to incorporate the common boundary in your new polygon.

Drawing geographic entities like the States of Michigan or Hawaii that consist of two or more separate polygons requires a special technique. To draw a state with two polygons, draw all the vertices for the first polygon, but do not close the polygon. Press the </> key and choose ADD ISLAND from the resulting menu. Draw the second polygon and press <Enter> or click twice to draw the last line. Both polygons will be completed automatically. If you make a mistake, DELETE ISLAND can be used to remove an accessory polygon. Islands can be external to the first polygon or internal. An internal "island" might be a large lake or another country completely surrounded by the first as Lesotho is surrounded by South Africa.

Saving a Boundary File

Whether created from the beginning or merely edited, a new boundary file must be saved before it can be considered permanent. Return to the main menu with <Esc> and choose BOUNDARY and then SAVE BOUNDARY.

Related Topics in Other Chapters

Chapter 8 discusses conversion of boundary files from other sources, map projections, the use of a digitizer tablet to draw boundaries, and further technical details of boundary files when a single entity consists of multiple polygons or contains other polygons.

Chapter 4

Data Files

Tutorial

Data files in Epi Map can be created in Epi Info or dBASE-compatible systems, or imported through Epi Info from a variety of other formats. In this tutorial, however, we will create a data file by entering values on the screen in Epi Map after loading a boundary file.

From the main menu, choose BOUNDARY and then LOAD COMPLETE. Load the AFRICA file.

Now choose DATA from the main menu, and then EDIT DATA. A screen will appear that contains the names of the countries on the map of Africa. In the VARIABLE #1 column enter a number for each country, pressing <Enter> after each. The numbers may represent cases of a disease, for example.

Now press <Esc> to see the map. The data values will be displayed. Return to DATA and EDIT DATA and change some of the values to verify that they are the ones shown on the map.

To save the data file, choose DATA and then SAVE DATA. Use your own first name (up to 8 letters) as the name of the file.

Overview

Epi Map accepts data from Epi Info files or from files in the dBASE format. Each record to be displayed must contain a geographic name corresponding to one of the entities (polygons) in the boundary file being used by Epi Map. The records must also contain at least one numeric field with the data to be displayed, such as Number of Hepatitis B Cases, or Cases of Cholera per Hundred Thousand Population. Epi Map will ask which field contains the boundary names and which field contains the data for each map displayed. Although the file may contain many numeric fields, each map represents data from only one field. As described later, however, more than one map may be placed on a single screen.

If individual cases are the starting point, they must be processed in Epi Info or another system to produce a summary file, with only one record per geographic entity. This is done with the OUTPUT FREQ command in Epi Info's ANALYSIS program.

If you prefer to enter data from the keyboard, Epi Map will construct an Epi Info file containing the geographic names automatically and allow you to enter the corresponding data values.

The Content and Structure of Epi Map Data Files

Epi Map is designed to display data from both Epi Info and Epi Map files. Epi Info is a companion program for Epi Map that provides a complete database and statistics program for epidemiologic and other public health work (REFERENCE). Case or other individual records may be processed in Epi Info to produce summary data files for use in Epi Map. Similar processing must be done in dBASE systems before plotting the data in Epi Map. Although the actual file structure is more complicated, either file format should contain the following information for each record:

Geographic Entity Name Variable #1 Variable #2 Variable #3 etc.

To display a map of the State of Connecticut with each County showing cases of Hepatitis A, the records might contain:

COUNTY	HEPCASES
FAIRFIELD	3
HARTFORD	1

```
LITCHFIELD              0
MIDDLESEX               2
NEW HAVEN               1
TOLLAND                 0
WINDHAM                 1
```

There are seven counties in Connecticut and this data file would match the boundary file exactly. If the County names do not match, however, only data corresponding to the names in the boundary file will be plotted. Misspellings and synonyms will cause the data to be ignored; you must change the names in the boundary file or in the data file so that they match before the data will be displayed. It is quite possible to have many fields of relevant or irrelevant data in the file, as long as the geographic name variable is first. If there are fields for Hepatitis A, Hepatitis B, Salmonella, Shigella, and several other diseases, you can choose which one to map from within Epi Map at the time the map is displayed.

Entering Data Directly in Epi Map

Sometimes the data values for a map are not available in Epi Info or dBASE file format, and you may want to enter them directly from the keyboard. To do this first load the boundary file using BOUNDARY and LOAD COMPLETE as described in Chapter 3. From the main Epi Map menu, choose DATA and then EDIT DATA. A data file containing the geographic names from the boundary file will appear on the screen. To enter data, move the bar cursor to the VARIABLE #1 column and enter numeric values, pressing <Enter> after each. Then press <Esc> to display the map.

At the bottom of the data file screen are prompts for several additional functions. These are:

F2 NEW VARIABLE: Creates a column for a new variable.

F3 MODIFY VARIABLE: Allows entry of a more descriptive name for the variable in the current column. Column width can be changed and pressing the <+> key toggles between STRING (text) and NUMERIC field types. Data to be displayed must be numeric.

F4 UPDATE NAMES: When a boundary file has been edited, pressing this key will update the data file so that new entities are included.

F5 SORT FILE: Sorts the geographic names on the screen to make it easier to find a given name or to correspond to an alphabetized list from which you may be entering data.

F10 DONE: Returns to the main menu and displays the map.

After data items have been entered, you must choose DATA and SAVE DATA from the main menu to save the file in permanent form.

Processing Individual Cases in Epi Info for Display in Epi Map

In Epi Info, if you have a file of individual cases, such as those commonly used for surveillance of reportable disease, called WEEK2, the following ANALYSIS commands will produce a file suitable for use in Epi Map:

```
READ WEEK2
SELECT DISEASE = "HEP B"
ROUTE  HEP.REC
OUTPUT FREQ COUNTRY
QUIT
```

The resulting file will have a field called COUNT that contains the number of hepatitis B cases for each country. Because there is only one text field (COUNTRY) and one numeric field (COUNT), Epi Map will not ask for the names of the fields containing boundary names and data items. You will, however, want to create a title for the map more specific than "COUNT." Titles are discussed in chapters 7.

Related Topics in Other Chapters

The use of Epi Info files to provide automatic mapping from within other software, such as systems for disease surveillance, is discussed in Chapter 12.

Chapter 5

Map Files

Tutorial

To make a simple map, load any boundary file, such as AFRICA, by choosing BOUNDARY from the main menu and then LOAD COMPLETE. Press <F1>, choose a boundary file, and press <Enter> twice.

Now choose DATA from the main menu and ENTER/EDIT DATA. Press the right arrow key and then enter a series of numbers on the screen that appears. Press <Esc> to display the map and you should see the data displayed in several color or shading patterns. Choose DATA again and the SAVE DATA to save the file. Give the file a name. So far we have repeated the tutorial for the previous two chapters.

To preserve this combination of boundary and data values, choose MAP from the main menu, and then SAVE MAP. Give the map a name such as TESTMAP.MAP. Then exit from Epi Map.

To examine the map file you have just made, use the DOS TYPE command (or EPED from Epi Info) to display the file:

```
>TYPE  TESTMAP.MAP
```

Now run EPIMAP again, giving the name of the map file from the command line, as in:

```
>EPIMAP  TESTMAP
```

Your map will appear, complete with data, on the screen. Rather than loading the map directly from the

command line, you could have chosen MAP from the main Epi Map menu and then LOAD MAP followed by the name of the .MAP file to do the same thing.

Overview

In previous chapters, maps have been described as derived from matched boundary and data files. Each map must have at least one boundary file and one source of data. This chapter describes map or .MAP files that are used to record the boundary and data file(s) for a map and may also contain details of titles, colors, labels, legends, lines, boxes, symbols, and other details that make up a final version of a map. Once all these items are saved in the .MAP file, the map may be easily redisplayed by loading the .MAP file. This can be done from the MAP menu or from the DOS command line by typing EPIMAP and the name of the .MAP file, thus providing a way to display maps from within Epi Info and other programs automatically.

The Structure of Map Files

The .MAP file may be regarded as a private set of notes kept by Epi Map as you construct and modify a map. The information is sufficient to reproduce the map at a later time, but is not particularly designed to be modified except through Epi Map. If you are curious, however, you can view the inside of a .MAP file using Epi Info's EPED or another editor or word processor. The file is in ASCII or "plain vanilla" format, but contains many numbers representing locations on the screen and other parameters. Among the more easily understood items are BOUNDARY, the name of the boundary file; DATAFILE, the name of the data file; and MAPTYPE, the type of map to be produced. There are also entries for LABELS, RANGES, TITLES, and the LEGEND. BOUNDVAR and DATAVAR are the variables in the data file to be used for mapping. If you have created annotations or changed the location of labels, there will be entries to record the changes.

Creating a Map File

As described in Chapter 2, the CREATE MAP FILE choice on the MAP menu proceeds through choosing a boundary file and then a data file to make a first draft of a map. You can then use the ANNOTATIONS menu choices to adjust or add features and finally SAVE the .MAP file as described in the next section.

Saving a Map File

Before a map file can be retrieved, it must be saved using the SAVE MAP FILE command on the MAP menu. If you attempt to leave Epi Map without saving the file, the program will remind you to save the .MAP file.

Loading a Map File

To load an existing .MAP file and display the map that it describes, choose the MAP menu and then LOAD MAP FILE. To see a list of available .MAP files, press <F1>. Choose or type the name of the .MAP file to be loaded and the map will be displayed. An alternative method for displaying a map is to call the .MAP from the DOS command line when running Epi Map. For example:

C:\>**EPIMAP CURRWEEK**

will run Epi Map and use the file, CURRWEEK.MAP to display a map.

Related Topics in Other Chapters

In Chapter 12, more information is given on running .MAP files from the command line. In Chapter 11, on drawing multiple maps on a single screen, the Map Management command on the MAP menu is described fully. Chapter 7 describes creation and editing of annotations and labels that are stored in .MAP files.

Chapter 6

Map Types

Tutorial

Create a map by loading the boundary file AFRICA.BND and the data file MAPDEMO.REC. Now choose MAP TYPE from the main menu and then COLOR/PATTERN. On the screen that appears, the cursor will be in the left column under "Ranges." Press the down arrow and change the numbers in the right column to even numbers. Note the number of countries in each range on the left under "#R." If you like, change the MAP or BOUNDARY options on the right. Try setting the two shadow offsets to 2 for a three-dimensional effect. Note the statistics on the lower right. Press F8 for COLORS. Select a range with <PgUp> and <PgDn> to move the arrow on the left. Now choose the color and pattern by moving the bold rectangle with the arrow keys. Press <Esc> or <F10> twice to display the map. The results can be saved using SAVE MAP on the MAP menu if you wish.

Now choose MAP TYPE and DOT DENSITY. On the next screen, set the DOT VALUE to 100 and the DOT DIAMETER to 4. Change the DOT COLOR with the <+> and <-> keys if you wish. The other options are similar to those for Color/Pattern maps. Display the map by pressing <Esc>. Try adjusting the dot value, diameter, and color until you get a map you like.

Now choose CARTOGRAM from the MAP TYPE menu. Set the MINIMUM SIZE to 10% and the MISSING SIZE to 5% so that countries with zero or missing values will be visible. Press <Esc> to see the map. Although this kind of map is better when many countries have similar values, it does illustrate more clearly than the other two

that most of the reported cases are in Zaire and a few other countries. The map may be clearer if you use the LABELS entry on the ANNOTATIONS menu to turn on LABELS and thus put the names of the countries on the map (see Chapter 7).

Overview

There are three Map Types in Epi Map--COLOR/PATTERN, DOT DENSITY, and CARTOGRAM. Each is produced by choosing MAP TYPE from the main menu and then choosing the desired type. A screen of optional settings will appear for each type that allows setting ranges, dot-to-case-ratio, appearance of text, three-dimensional shadowing, and other special effects for each map type.

The Color/Pattern Map Type

In this type of map, data values are grouped into ranges and each level is assigned a particular color and pattern combination. When you choose Color/Pattern from the MAP TYPE menu, a screen of choices appears. Epi Map will already have chosen an initial set of ranges, based on quartiles in which the number of values falling into each range is as nearly the same as possible. The values in the ranges can be changed on the screen. Note that the number of values falling into each range is displayed to the left of the range. The function keys at the bottom of the screen have the following effect on the ranges:

<F3> DELETE: The range indicated by the cursor is deleted and those around it are adjusted to include its values.

<F5> ADD: This command duplicates the range indicated by the cursor, providing another line so that you can enter appropriate numbers for the new range, or choose EVEN or EQUAL to have them calculated automatically.

<F6> EVEN: This recalculates the ranges so that each spans an equal range of values, e.g. if there are four ranges, each value would be one-quarter of the way further from the minimum to the maximum value.

<F7> EQUAL: This recalculates the ranges so that equal numbers of polygons have values in each range. If there are values for 48 countries, for example, and 4 ranges have been set up, each range would contain

values for 12 of the countries. For most purposes this gives the best distribution for mapping, although you may want to adjust the ranges so that they also represent even numbers or correspond to meaningful ranges by other criteria, such as biological concepts of "normal" or ranges set on previous maps of the same area.

<F8> COLORS: The colors and patterns chosen for the ranges will greatly influence the usefulness of the map. Pressing <F8> presents another screen containing available colors and patterns. The ranges are displayed on the left with their current colors and patterns. Use the <PgUp> and <PgDn> keys to choose a range, placing the arrow opposite the range desired. Now with the mouse or <+> and <-> and the up and down arrow keys move the highlighted box to the color and pattern desired. If you plan to print to a black and white printer, patterns are definitely more important than colors. For screen display or color slides or transparencies, the colors may be used alone.

The best maps tell their story without having the reader consult the legend. This means that high ranges should be represented by intense colors or heavier patterns and low ranges by those with less impact. Generally colors presented on a map as red, yellow, green, blue are viewed as having high values to low values. Red/green colorblindness is common enough to require some thought in choosing colors that convey the message without these values or include patterns that will reinforce the values selected.

When you have finished selecting colors and patterns, press <Esc> to return to the previous screen.

On the right side of the RANGES and MAP OPTIONS screen, options are provided to display or not display Titles, the Legend, and a rectangular FRAME around the map. The TITLES and LEGEND options must be ON to display these features after alteration in the ANNOTATIONS menu, as described in Chapter 7.

Boundary Options allow altering the color and thickness of the boundary lines. The SHADOW instructions allow a shadow to be placed behind and offset from the main map to give a three dimensional effect. The values for the offsets in the X (horizontal) and Y (vertical) directions are arbitrary. Values of 2 to 6 are a good starting place for experimentation. Shadows cause the entire map to be drawn twice and thus increase the drawing time for the map. It is usually best to turn the shadow feature on after all the other items in the map have been finalized.

In the lower right corner of the screen is a box giving useful statistics summarizing the data values, including the number of values, the number of missing values, the

minimum, maximum, mean, mode, median, and standard deviation.

Dot Density Maps

Dot density maps give a quick visual impression of numbers on the map. Unlike shaded maps they do not require that ranges be constructed, since each dot represents a fixed number of cases.

To make a dot density map, choose MAP TYPE from the main menu and then DOT DENSITY.

Cartograms

Cartograms are perhaps most useful for representing population or other values in which none of the areas have extremely low values. They may be used to make a point that most of the values are in a few areas. They are easiest to interpret if the shapes of the areas are familiar to the audience so that easy identification is possible without labelling.

Related Topics in Other Chapters

In Chapter 11, on drawing multiple maps on a single screen, the Map Management command on the MAP menu is described fully. The next chapter describes creation and editing of annotations and labels that are stored in .MAP files.

Chapter 7

Titles, Legends, Labels, and Other Annotations

Tutorial

Having loaded the AFRICA boundary and MAPDEMO data file as in the tutorial for the previous chapter, choose MAPTYPE from the main menu and then COLOR/PATTERN. Display the map by pressing <Esc> from the OPTIONS screen.

Choose ANNOTATIONS from the main menu and then TITLES. Change the main title to "Cumulative Estimate of Imaginary Cases" and the second to "Africa: Prior to 1990." Press the <Tab> key and then use the arrow and <+> and <-> keys to change the text styles. Press <Esc> twice to display the map. Repeat this process until you are satisfied with the appearance of the titles, striving first for simplicity and clarity.

Choose ANNOTATIONS from the main menu and then LEGEND. Change the LEGEND HEADER to "Cumulative Cases." You may want to press <Tab> and change the Text Style and other Options before using <Esc> to display the altered legend. Changing the location of the legend will be described below.

Choose ANNOTATIONS and then LABELS. Set DISPLAY LABELS to ON, and adjust the other settings as desired. Press <Esc> to display the labelled map.

Now choose EDIT ANNOTATIONS from the ANNOTATIONS menu. Move the cursor to one of the labels and click or press <Enter> twice until a dotted rectangle appears around the label. Now move the cursor, dragging the label to a new position, and release it by clicking or pressing <Enter>. Try repositioning

the titles, legend, and the map itself in the same way.

Now add a text comment to the map by choosing the "A" symbol at the top of the screen, clicking or pressing <Enter> at the location where you want to place the text, and then typing the text. Draw a line from the text to a part of the map using the line tool at the top of the screen. Choose the tool marked by a small triangle and click or press <Enter> at a point on the map where you want a special marker, such as the location of a hospital or clinic. Try changing the type of symbol with the OPTIONS MENU.

To save the changes, choose MAP and SAVE MAP. To save the annotations without saving the map itself, choose ANNOTATIONS and SAVE ANNOTATIONS. LOAD ANNOTATIONS will then restore the annotations alone.

Overview

A completed map may include labels, legends, titles and various kinds of graphic or textual overlays that are not produced by the boundary and data procedures described so far. In Epi Map, most of these "extras," collectively called annotations, are produced from the ANNOTATIONS menu and saved in the .MAP file for later use.

Titles

Every map should have a descriptive title telling what is represented. It is important to indicate not only what is plotted ("Typhoid"), but over what time period ("First 6 Months of 1991") and in what units ("Cases of .." or "Cases of .. per hundred thousand population"). Epi Map constructs a title from the name of the field being plotted and the current date, but in many cases this will not be detailed enough.

Titles will be displayed only if the TITLES feature is ON in the appropriate MAP TYPE screen. To enter or edit a title, choose the ANNOTATIONS menu and then TITLES. Use the <Tab> key to move from one large box on the screen to the other and the <+> or <-> keys to see and choose the options. Press <Esc> to display the results.

The first box on the titles screen allows you to enter up to four lines of text to be centered at the top of the map (See "Editing Annotations" below if you would rather place the text somewhere else). To change the Font, Size, Color, or Justification, or to Underline the titles, press the <Tab> key. The cursor jumps to the other box on the screen and allows choices for each of these items. Several fonts are offered in arbitrary sizes ranging from 4 to 48, with a choice of 16 colors. They may be underlined and right, center, or left justified. It is best to use the font chosen by the program at first, but you will want to experiment with the others, reserving Gothic for Halloween or other occasions of humor, and remembering that the simplest is often the best in graphic displays. Unless you have a color printer, experiment with printing colored lettering before finalizing a choice if you intend to print copies.

The Legend

Legends are necessary for most shaded graphs to give information about the ranges of values represented by each color or pattern. A legend will be displayed only if the LEGEND feature is ON in the appropriate MAP TYPE screen. To edit the legend that is constructed by the program, choose the ANNOTATIONS menu and then EDIT LEGEND. The screen that appears allows you to alter the text in the legend, define the appearance of the text, and set several options for spacing, order and content of items, and box color. Use the <Tab> key to move from one large box on the screen to the other and the <+> or <-> keys to see and choose the options.

The box on the upper left displays the ranges that are currently in effect (set on the MAP TYPE--COLOR/PATTERN screen). The text in the legend for each can be altered by typing the desired phrase in the LEGEND TEXT column. Note that this does not change the values used by the program, only the text displayed in the legend. If you change the values in the MAP TYPE screen, the values in the legend will change automatically. Text style is set in the same way as described above for titles, by pressing <Tab> and making choices within the TEXT STYLE box.

OPTIONS include NORMAL and COMPRESSED for LEGEND SPACING. The order of items in the legend is set by their order in the box on the upper left of this screen, but the order may be reversed by choosing Descending for Order. Legends entries for "All Others" and "Missing" values may be included or excluded from the display. BOX COLOR offers a choice of eight background colors for the legend box.

When you have completed the choices, press <Esc> to display the results.

Labels

Labels are the names of the geographic entities in the map, taken from the boundary file. They may be suppressed or displayed in a variety of options indicated on the LABELS screen under ANNOTATIONS. The first choice determines whether the map will DISPLAY LABELS. For many maps the reader may be familiar enough with map outlines so that labels are unnecessary. Turning this option ON displays a label for each polygon in the map, but the next two options allow you to select only the important labels. You may choose not to display labels for polygons with missing data values, for example, or to be even more selective, and show only those for polygons with values of at least a certain minimum number.

The appearance of the labels can be altered by placing a box around each label or by changing the type, size, or placement of text in which the labels are displayed. Individual labels can be moved as described in the next section.

Editing Annotations

In displaying a map, Epi Map makes many choices automatically, including the placement of labels, titles, and legends, that may not satisfy your own artistic sense. You may wish to move these items or supplement the standard annotations with others, such as lines, rectangles, or text. Epi Map provides facilities for creating and editing such features when you choose ANNOTATIONS and then EDIT ANNOTATIONS. This feature also allows you to change the size of the map or even to place several copies of the same map on the screen. In a later chapter, you will see how to use the map manager to place several similar or different maps on the same screen.

The EDIT ANNOTATIONS screen shows the map in a frame. On the upper left are five "tools" that may be chosen for editing. The arrow on the left represents the cursor, used to SELECT items for moving or other editing. The letter "A" is the text tool that allows overlaying TEXT on any part of the map. The LINE tool allows drawing solid or dotted lines of any length and orientation in varying thickness. The small box is a tool for drawing RECTANGLES anywhere on the map in varying sizes, shapes, and line widths. The small triangle represents the SYMBOL tool, offering a variety of symbols for marking the location of hospitals, clinics, individual cases, or anything else that can be represented by individual markers placed on the map.

To use the tools, place the cursor over one of the tools and click or press <Enter>.

The OPTIONS menu on the upper right can be selected in the same way, and will display options appropriate for the currently selected tool. To use the tools, move the cursor to the location where the tool will be used and click or press <Enter>. Individual tools are used as follows:

SELECT: Place the cursor over a title, the legend, the map, or an individual label on the map and click or press <Enter>. The item selected will be highlighted. Clicking again on the item will allow you to drag it to any point on the map and then release it by clicking again. The entire map, or the titles, legend, and individual labels can be repositioned in this way.

OPTIONS: When the entire map is selected, additional options are available on the OPTIONS menu:

> CUT: This option deletes the entire map, leaving only annotations on the screen. It is useful mainly for removing extra copies of the map that you have made with the COPY and PASTE commands below. Be careful with this command, as there is no way to retrieve a map that has been CUT except to reload it.
>
> COPY: This command makes a copy of the map to the computer's memory, but does not make another copy on the screen.
>
> PASTE: After COPY has been invoked, PASTE places the copy on the screen. It may then be selected with the SELECT cursor and moved to wherever it is needed. Several copies can be pasted if desired.
>
> FRONT, BACK: These two commands move the selected image to the front or back of the screen. The front image appears to lie in front or cover up the one that is in back.

TEXT: This tool will allow you to type text at the location indicated by clicking. The appearance and placement of the text is controlled by the choices you have made in the OPTIONS menu.

LINE: Drawing a line requires two clicks, one for each end of the line to be drawn. The appearance of the line is controlled by the choices in the OPTIONS menu.

RECTANGLE: Clicking once for the upper left and once for the lower right corner. The thickness of the lines is controlled from the OPTIONS menu.

SYMBOL: Each click will place a symbol of the type selected on the OPTIONS

menu at the cursor location.

Saving Annotations

Annotation choices and additions are saved in the .MAP file along with the names of the boundary and data files when you use the SAVE MAP command on the MAP menu. SAVE ANNOTATIONS from the ANNOTATIONS menu creates an Epi Info file containing the annotations, but without the map itself. You can reload this file by using LOAD ANNOTATIONS.

Related Topics in Other Chapters

Some features described in this chapter require that legends and titles be turned on in the MAP TYPE screens described in Chapter 6. Features described here, particularly changing the size of the map image, are essential to making multiple maps as described in Chapter 11.

Chapter 8

Simplifying, Projecting, Importing, and Exporting Boundary Files

Tutorial

Boundary files can be manipulated by a utility program called BOUNDARY.EXE. From the DOS command line, run this program by typing BOUNDARY.

Choose PROCESS EPI MAP BOUNDARY FILES. For the INPUT FILE, type AFRICA.BND. Press <Enter> several times until the cursor is in SAVE FILES IN COMPRESSED BINARY MODE. Enter N, and specify AFRICA.ASC for the OUTPUT FILE. Press <F4> and the file will be converted to ASCII (plain text) format so that it can be examined. Use the TYPE command or EPED from Epi Info to examine AFRICA.ASC and see the country names, the number of points for each country, and the X and Y coordinates for each point on the country outline. Note that the last and first points for each country are the same.

Run BOUNDARY again and use USA.LL as the INPUT FILE. Move to the PROJECT BOUNDARIES field and press the space bar or <+> key. Press <Enter> and then choose the LAMBERT EQUAL-AREA CONIC projection by pressing the <+> key until it appears. Move to OUTPUT FILE and enter USA.LAM; press <F4> to make the conversion. Now use Epi Map to load first the USA.LL boundary and then the USA.LAM boundary. Note that the latitude-longitude (LL) file looks squashed, but that the projection is like those that usually appear in atlases. All the .BND files supplied with Epi Map have been projected. Projections should only be performed from .LL files.

The ELIMINATE UNNECESSARY POINTS choice will reduce the number of points in each polygon if you have an overly detailed boundary file obtained from an outside source. This allows it to load faster and to fit in memory with Epi Map. If you intend to load several contiguous maps together, you should answer N to ELIMINATE POINTS ON EXTERNAL BOUNDARIES or load and save all the boundaries first before eliminating the unnecessary points, so that points on the contiguous boundaries will matdh .

Overview

Boundary files consist of names of polygons and number defining the location of the vertices. Many boundary files are supplied with Epi Map in "binary" form. They can be converted to ASCII (readable) form with the BOUNDARY program.

Boundary files are available from a variety of public and commercial sources in various formats. BOUNDARY provides facilities for importing files in other formats and for simplifying those that are too large and detailed to be useful.

For boundary files containing coordinates in latitude and longitude, BOUNDARY will do several different kinds of *projections*, changing the perspective and methods of portraying the earth's sphere on flat surfaces.

The BOUNDARY Program

Importing Boundary Files

Some mapping programs, such as MapInfo, use boundary files that have the coordinates of two points on each line rather than the single points represented on each line in Epi Map files. These files describe the line segments making up a polygon rather than the vertices. Since nearly all of the points are specified twice, these files are larger than Epi Map files. BOUNDARY will convert from the line-segment format to the Epi Map format. The file to be imported must first be in ASCII format; when viewed in an editor or with the TYPE command from DOS, it should look something like:

```
"Lesotho",8
20.41529,6.34074,   20.53062,6.26710
20.53062,6.26710,   20.41946,6.13927
20.41946,6.13927,   20.30552,6.10314
20.30552,6.10314,   20.25550,6.12537
20.25550,6.12537,   20.19159,6.19207
20.19159,6.19207,   20.28329,6.30462
20.28329,6.30462,   20.41529,6.34074
```

The format used by Epi Map is similar but eliminates the second pair of coordinates on each line, since they are the same as the first pair on the next line (See "The Epi Map Boundary File Format" later in this chapter.) The line-segment map file can be converted into the Epi Map point format by choosing IMPORT ASCII LINE-SEGMENT BOUNDARY from the main menu of the BOUNDARY PROGRAM.

Projections: Changing the Point of View

Cartography and the different kinds of map projections are the subject of many books. Since the earth is (almost) a sphere, many ingenious ways of projecting it onto a flat surface have been tried. In computerized mapping, this means applying a mathematical formula to relocate the vertices of all the polygons that make up a boundary file. They require that you begin with a boundary file in which the points represent latitude and longitude. Since latitude-longitude files make very distorted maps without projection, they are supplied with file names ending in .LL to avoid confusion.

All projections involve some compromise among distortion of angles (shapes), areas, directions, or distances. Selecting the right projection requires choosing the least damaging kinds of distortion for a particular purpose.

In making maps with an epidemiologic theme, it is desirable that a given area of the earth's surface be represented by the same amount of space on the plane of the paper regardless of its location on the map. Such projections are called "equal-area" projections. The ones that can be produced by BOUNDARY include the ALBERS EQUAL-AREA CONIC projection and the LAMBERT EQUAL-AREA CONIC projection. For situations in which the world may be represented in a form closer to the much maligned, but familiar, Mercator projection, the MILLER CYLINDRICAL projection is also available. This greatly distorts the representation of areas near the poles, although countries near the equator are more evenly represented.

The world, as represented in Epi Map without projection and in the three projections, is presented below:

The boundary files ending in .BND that are supplied with Epi Map are already projected. Those with file names ending in .LL are latitude-longitude files from which you can do your own projections by using BOUNDARY.

Each type of projection requires a different set of parameters for the calculations. BOUNDARY will supply reasonable values for the parameters and in most cases you should choose to accept these. The parameters and some general advice on their values are given below for those who wish to experiment further. Further information is contained in Snyder's book on map projections (1).

Latitude and longitude begin at 0 degrees at the equator and at Greenwich in the City of London in the United Kingdom respectively. Latitude is negative in the Southern Hemisphere and reaches 90 degrees at each pole. Longitude is negative west of Greenwich and positive east of Greenwich, reaching 180 degrees near the Fiji Islands.

For all projections: The latitude and longitude of the center of the projected area are required. This might be looked upon as the location directly under a satellite from which you are viewing the earth. A default value near the "center" of teh territory is provided.

The Radius of Sphere at Map Scale: XXXXXXXXXXXXXX

For the Albers Equal-Area Conic Projection: Two parallels of latitude can be chosen so that the scale (miles per inch, for example) will be the same along these two parallels. Usually these two parallels are chosen so that they lie near the top and bottom of the area of interest, one-sixth and five-sixths of the way from the bottom to the top, for example .

For the Lambert Equal-Area Conic Projection: One parallel of latitude is chosen so that the scale (miles per inch, for example) will be that stated for the map. The scale is constant along any parallel, but not necessarily the same as that for other parallels.

Using a Digitizer to Create New Boundary Files

(Under Construction)

The Epi Map Boundary File Format

Boundary files for Epi Map exist in two forms--ASCII and binary. ASCII files are readable in a word processor and contain names of polygons and numbers. Binary files are compressed and will load more rapidly, but cannot be viewed or edited in most word processors. In order to see the format of a binary file, first convert it to an ASCII file by using BOUNDARY. Check the box next to "Change compression status" by pressing the <+> key or the space bar. Then press the right arrow key and answer "N" to "Save Files in Compressed Binary Mode." Press <F4> and the file will be converted to ASCII format, for example:

```
"Lesotho",8
20.41529,6.34074
20.53062,6.26710
20.41946,6.13927
20.30552,6.10314
20.25550,6.12537
20.19159,6.19207
20.28329,6.30462
20.41529,6.34074
"Swaziland",7
20.88911,6.59502
20.81130,6.53666
```

```
20.73071,6.57973
20.71403,6.68673
20.77656,6.76732
20.88633,6.76870
20.88911,6.59502
"Botswana",19
 etc.
```

The coordinates do not have to be units of latitude or longitude, in fact those given above are not, since they are from a projected map. Any arbitrary but consistent system will do, and Epi Map automatically adjusts the positioning of the map to include the maximum and minimum values in each direction on the screen.

Note that the first and last points or vertices in each polygon must match so that the polygon is closed. When you draw polygons in Epi Map, this is automatically accomplished when you press <Enter> to close the polygon.

If there is more than one polygon in a geographic entity, for example, the State of Hawaii and its several islands, the islands must all be closed polygons with the same name, "Hawaii." They are then treated as being part of the same entity for data-display purposes. If a polygon is contained within another polygon by the same name that is immediately adjacent in the file, it is treated as a "hole" in the larger polygon--a lake, for example, or another country.

Related Topics in Other Chapters

Chapter 3 describes the use of boundary files in Epi Map.

References

1. Snyder, John Parr. An album of map projections. U.S. Geological Survey professional paper: 1453). U.S. Supt. of Documents no: I 19.16:1453, 1989.

Chapter 9

Printing Maps

Tutorial

Choose SETUP from the main menu of Epi Map. On the screen that appears, use the arrow keys and <+> and <-> to indicate the type of printer you have. If you have only one printer, configure the second printer to be CGM FILE with FILE as the PORT. Press <F2> for SAVE SETUP FILE.

To print a map, choose OUTPUT from the main menu and then choose the desired printer and resolution mode. Use low resolution first until you are sure everything works. Higher resolutions look better but take longer.

Overview

Epi Map can print maps on IBM/Epson compatible dot matrix printers, Hewlett Packard Laserjet and Deskjet printers, Hewlett Packard plotters (7470, 7475, and 7550), the Hewlett Packard Paintjet, and Postscript printers. It will also produce files in the Computer Graphics Metafile (CGM) format that can be imported into other programs like Lotus Freelance, Harvard Graphics, and Word Perfect.

You need to choose the type of printer or file output and tell Epi Map enough details to set up the output only once. This is done from the SETUP command on the main menu. The following instructions will assist in configuring Epi Map to match the type(s) of printer you will be using. You can configure or reconfigure the printer setup at any time and save the setup file for routine use.

Setting Up File Directories, Printers, or a Digitizer

Run Epi Map as described above. When you see the main menu bar across the top of the screen, choose SETUP by typing "S" or by moving the cursor with the

mouse until it is over the word SETUP and pressing the left mouse button. A screen called "Epi Map Setup" will appear.

Boundary File Path and **Data File Path** are the names of directories where you keep map outlines ("boundary files") and the Epi Info or dBASE files that contain data to be represented on the map. If you plan to keep these in directories other than the one where Epi Map resides, fill in the disk letter, a colon, and the complete directory names, for example,

C:\MAP\BND
C:\EPI5\DATA

If you leave these items blank, Epi Map will assume that boundary, data, and map files are kept in the same directory with Epi Map. If directories are specified, the files will be assumed to exist in these directories.

The rest of the screen allows you to specify two different printers and a digitizer tablet for use with Epi Map. To set up the first printer, move the cursor to the "Type" field under "Printer #1" using the mouse or the <Down arrow> key. Press <F1> to see the possible choices, move the cursor bar to the one desired, and press <Enter> or click the (left) mouse button. If you do not press <F1> the choices can also be seen one by one by pressing the + or - keys. Most of the choices are particular printers for which drivers are supplied with Epi Map (as files called $LJ.BGI and $HP7550.BGI, for example). The CGM File option allows finished maps to be sent to a file in the Computer Graphics Metafile format, ready for display, printing, or editing in Harvard Graphics, Word Perfect, Lotus Freelance, and other commercial programs. If you have only one printer, we suggest that you choose this option for "Printer #2" so that it will be available when you wish to use it.

A PORT must be specified for each "printer." This is LPT1 or LPT2 for parallel printers and COM1 or COM2 for serial printers. The other option, FILE, allows *any* type of output to be sent to a file. You might use this option to make an output file to carry down the hall to print on someone else's computer or in certain cases, send it through a network to a printer.

If COM1 or COM2 is chosen, you must also specify the BAUD RATE or speed at which the port operates. If this is unknown, look up the printer instructions, or experiment with different values, starting with 9600, the most common value.

It is rarely necessary to set PARITY to values other than NONE, but this option is provided in case your printer requires it.

The DEFAULT MODE choice is extremely important. Most printers offer a variety of "modes" that range from rough draft (fast but crude) to highest resolution (satisfying but slo-o-o-w). Some printers, particularly laser printers, will only print in the higher resolution modes if they contain large (optional) amounts of memory. It is best to start with a low-resolution setting and to advance to others as experience is gained. If you have only one printer and do not want to use the CGM File option, "Printer #1" might be set to draft or low resolution and "Printer #2" to the highest resolution your printer will accept, making it easy to printer either drafts or final copies.

A DIGITIZER or graphics tablet is an input device for the computer that functions somewhat like a mouse, but allows much finer control for purposes of drawing original maps on the screen. Generally you would tape a paper copy of a map on the digitizer tablet and then outline the various entities of the map by touching each "corner" with the digitizer stylus. Since a number of digitizers accept input compatible with the Summagraphics II, a driver for this digitizer is supplied. Since digitizers are serial devices, the PORT should be designated as COM1 or COM2.

When you have completed all the SETUP choices, be sure to SAVE the configuration file by pressing <F2> as indicated at the bottom of the screen. Then press <Esc> to return to the main menu.

Chapter 10

Producing Slides and Transparencies

Overview

Full sized transparencies can be produced in most printers or made from paper output on a photocopying machine. The best color slides are made on a slide digitizer costing thousands of dollars, but satisfactory slides can often be made by photographing the screen if the rules given here are followed.

Transparencies

Transparencies can be produced on many devices that print on paper, including laser printers and plotters. Commercial photocopy shops can produce color transparencies from color output produced by Epi Map, and most photocopy machines can produce black-and-white transparencies from paper output if transparency material is placed in the paper feed bin. Be sure to buy the correct type of transparency material for any device that produces heat, such as a laser printer or photocopy machine, as the wrong kind can fill the inside of the machine with an expensive mass of molten plastic glue.

Slide Systems

Digitizers for producing color slides directly from computer output are available, costing several thousand to several tens of thousands of dollars. They may accept output in either CGM or Postscript format as produced by Epi Map, but many require special "drivers" specific for each model and brand of device. In this case, a CGM file can be produced in Epi Map and transferred to a suitable program, such as Harvard Graphics, that has a wide variety of drivers for different devices. It is then sent to the slide digitizer from the second program.

Photographing the Screen

Those with professional slide digitizers often gasp at the thought of merely photographing the screen of a monitor, and there are many ways to produce unsatisfactory results with this inexpensive method. Nevertheless, we have had good results by employing the following techniques:

1) Remove the Epi Map menu by pressing <Esc>. Another <Esc> will bring it back.

2)Use a tripod and a cable release to prevent camera movement

3) Take the photographs in a completely dark room to avoid screen reflections

4) Use a single-lens reflex camera and a telephoto lens (about 135 mm for a 35 mm camera). The telephoto has the effect of flattening the curvature of the monitor screen.

5) Use a long exposure relative to the 1/60 or 1/30 second retrace time of the screen.

6) Mark the position of the contrast and brightness settings on your monitor so that they can be the same each time and determine the exposure empirically with a test roll. Use this exposure rather than trying to measure the screen with a meter, unless you have a standard display that can be used for the measurements. Our exposure is 1/8 second for ASA 200 color film.

7) Set up the screen and the camera so that the screen is as close to perpendicular to the axis of the lens as possible and so that the screen margins but not the screen housing are included in the photos. Marking a satisfactory position for the tripod on the floor will facilitate setup the next time.

8) When in doubt about exposure, bracket exposures by one stop above and below the one estimated to be correct. Extra film is usually cheaper than the time to reshoot.

Related Topics in Other Chapters

The chapter on Printing Maps gives the details necessary for producing transparencies or printed copy suitable for photographing by sending Epi Map output to printers or plotters or to a file for transfer to other programs.

Chapter 11

Multiple Maps on One Screen: The Map Manager

Tutorial

To place several similar maps on the same screen, make the first one as usual, loading first the boundary file and then the data file. Use AFRICA.BND and MAPDEMO.REC. Now choose the ANNOTATIONS menu and LEGEND. Turn off the legend display. Choose TITLES and turn off the title display also.

Choose EDIT ANNOTATIONS from the ANNOTATIONS menu and then press <Enter> or click on the arrow box in the upper left corner of the screen. Move the cursor down over the map and click or press <Enter> again. Small rectangles will appear at the corners of the map. Move the cursor to the Options Menu and click again. Now choose TOP from this menu and move the cursor so that it is exactly over the small solid rectangle at the upper right corner of the map. Click or press <Enter> so that a dotted rectangle surrounds the map. Now move the cursor down and to the left to make the map smaller, until it occupies about one-sixth of the screen. Click or press <Enter> again and you should have a miniature of the map that you made. Click or press <Enter> in the center of the map and move the map up to the upper left corner, clicking again to release it. Press <Esc> to bring back the main menu.

Choose MAP from the main menu and then MAP MANAGEMENT. Press <F3> twice to make two copies of the map you just created. Use the down arrow to move the bar cursor to "Map 2," the first of the two new maps. Every action you take in Epi Map will affect only this map from now on, not the other two. Press <Esc> to see the three maps. You will want to edit the data in

maps 2 and 3 so that it differs from that in the first map. To do this first choose the proper map and then use DATA and EDIT DATA from the main menu to edit the data. After editing the data for each map, save it under a new name, such as MAPDEMO2.REC. If you would like to add a legend, this can be done by turning on legends for one of the maps and moving it to a suitable location. Titles can be added either as free text annotations or by turning on titles for one of the maps and editing and moving the title. Be sure to save the completed triple map by choosing SAVE MAP from the MAP menu.

To see two examples of multiple maps, choose MAP and LOAD MAP and then load first DOUBLE and then UGWEEKS. The first shows two different maps used to illustrate the location of Uganda in Africa and the second is a series of maps (with imaginary data) that might represent the progress of an epidemic over a six-week period. Examine the map manager after each map is loaded to see how the various files are used. If you are adventurous, look at DOUBLE.MAP and UGWEEKS.MAP in an editor such as EPED from Epi Info to see how the information is stored.

Overview

Any of the maps described so far can be combined with others on a single screen. Epi Map is capable of displaying multiple copies of the same boundary file with different data sets, or a number of entirely different related or unrelated maps at one time. This is done with the MAP MANAGER choice on the MAP menu. This single feature gives enormous power to construct displays that present more than one variable at a time, or the same variable at different times. If you have six maps on the screen, the data can come from six different files or from six different fields in the same file.

With the map manager you can show data for a number of different diseases, or for one disease over a number of weeks or months. You can also show a map of a continent with an enlarged country pulled to one side for a more detailed display. Each separate map in the display is created and can be edited at any time by selecting it in the map manager.

The Map Manager

To use the map manager, select the MAP menu and then choose MAP MANAGER. A screen appears that displays details of the currently selected map. On the left side of map manager is a list of MAPS that are linked to the current screen. At the bottom of the screen are listed the function-key commands.

If you have already created one map, you will probably want to reduce its size to accommodate another map on the screen. Return to the main menu by pressing <Esc> and choose ANNOTATIONS and then EDIT ANNOTATIONS. Place the cursor over the map whose size is to be reduced and click or press <Enter>. Small white rectangles will highlight the corners of the map. Return to the map and click *on one of the highlighted corner markers* to display a dotted rectangle at the edges. Now move the cursor and you will see the size of the image change. When the size has been reduced adequately, click or press <Enter> again. Now click again until the rectangle appears and move the map to an appropriate location on the screen. You may also want to return to the main menu (<Esc>) and choose the appropriate MAP TYPE so that you can turn off the legend or title. Now you are ready to use the map manager to make another map.

The available commands are:
<F1> CREATE ADDITIONAL: This command creates an additional map, starting with loading of a boundary file and then loading or creation of a data file. You will be led through the process just as with CREATE MAP from the MAP menu.

<F2> LOAD ADDITIONAL: This command loads another .MAP file that has already been created in Epi Map, allowing you to create several separate map files and then combine them into a single display later.

<F3> DUPLICATE: Pressing this key produces a duplicate of the current boundary image and asks for a choice of fields in the same data file. Thus if you have several fields in a data file you can display each in a separate small map on the same screen. This could be useful for surveillance data for several diseases in the same time period, for example.

<F6> TOGGLE ON/OFF: Pressing this key makes the current map disappear from the screen. It may be brought back by pressing the same key again.

<F7> RENAME: With this command, you can give new labels to the maps, titling each map with a meaningful label, such as March, April, and May, or Hepatitis, Salmonellosis, and Shigellosis.

Multiple Copies of One Boundary Showing Different Data

Suppose that you have data on cases or rates of influenza in a continent. You would like to show the progress of the epidemic by week over a six-week period to illustrate its geographic distribution over time. You will be creating a "movie" made with maps.

The procedure varies depending on whether you have one data file with a different field for each week or six separate data files--one for each week. In either case, produce the first map as in any Epi Map interaction. When it is complete, turn off the legend and title displays through the Map Type choices. Then reduce the size of the map to about one sixth of the screen and move it to the upper left corner as described above.

Now enter the Map Manager screen through the MAP menu. Press <F7> for RENAME and rename "Map 1" to "Week 1" if you like, although this has no effect on the final results. Now press <F3> for "Duplicate." If your data file has more than one numeric field, you will see a choice of fields for the data in the second map. If you want to use a field from this data file, move the cursor bar to this field and press <Enter>. If you prefer to use another data file, press <Esc>. Now press <Esc> again to see the two maps, side by side, on the same screen.

Since the second map is the one selected, you can now perform operations like loading a data file on this map alone. Do this if you are using different data files for each map. If, for any reason, you need to perform operations on the first map, simply return to the Map Manager, move the cursor bar to the name for the first map, and then return to the main menu to perform the operation. You can use Edit Annotations at any point to add text or graphics to tie maps together or explain their meaning. An example called DOUBLE.MAP is supplied with Epi Map.

Different Maps on One Screen

Suppose that you would like to have Africa shown on the left of a screen, with Uganda highlighted to show its location. To the right will be an enlarged map of Uganda by region showing current rates for a particular disease. Straight lines connect the top and bottom of the Uganda map with the image of Uganda within the continent.

First create a map of Africa by loading the AFRICA.BND file. Then to highlight Uganda, enter a single data value for Uganda by using Edit Data. Reduce the size of the map and place it on the left side of the screen as described above. Turn off

the Title and Legend displays. In the Map Manager, change "Map 1" to "Africa" for convenience in identifying the parts of the screen. Now press <F1> for "Create additional," and load the boundary and data files for Uganda. Use Edit Annotations to draw lines from the larger Uganda map to the smaller.

Editing Multiple Maps

When multiple maps have been constructed, EDIT ANNOTATIONS can be used to draw lines, text, boxes, and other embellishments. Each element of the individual maps can be moved in the usual way within EDIT ANNOTATIONS.

Titles can be added or suppressed for each map in a series. An overall title can be constructed using the text tool in EDIT ANNOTATIONS or a title for one of the individual maps. Each title can be moved to an appropriate location by using EDIT ANNOTATIONS. The text of each can be altered in appearance or content by choosing the appropriate map from the Map Manager and then using TITLES.

Usually only one legend will be necessary. This can be edited from the appropriate map and move into place with EDIT ANNOTATIONS. Legends for the other maps can be turned off from their MAP TYPE screens.

Related Topics in Other Chapters

Techniques explained in most of the previous chapters can be applied to each map in a series after it is selected with the map manager.

Chapter 12

Using Epi Map with Database and Statistics Systems

Tutorial

From the DOS command line, type:

>EPIMAP DOUBLE

If you have a printer connected and ready and have set up Epi Map for this printer using the SETUP menu, type
>EPIMAP DOUBLE /P

If you have Epi Info, type:

>HEPRATES

After you have seen the results, examine HEPRATES.BAT and HEPRATES.PGM until you understand how Epi Map is used to produce this automatic system.

Overview

Although Epi Map does not have built-in facilities for rate calculations or other mathematical manipulation of data, it is designed to work with other database and statistical programs that can provide any desired amount of such power. Epi Map can serve as the "mapping engine" for any set of programs that will produce an Epi Info or dBASE file. Since the CONVERT program in Epi Info will convert Lotus 1-2-3 or fixed-field or comma-delimited ASCII files to the Epi Info format, it may be used to produce complete systems for automatic mapping in conjunction with other programs by embedding the necessary commands in DOS batch files.

Running Epi Map from DOS Batch Files or Other Programs

Epi Map may be run from the DOS command line or from a batch file with the name of a .MAP file, as in:

>EPIMAP DOUBLE

to load the map described in DOUBLE.MAP. If the command is followed by a slash and the letter "P" (/P), the map will be loaded and printed, with an automatic exit from Epi Map after the printing is complete.

The .MAP file contains the names of boundary and data files that comprise the map. If the data file is to contain new data periodically, the program calling Epi Map need only produce a new data file with the name specified in the .MAP file in order to display or print the most current data. The other settings for the map are contained in the .MAP file and boundary file and hence will not change. Thus a database program for surveillance could produce a file called THISWEEK.REC that contained current disease counts or rates for a region. A map file would load this file and the appropriate boundary file each week and display or print the map. An example of such an automatic system called HEPRATES.PGM is supplied with Epi Map. HEPRATES.PGM is a program for the ANALYSIS portion of Epi Info. To see it operate, type HEPRATES from the DOS command line. A DOS batch file called HEPRATES.BAT will run ANALYSIS with the HEPRATES.PGM program and process data from a surveillance database called SURVDB.REC. A map of the State of Connecticut will be displayed showing hepatitis counts for one week. Maps of several diseases on one screen could be made by using the techniques in the chapter on Multiple Maps on One Screen, placing the values for each disease either in separate files or in different fields in the same .REC file.

Preparing Data to Show Rates or Other Calculations in Epi Map

The most common calculation needed for mapping is the production of rates. The use of Epi Info to produce rates will be described. Other systems such as dBASE can be used to produce rates in similar fashion.

Calculating rates requires that the population for each geographic entity be available as the denominator. The easiest way to do this in Epi Info is to keep the population in a separate file with just two fields. For the State of Connecticut these would be COUNTY and POPULATION. In ANALYSIS, the following commands will

calculate rates and produce a file called HEPRATES for Hepatitis B for the time period covered by the database. They are contained in an ANALYSIS program file called HEPRATES.PGM and may be run from a DOS batch file called HEPRATES.BAT.

```
READ SURVDB
SELECT DISEASECOD = 10
*Select Hepatitis B records
ROUTE TEMP.REC
OUTPUT TABLES COUNTY
*Produce a file with fields COUNT and COUNTY
ROUTE SCREEN
*Close the file
*We could use this file to map the counts
ROUTE RELATE COUNTY POP.REC
*Relate the population file, using county name as the link
DEFINE RATE ###
*Define a new variable
RATE = ROUND((COUNT / POPULATION) * 100000)
*Calculate the rate
ROUTE HEPRATES.REC
WRITE RECFILE
*Write the new file, including the rates, as HEPMAP.REC
ROUTE SCREEN
*Close the file
DOS EPIMAP MAPWEEK
*Run the map file in Epi Map to display the map
*DOS EPIMAP MAPWEEK /P would print the map
QUIT
*Leave ANALYSIS
```

Dealing with Small-Number Problems

Rate calculations are a great help in dealing with variable denominators such as those encountered in mapping disease patterns on geopolitical map boundaries. The populations of the defined areas vary greatly. U.S. counties, for example, may have populations from a few thousand to several million, roughly a thousand-fold difference. In mapping disease cases, the condition is often relatively unusual so that one or two cases can make an enormous difference in rates. A map of rates therefore may give the false impression that great elevations have occurred in a particular area without conveying that the rate is based on a small number of cases.

There are several solutions to this problem:

1) If the counts being plotted have small numbers, avoid plotting them as rates, but map only the counts. This solution is often used in communicable disease surveillance.

2) Extend the time period for the map so that larger numbers are obtained.

3) Eliminate or mark the rates or elevated rates based on small numbers. You could, for example, decide that rates based on less than five cases would be recoded to 999, and then employ a special color or pattern in Epi Map to display the "999"s. This can easily be set on the Range screen after choosing MAP TYPE and COLOR/PATTERN.

4) To be more rigorous, only the rates exceeding a statistical limit, such as two standard deviations from the mean, might be plotted. The calculations would be done in Epi Info or another statistics program before the file is sent to Epi Map.

Related Topics in other Chapters

A simple example of how to produce a data file for Epi Map is given in Chapter 4.