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Philippines Water Resources Abstracts



Special Edition On

WATER SUPPLY AND SANITATION

**REPUBLIC OF THE PHILIPPINES
NATIONAL WATER RESOURCES COUNCIL**

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The National Water Resources Council (NWRC) is the body responsible for coordinating and integrating all water resources development of the Philippines. It was created to study, integrate and coordinate all water resources activities to obtain scientific and orderly development as well as optimum and multipurpose utilization and maximum conservation of all water resources to meet present and future needs of the country.

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Philippines Water Resources Abstracts

Special Edition on Water Supply
and Sanitation

In Support of the International Drinking
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(IDWSSD)

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FOREWORD

One of the tasks of the WHO International Reference Centre for Community Water Supply and Sanitation (IRC) is to implement a Programme On Exchange and Transfer of Information (POETRI) on community water supply and sanitation in developing countries. This programme aims at:

1. Establishing an international clearing house mechanism consisting of National and Regional Focal Points (NFP and RFP) in both developing and industrialized countries;
2. Improving the availability and accessibility, and promoting the use of relevant information and documentation;
3. Collecting, analyzing and selectively disseminating such information and documentation to policy makers, planner and implementors of community water supply and sanitation programmes and projects in developing countries.

The National Water Resources Council (NWRC) was designated to act as the National Focal Point (NFP) for POETRI-related activities in the Philippines. In this framework, the NWRC, through the established Water Information Center of the Philippines (WICEP), serves as the Philippines' focal point for all water supply and sanitation information requirements.

As the initial contribution of WICEP to the POETRI Programme, and in support of the International Drinking Water Supply and Sanitation Decade (IDWSSD), this selected and annotated bibliography has been prepared. It is intended to serve as a major reference source on all questions and answers relating to water supply and sanitation.

This bibliography is the result of a literature survey conducted by the WICEP library. This publication generally covers the period 1970–1982, with some pre-1970 titles included. Two-hundred sixty-one items were selected for inclusion. Each reference includes an accession number located at the upper right hand corner, a full bibliographical citation and a set of keywords which best describe the article. The annotations provide an informative interpretation of the ideas and techniques presented in the original item.

An attempt was made to classify the references in the bibliography according to six primary categories based on the Standard Basic Reference Library provided by POETRI. The choice of category under which to classify certain references was rather arbitrary, since they contained materials relevant to two or more categories. The read-

er is therefore advised to consult more than one category when searching for specialized subject matter. The classification is as follows:

Category	No. of Items	% of Items
1. General (Water Supply and Sanitation) Including Bibliographies	40	15.33
2. Planning, Management, Evaluation and Training	64	24.52
3. Technology		
A. Water Supply	29	11.11
B. Sanitation	14	5.36
4. Community Participation and Health Education	40	15.33
5. Philippine References	74	28.35

The bibliography is provided with an authors index and an index of keywords. All references are available at the WICEP library. Photoprint copies of any listed items may be ordered from the library's copying service.

This bibliography is only a first step towards filling the need for relevant and accessible literature in the field. We are certain that it still has many significant omissions and we would therefore like to solicit additional literature on the subject to be made available in future editions of the bibliography.

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International Rice Research Center
North Carolina. University. Water Resources Research Center
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Texas University at Austin
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U. S. Army, Corps of Engineers, Hydrologic Engineering Center
_____. North Atlantic Water Resources Study Group
U.S. Environmental Protection Agency
U.S. General Accounting Office
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PUBLIC GROUNDWATER SUPPLIES IN MACOUPIN COUNTY

Woller, D.M.

Department of Registration and Education, Illinois. Illinois State Water Survey, Urbana.

Bulletin 60-17, 1976. 9 p, 1 fig. 15 tab.

Key Words : Groundwater, Water supply, Wells, Groundwater geology, Macoupin County (Illinois), Groundwater sources, Mineral analysis.

This publication presents all available information on production wells used for public groundwater supplies in Macoupin County. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. This report consists of separate descriptions for groundwater supplies of four municipalities and one state park in Macoupin County. These are preceded by brief summaries of the groundwater geology of the county and the development of groundwater sources for municipal use. An explanation of the format used in the descriptions is also given.

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ELEMENTS OF WATER SUPPLY AND WASTEWATER DISPOSAL

Fair, G.M., Geyer, J.C., and Okun, D.A.

Harvard University, Cambridge, Massachusetts. Johns Hopkins University, Baltimore, Maryland. University of North Carolina, Chapel Hill.

John Wiley & Sons, Inc., New York, 1971. 752 p, 215 fig, 95 tab, 172 ref, 1 append.

Key Words: Water supply, Waste water disposal, Statistical analysis, Water collection systems, Groundwater, Water distribution (applied), Water quality, Operations, Aeration, Screening, Sedimentation, Flotation, Filtration, Flocculation, Adsorption, Desalination, Ion exchange, Coagulation, Precipitation (chemistry), Stabilization, Disinfection, Biological treatment, Solid wastes, Projects.

This book opens with a discussion of water supply and wastewater systems, citing their historical development briefly: Chapters in statistical hydrology, surface-water collection, groundwater development, water transmission and water distribution are presented accordingly. The remaining chapters deal extensively with the various modes of treating water (water supply and wastewater). The book ends with a chapter on the role of engineers in the initiation and creation of a project, giving some guidelines in planning water and wastewater projects.

721

CHEMISTRY OF WATER SUPPLY, TREATMENT AND DISTRIBUTION

Rubin, A.J.

The Ohio State University, Water Resources Center, Columbu, Ohio.

Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1975. 446 p, 148 fig, 57 tab, 418 ref.

Key Words: Water chemistry, Water supply, Water treatment, Water distribution (applied), Water quality standards, Nutrients, Water quality, Gas chromatography, Chelation, Water analysis, Analytical techniques, Disinfection, Cadmium, Wastes, Sorption, Oxides, Sulfur, Arsenic compounds, Hydrolysis, Coagulation, Sand filters, Cations, Adsorption, Catalysts, Activated carbon, Dechlorination, Organic compounds, Chlorine, Chlorination, Aqueous solutions, Kinetics, Viruses, Bromine, Bacteria, Ozone, Trace elements.

The book opens with the criteria developed for new drinking water standards; examines raw water quality; investigates new analytical techniques for studying water quality; describes removal processes; and culminates with a study of the quality of the finished water. Trace contaminants are dealt with in a thorough examination of the aqueous chemistry of arsenic, aluminum, cadmium, sulfur and other elements.

PUBLIC GROUNDWATER SUPPLIES IN McHENRY COUNTY

Woller, D.M. and Sanderson, E.W.

Department of Registration and Education, Illinois. Illinois State Water Survey, Urbana, Illinois.

Bulletin 60-19, 1976. 52 p, 3 fig.

Key Words : Groundwater, Wells, Groundwater geology, Water supply, McHenry County (Illinois), Groundwater sources, Mineral analysis.

This publication presents all available information on production wells used for public groundwater supplies in McHenry County and includes separate descriptions for 16 municipalities, 17 subdivisions, and 1 state park. These are preceded by brief summaries of the groundwater geology of the county and the development of groundwater sources for public use. An explanation of the format used in the descriptions is also given.

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RURAL WATER SUPPLY AND SANITATION

Wright, F.B.

Cornell University, New York State College of Agriculture, Ithaca, New York.

Second Edition, John Wiley and Sons, Inc., New York, 1956. 347 p, 260 fig, 25 tab.

Key Words : Water supply, Sanitation, Rural areas, Water properties, Water sources, Water table, Water quality, Water treatment, Pressure head, Pumps, Water supply systems, Plumbing, Sewage disposal, Refuse disposal, Valves, Septic tanks.

This book presents a practical knowledge of water supply, sewage disposal, plumbing and sanitation for rural homes and farms. It is divided into two parts. In the first part the important aspects of water supply and sewage disposal are discussed. Particular emphasis is placed upon methods of securing adequate sources of water, the selection and installation of pumping equipment, treatment of water and the design and installation of sanitary sewage disposal system. For the laboratory and for field work a selection of important jobs connected with water supply and sewage disposal are presented in the second part of the book.

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WATER AND WASTEWATER ENGINEERING

Far, G.M., Geyer, J.C. and Okun, D.A.

Harvard University, Cambridge, Massachusetts. Johns Hopkins University, Baltimore, Maryland. University of North Carolina, Chapel Hill, N.C.

Vol. I: Water Supply and Wastewater Removal, John Wiley and Sons, Inc., 1966. 495 p, 52 tab, 141 fig, 131 ref.

Key Words: Water supply, Waste water, Water supply systems, Sewerage, Hydrology, Rainfall-runoff relationships, Water storage, Groundwater flow, Water collection systems, Water distribution (applied), Waste water disposal, Machines, Pumps, Blowers, Optimization.

This volume outlines the purpose and composition of wastewater and water supply systems, describes their collection, and estimates their volumes and flows in relation to population and time. Analyses of rainfall, runoff and groundwater flows, and the principles in storage and runoff controls are discussed. The book also examines hydraulic equipment, water transmission and distribution systems, and considers sets of functional relationships for optimizing a prototype system. Finally, project planning, design and construction are added.

INTERNATIONAL STANDARDS FOR DRINKING-WATER

World Health Organization, Geneva.

Third Edition, 1971. 70 p, 12 tab, 99 ref, 3 annexes.

Key Words: Potable water, Water quality standards, Water analysis, Water quality, Pollutant identification, Microorganisms, Chemical analysis, Water sampling, Public health.

This publication is concerned primarily with methods of ensuring that supplies of drinking-water do not constitute a danger to the health of the consumers. It discusses standards of chemical and bacterial quality that may reasonably be set for drinking-water supply. It enumerates methods of detecting microorganisms and other pollutants which are used as indicators of pollution and recommends tentative limits of concentration that should be set for these pollutants to safeguard public health. Methods of sampling for the various types of analysis discussed are outlined, and advice is given on when and how frequent samples should be collected for each purpose.

1191

WATER SUPPLY ENGINEERING

Babbitt, H. E. and Doland, J.J.

University of Illinois, Urbana. Fourth Edition, McGraw-Hill Book Company, Inc., New York, 1949. 637 p, figures, tables, 2 append.

Key Words: Water supply, Hydraulics, Water demand, Groundwater, Well construction, Rainfall, Runoff, Dams, Intakes, Aqueducts, Pipe stress, Impounding reservoirs, Pumping plants, Pumps, Electric reactors, Pipe design, Valves, Gates, Hydrants, Meters, Metallic corrosion, Distribution systems, Construction practices, Operation and maintenance, Water quality, Water analysis, Sedimentation, Coagulation, Sand filters, Water softening, Disinfection, Water purification.

This book emphasizes functional rather than structural procedure, and practical applications rather than theoretical design. Application of theories to practice in finances, hydraulics, pumping machinery, electrical equipment, and water purification is discussed. Fundamentals are stated, practice is explained, and where desirable, references and illustrations are made to articles of value on the subject.

1193

RURAL WATER SUPPLY AND SANITATION IN THE DEVELOPING COUNTRIES

United Nations Children's Fund (UNICEF), New York.

1975. 324 p, 54 tab, 18 annexes.

Key Words: Water supply, Sanitation, Developing countries, Surveys, Water analysis, Field tests, Soil analysis, Well construction, Drilling, Well casings, Well screens, Pumps, Pipes, Valves, Water meters, Water treatment plants, Disinfection, Waste disposal.

This guide discusses the more significant aspects underlying water quality and water supply systems in the developing countries. Herein presented is a brief description and specification on different equipment, supplies and materials provided by UNICEF to support rural sanitation and water supply projects. Important topics covered include: water quality field testing, wells and well construction, pumps and prime movers, water supply connections, excreta disposal, and sanitation equipment and supplies.

WATER SUPPLY AND SEWERAGE

Steel, E.W.

University of Texas, Austin

Fourth Edition, McGraw-Hill Kogakusha, Ltd., Tokyo, 1960. 655 p, 262 fig, 65 tab.

Key Words: Water supply, Sewerage, Quantitative analysis, Rainfall, Runoff, Groundwater, Aqueducts, Water pipes, Water collection systems, Water distribution (applied), Pumps, Pumping plants, Water quality, Water treatment, Filtration, Methodology, Sewers, Sewage disposal, Screens, Sedimentation, Sewage treatment, Activated sludge, Sludge treatment, Sludge disposal, Financing.

This book attempts to present the principles and present-day practices necessary to the solution of water supply and sewerage problems. It discusses the design, construction, and operation of water and sewage works. Formulas, charts, and diagrams especially applicable to sanitary engineering design are presented.

1279

DRINKING WATER SUPPLY — A FIELD FOR UNICEF ASSISTANCE

United Nations Children's Fund (UNICEF), New York.

United Nations Water Conference, ESCAP Regional Preparatory Meeting, 27 July-2 August 1976. 10 p.

Key Words: Water supply, Potable water, Rural areas.

The United Nations Children's Fund has for many years been actively assisting governments of the developing countries in their rural water supply programmes, particularly on water for drinking purposes and household use. This paper presents the policies and priorities of UNICEF with regards to drinking water and environmental sanitation programs. In addition, the different forms of assistance extended by UNICEF are also discussed. These include the provision of water supply installations, the training of national technical staffs, and the education of villagers in such matters as maintenance and repair of hand pumps and the preservation of good water. Finally, the future plans of UNICEF are mentioned.

1455

RURAL WATER SUPPLY AND SANITATION

Wright, F. B.

Cornell University, New York State College of Agriculture, Ithaca.

Third Edition, Robert E. Krieglger Pub. Co., Inc., Huntington, New York, 1977. 305 p, 265 fig, 19 tab.

Key Words: Water supply, Rural areas, Sanitation, Water sources, Water resources development, Water treatment, Head, Pumps, Water supply systems, Sewage disposal, Garbage, Piping systems (mechanical), Pipe fittings, Equipment installation.

The book places emphasis on water conservation and the importance of water in the ecological system. The nature and sources of water are discussed along with the development of possible new sources of water and its purification and treatment. There is new material on important developments in the field of rural water supply, sanitation, and plumbing practices. Instructions are given for building a septic tank, cesspools and seepage pits, as well as methods of laying sewer tiles and drain tiles. Guidance is offered on the maintenance of water systems, plumbing systems, and sewage and garbage disposal systems. All aspects of pipe handling are also discussed.

ALGAE IN WATER SUPPLIES

Palmer, C.M.

U.S. Department of Health, Education, and Welfare, Public Health Service, Ohio.

An Illustrated Manual on the Identification, Significance, and Control of Algae in Water Supplies, Public Health Service Publication No. 657, 1959. 88 p, 62 fig, 13 tab, 147 ref.

Key Words: Algae, Water supply, Algal control, Taste, Odor, Plankton, Photosynthesis, Cytological studies, Pollutant identification.

This manual supplies information on the kinds of algae commonly found in water supplies and includes key illustrations, and other aids needed for their identification. It discusses algae in filters, in clean and polluted waters in reservoir walls, and in surface waters. Reference has been made to the utilization of algae as indicators of domestic sewage pollution, of natural purification in streams, and of sources of a particular water supply.

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COMMUNITY WATER SUPPLY AND SANITATION CLEARING HOUSE MECHANISM

World Health Organization, International Reference Centre for Community Water supply, Netherlands.

January 1978. 32 p, 1 fig, 18 ref, 7 annex.

Key Words: Information centers, Dissemination (information), Water supply, Sanitation.

The programme described in this paper discusses the development of a clearing house mechanism. A clearing house is defined as an agency responsible for the collection, analysis and distribution of information, and the promotion of the transfer of know-how and experiences on rural water supply and sanitation. This mechanism should ensure that each potential user will have access to the knowledge and experience garnered in this field. The aim, therefore, of the programme is to support the improvement of the overall situation in the field of water supply and sanitation in developing countries.

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WATER SUPPLY ENGINEERING DESIGN

Al-Layla, M. A., Ahmad, S. and Middlebrooks, E.J.

University of Mosul, College of Engineering, Iraq. Utah State University, College of Engineering, Logan.

Ann Arbor Science Publishers, Inc., 1978. 284 p, 131 fig, 28 tab, 50 ref, 1 append.

Key Words: Water supply, Water demand, Water sources, Wells, Well yield, Reservoir storage, Water distribution (applied), Pumping, Pumps, Pipelines, Pipe flow, Water quality, Water treatment, Sedimentation, Coagulation, Filtration, Disinfection, Organoleptic properties, Water softening.

In the past, water was either drawn from wells or brought from rivers in buckets or pitchers. There was little idea of a water distribution system for a community. Now, units for water supply in individual houses are giving way to a central water supply system which can ensure adequate and safe water. The crux of the problem lies in the economics of collection, treatment, and distribution of water to the community. This book deals with these problems. It presents the principles involved in the design of water supply and treatment systems in detail. Among the major topics discussed are: sources of water, pumping, distribution systems, pipelines, sedimentation, filtration, taste and odor control, and water softening.

PARTICIPATION AND EDUCATION IN COMMUNITY WATER SUPPLY AND SANITATION PROGRAMMES: A LITERATURE REVIEW

Van Wijk-Sijbesma, C.

World Health Organization, International Reference Center for Community Water Supply, Netherlands.

Technical Paper No. 12, March 1978, 204 p, 13 fig, 236 ref, 2 annexes.

Key Words: Social participation, Education, Public involvement program, Community development, Water supply, Sanitation, Environmental sanitation, Public health, Planning, Administration.

This review was compiled in order to support national development agencies in the design, testing and implementation of community participation and education strategies in water supply and sanitation programmes. It aims to take stock of data and information on community participation and education which could be obtained from the literature and which seemed relevant for a wider readership. It is hoped that the present work may be a useful contribution in the various aspects of community participation, and that it may give rise to increased activity in this field.

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SLOW SAND FILTRATION FOR COMMUNITY WATER SUPPLY IN DEVELOPING COUNTRIES: A SELECTED AND ANNOTATED BIBLIOGRAPHY

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

Bulletin No. 9, May 1977. 50 p, 2 fig, 3 annexes.

Key Words: Sand filters, Filtration, Water supply, Bibliographies.

This bibliography lists selected publications written on the subject of slow sand filtration for community water supply in developing countries. The major part of the publications is written in the English language and mainly deals with the technical aspects of the process. The publications are annotated and provided with keywords. An author and keyword index as well as a list of institutions and organizations that can give further information on the subject are added to this bibliography.

2423

WATER SUPPLY AND SEWERAGE

Steel, E.W. and McGhee, T.J.

Tulane University, New Orleans, Louisiana.

Fifth edition, McGraw-Hill, Inc., 1979. 665 p, 281 fig, 59 tag, 367 ref, 4 append.

Key Words: Water supply, Sewerage, Water consumption, Sewage, Rainfall, Runoff, Groundwater, Aqueducts, Water pipes, Water collection systems, Water distribution (applied), Pumps, Pumping plants, Water quality, Water treatment, Sedimentation, Coagulants, Filtration, Storm runoff, Sewers, Pipes, Closed conduit flow, Appurtenances, Design practices, Construction methods, Maintenance, Sewage disposal, Sewage treatment, Sludge treatment, Sludge disposal, Waste treatment, Financing.

This book contains discussions of topics necessary to design engineering works for the supply, treatment and distribution of water, and the collection, treatment and disposal of wastewater. Topics covered include: (1) the hydrologic cycle; (2) the quantity, quality, collection, distribution and treatment of water and water supplies; (3) aqueducts and water pipes; (4) sewerage; and (5) sewer pipes, appurtenances, and their design, construction and maintenance. Also presented and illustrated are up-to-date techniques and equipment concerning water and wastewater conveyance, granular filtration, alternate sewage disposal, sludge handling and dewatering, and pumps and pump selection.

CONTRIBUTIONS TO A MAIL SURVEY ON PRACTICAL SOLUTIONS IN DRINKING WATER SUPPLY AND WASTES DISPOSAL FOR DEVELOPING COUNTRIES

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

February 1977. 147 p, figures, references.

Key Words: Potable water, Water supply, Waste disposal, Surveys (data collection), Developing countries, Water sources, Water collection systems, Water treatment, Water conveyance, Water utilization, Sewerage.

Contained herein are the collections of field experience and unpublished data with particular reference to practical solutions in drinking water supply and waste disposal in developing countries. The nature of the information collected varied from mere indications of some interesting applications or ideas requiring evaluation to solutions which were readily applicable. These practical solutions or techniques cover such topics as: (1) water supply; (2) water sources and recovery; (3) water treatment; (4) water transport and use; (5) solar and wind energy; and (6) waste collection and disposal.

WATER SUPPLY AND WASTEWATER DISPOSAL: INTERNATIONAL ALMANAC

Kepiński, A. and Kepinski, W.A.S.

Volume 1, Vulkan-Verlag-Essen, Germany, 1976. 312 p.

Key Words: Water supply, Waste water disposal, Bibliographies, Administration, Utilities, Water management (applied), Planning, Public relations, Water law, Legislation, Social aspects, Costs, Economic aspects, Financing, Human resources, Education, Training, Research and development, Investigations, Methodology, Information, Documentation, International compacts.

This volume is the first of a planned series which will serve as a reference tool on problems and aspects in the domain of water supply and wastewater disposal. This English/German almanac provides adequate sources of information on all questions and aspects of the subject. The volume includes a list of significant periodicals and reference classified into 9 groups namely: Health, Public Utilities, Administration, Law, Costs, Human Resources, Research, Documentation and International Relations.

WATER SUPPLY AND WASTEWATER DISPOSAL: INTERNATIONAL ALMANAC

Kepiński, A. and Kepinski, W.A.S.

Volume 2, Zoetermeer, The Hague, Netherlands, 1977. 350 p.

Key Words: Water supply, Waste water disposal, Bibliographies, Organizations, Handbooks, Manuals, Water supply systems, Regional analysis, Regional development, Filtration.

Volume 2 begins with a general section containing addresses of international organizations and a list of reference books on water supply. The main bibliographic section contains reference sources on types and characteristics of water supply systems, geographical survey of water supply systems, filtration of water, rural water supply, and water supply in developing countries. The literature sources cited include scientific periodicals, technical and professional journals, conference papers and proceedings, and research and technical reports.

WATER SUPPLY AND WASTEWATER DISPOSAL: INTERNATIONAL ALMANAC

Kepiński, A. and Kepiński, W.A.S.

Volume 3, Zoetermeer, The Hague, Netherlands, 1978. 322 p.

Key Words: Water supply, Waste water disposal, Bibliographies, Groundwater management, Canada, Wells, Well yield, Well regulations, Subsurface waters.

The general section of volume three contains two papers. The first, "Groundwater Conservation and Utilization in Canada", examines the role of the provinces and the Canadian government in the development and management of groundwater and describes the occurrence, quantity and quality of groundwater in its six hydrogeological regions. The second paper presents a formula, "The Index of Well Capacity", which can be used for gaging well capacity and for sizing screens in drilled wells. The bibliographic section contains references on characteristics and types of sub-surface—water intaking, wells, well hydraulics, well design, well construction, efficiency and operation of wells, ageing, corrosion, incrustation and renovation of wells, and pollution and protection of wells and subsurface waters.

WATER SUPPLY AND WASTEWATER DISPOSAL: INTERNATIONAL ALMANAC

Kepiński, A. and Kepiński, W.A.S.

Volume 4, Zoetermeer, The Hague, Netherlands, 1978. 357 p.

Key Words: Water supply, Waste water disposal, Bibliographies, Organizations, Pipelines, Piping systems (mechanical), Water meters, Water metering.

The general section of this volume contains addresses of national associations arranged alphabetically by country. The bibliographic part consists of sections devoted to pipeline: types and characteristics; planning and design; hydraulics; materials; construction; operation and maintenance; ageing, corrosion, damages and protection. Other sections relate to types and characteristics, planning and designing, operation and maintenance, contamination and water quality deterioration in pipe networks as well as water meters and water metering.

WATER SUPPLY AND WASTEWATER DISPOSAL: INTERNATIONAL ALMANAC

Kepiński, A. and Kepiński, W.A.S.

Volume 5, Zoetermeer, The Hague, Netherlands, 1978. 316 p.

Key Words: Water supply, Waste water disposal, Bibliographies, Organizations, Handbooks, Manuals, Waste water, Waste water treatment, Sludge treatment, Sludge disposal.

The general section in this fifth volume continuously lists the addresses of national associations and the reference books in the field of wastewater disposal. The bibliographic section contains resource materials on types and characteristics of wastewaters, wastewater treatment and sludge processing and disposal.

PARTICIPATION AND EDUCATION IN COMMUNITY WATER SUPPLY AND SANITATION PROGRAMMES: A SELECTED AND ANNOTATED BIBLIOGRAPHY

Van-Wijk-Sijbesma, C.

World Health Organization, International Reference Centre for Community Water Supply, The Hague, Netherlands.

Bulletin Series No. 13, July 1979, 238 p, 3 annexes.

Key Words: Bibliographies, Water supply, Sanitation, Public participation, Education, Social aspects, Abstracts.

Selected books and articles dealing with public participation and education in community water supply and sanitation programmes are abstracted. The 145 materials documented cover the fields of sociology, cultural anthropology, community development, communications, health education, adult education, public health, preventive medicine and sanitary engineering. Emphasis has been placed on field studies illustrating the social aspects of water supply and sanitation projects. In addition, indexes of authors' names, keywords, and countries have been included.

2778

VILLAGE TECHNOLOGY HANDBOOK

Volunteers in Technical Assistance, Mt. Rainier, Maryland.

1978. 387 p, figures, tables, references, 1 append.

Key Words: Handbooks, Technology, Wells, Pumps, Cisterns, Springs (water), Water power, purification, Chlorination, Boilers, Sand filters, Health, Sanitation, Agriculture, Construction practices.

Specifically designed for developmental workers, this handbook aims to make man manage his own resources. Better living conditions through improved technology know-how are pursued in this do-it-yourself book. It covers in a step by step format almost all areas that affect basic human needs such as water resources, agriculture, health and sanitation, construction, home improvement, and food processing and preservation. Industrial crafts and the manufacture of communication tools are also discussed in detail.

2958

PLASTIC PIPE IN DRINKING WATER DISTRIBUTION PRACTICE: INTRODUCTION AND BIBLIOGRAPHY UP TO 1970.

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

Technical Paper No. 1, June 1971. 35 p.

Key Words: Plastic pipes, Water distribution (applied), Bibliographies, Water supply, Water quality, Strength of materials, Pipe design, Pipe laying, Operation and maintenance.

One of the tasks of the WHO International Reference Centre for Community Water Supply is to stimulate and coordinate research and development in community water supply. The present paper aims to introduce a study on plastic pipes and their role in the drinking water distribution practice and to initiate the collection of data with the following objectives: (1) to gain and collect information on the present knowledge of production, performance, standards, specification and test methods of plastic pressure pipes; (2) to serve and disseminate information on plastic pipe in water distribution systems; and (3) to collect and produce guidelines on design, installation, operation and maintenance of such systems. A bibliography has been added to serve as a guide to literatures on applications and development.

IMPACT OF THE SAFE DRINKING WATER ACT ON TEXAS

University of Texas at Austin, Lyndon B. Johnson School of Public Affairs

Policy Research Project Report No. 21, April 1978. 189 p, 11 fig, 15 tab, references, 9 append.

Key Words: Potable water, Water policy, Federal agencies, Water supply systems, Water treatment, Financing, Health, Administration, History, Personnel, Revenues, Monitoring, Surveys (data collection).

The present report describes the implications of the Federal Safe Drinking Water Act (P.L. 93-523) for state and local agencies. The study makes concrete policy recommendations to the Environmental Protection Agency and the Texas Department of Health on such issues as federal financing and responsibility, state financing for private systems, monitoring of small systems, public information regulations, and the granting of variances and exemptions.

3465

APPROPRIATE TECHNOLOGY SOURCEBOOK

Darrow, K. and Pam, R.

Vol. I, Volunteers in Asia, Inc., Stanford, California, June 1978. 318 p, 250 fig, 64 ref.

Key Words: Technology, Bibliographies, Annotations, Publications, Agriculture, Energy, Water supply, Architecture, Health, Industries.

A guide to practical plans and books for village and small community technology. Critical reviews of selected publications on alternative sources of energy, farm implements, shop tools, agriculture, low-cost housing, health care, water supply, pedal power, philosophy of appropriate technology, and related subjects. Small-scale systems using local skills and resources are emphasized. Publications were chosen that provide enough practical information to be of significant help in understanding principles and in actually building the design included. Titles were selected on the basis of low price, clarity of presentation, understandable non-technical language and unique subject matter. Materials and production techniques required are listed for all equipment plans. International in scope and well illustrated with price and address given for each publication.

3466

APPROPRIATE TECHNOLOGY SOURCEBOOK

Darrow, K., Keller, K. and Pam, R.

Vol. II, Volunteers in Asia, Inc., Stanford, California, January 1981. 491 p, figures, references.

Key Words: Technology, Applied research, Publications, Bibliographies, Annotations, Agriculture, Forestry, Aquaculture, Water supply, Sanitation, Energy, Housing (residential), Construction, Health, Education, Communication, Industries, Community development.

This is the second volume in a set of guides to practical books and plans for village and small community technology. Contained herein are 500 additional publications from sources all over the world, to supplement the first volume. Reviewed are topics on small water supply systems, renewable energy devices such as windmills and solar dryers, agricultural tools and implements, intensive gardening, workshop tools and equipment, crop preservation, housing, and health care. Also included are articles on forestry, aquaculture, nonformal education, small enterprises, transportation and others. Price and ordering addresses are provided for each publication, together with illustrations.

DRINKING-WATER SANITATION, 1981-1990: A WAY TO HEALTH

World Health Organization (WHO), Geneva.

1981. 56 p, 2 tab.

Key Words: Potable water, Sanitation, Health, Water supply, Development programmes, Community development, Urbanization.

The major aim of the International Drinking Water Supply and Sanitation Decade is the improvement of people's health. The essential elements of the Decade approach are: 1) complementary sanitation and water supply development, 2) strategies that give precedence to underserved populations, both rural and urban, 3) programs that will serve as a model for self-reliant, self-sustaining action, 4) socially relevant systems that people can afford, 5) association of communities in all stages of projects (planning, construction, financing, operation and maintenance), 6) coordination of water supply and sanitation programs with those in other sectors, and 7) association of water supply and sanitation with other health improvements.

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THE INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE DIRECTORY

World Water Magazine, England. World Health Organization, Geneva.

Thomas Telford Ltd., United Kingdom, June 1981. 407 p, 126 tab, 3 append.

Key Words: Potable water, Sanitation, Directories, Water supply, Developing countries, Technical assistance, Financial aid.

Compilation of this Directory has been done to provide data from all developing countries and from potential donors. Each country entry contains the following: rapid assessment reports on the state of preparedness of countries to implement programs during the Decade; sector digests of each country's status in water supply and sanitation; and responses to a resolution of the UN Economic and Social Council (ECOSOC) in May 1979, which requested countries to prepare national reports on the status of the water supply and sanitation sector and national targets set for the Decade. A dossier of statements relating to assistance for the water supply and sanitation sector made by various donor agencies and voluntary organizations have also been compiled and made as the final section of the Directory.

3967

A REVIEW OF BANK OPERATIONS IN WATER SUPPLY AND SEWERAGE SECTOR (SEPTEMBER 1968-DECEMBER 1976)

Byong-Kuk Kem

Asian Development Bank, Water Supply and Urban Development Division, Manila.

October 1977. 28 p, 2 tab, 3 append.

Key Words: Water supply, Sewerage, Financial analysis, Loans, Social aspects, Economic aspects, Financial aid.

The Asian Development Bank made its first loan for water supply in September 1968 to Malaysia for the Penang Water Supply Project. By the end of December 1976, the Bank's loans to the water supply and sewerage sector covered 21 projects in 12 member countries while the total amount of lending in the sector reached about 9.3 per cent of total Bank lending. Other financial activities of the bank discussed in this report are: the bank's lending operations and technical assistance in the sector; the financial covenants; the project implementation and loan administration; and a brief description of bank projects in the water supply and sewerage sector.

APPROPRIATE TECHNOLOGY FOR WATER SUPPLY AND SANITATION

Kalbermatten, J.M., Julius, D.S. and Gunnerson, C.G.

World Bank, Transportation, Water and Telecommunications Department, Washington, D.C.

Volume I: Technical and Economic Options, December 1980. 116 p, 15 fig, 15 tab, 67 ref.

Key Words: Appropriate technology, Water supply, Sanitation, Developing countries, Environmental aspects, Economic aspects, Public health, Social aspects.

In 1976, the World Bank launched this two-year research project to identify and evaluate alternative sanitation technologies for their potential to meet the needs and match the resources of project beneficiaries. The project reviewed technologies, social/behavioral factors, economic and financial aspects, suggested technical improvements and new applications for traditional technologies, and developed selection criteria and demonstrated the feasibility of staging sanitation sequences to match demand for improvements. The aspects of program planning necessary to implement the findings are also discussed.

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APPROPRIATE TECHNOLOGY FOR WATER SUPPLY AND SANITATION

Kalbermatten, J.M. Julius, D.S., Mara, D.D. and Gunnerson, C.G.

World Bank, Transportation, Water and Telecommunications Department, Washington, D.C.

Volume 2: A Planner's Guide, December 1980. 194 p, 46 fig, 10 tab, 51 ref.

Key Words: Appropriate technology, Water supply, Sanitation, Social aspects, Economic aspects, Planning, Waste disposal.

This manual aims to provide the immediate dissemination of research results, summaries of selected portions of publications needed for sanitation program planning, and descriptions of engineering details of alternative sanitation technologies and the means by which they can be improved. Information and instructions on how to design and implement appropriate technology projects based on the findings reported in the preceding volume are provided. Guidelines and design tools for the engineers and sanitarians responsible for planning and implementing sanitation projects are also given.

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COMMUNITY WATER SUPPLY RESEARCH 1973

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

Bulletin No. 6, October 1973. 62 p.

Key Words: Water supply, Community development, Research projects, Research centres, Water quality, Water treatment, Water distribution (applied).

The International Reference Centre (IRC), undertakes the basic task of disseminating and transferring technical and scientific information on community supply. This literature is part of a series that provides an inventory of the different research projects carried out by institutions which collaborate with the International Reference Centre (IRC). These research projects are classified in this report, according to a general classification of topics on community water supply.

PROJECT AND PROGRAMME INFORMATION SYSTEM

World Health Organization, Global Promotion and Cooperation for Water Supply and Sanitation (GWS), Geneva.

March 1981. 25 p, figures.

Key Words : Water supply, Sanitation, Information systems.

Clean water and adequate sanitation for all by 1990 is the main goal of the International Drinking Water Supply and Sanitation Decade. This booklet has been written for those involved in the external support of the Decade. The purpose is to present in a short format the main guidelines for a Project and Programme Information System which offers an option, maybe not the only one, to increase external support for the Decade.

APPROPRIATE TECHNOLOGY FOR RURAL WATER SUPPLY AND SANITATION IN EL SALVADOR: A BRIEF REVIEW AND BIBLIOGRAPHY

Pineo, C.S.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 26, September 1981. 13 p.

Key Words : Appropriate technology, Water supply, Sanitation, El Salvador, Bibliographies.

Discussed in this report are the important factors contributing to the success of potable water supply and sanitation project developed for some sectors in El Salvador. These factors include: (a) technology; (b) organizational and administrative structure; (c) trained personnel; and (d) sanitation programs. The draft of the letter of request for the use of appropriate technology to facilitate the realization of the programs and projects is included. Publications under the following categories are given: general, sanitation, and water supply.

THE ROLE OF WOMEN AS PARTICIPANTS AND BENEFICIARIES IN WATER SUPPLY AND SANITATION PROGRAMS

Elmendorf, M.L. and Isely, R.B.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Technical Report No. 11, December 1981. 27 p, 1 fig.

Key Words : Water supply, Sanitation, Project planning, Project evaluation, Water utilization, Project benefits.

There appears to be sufficient evidence for assuming that the success of water and sanitation projects in developing countries depends to a significant extent on the role of women as participants in improving technologies as well as beneficiaries of such technologies. Presented in this paper are arguments to support the above statement. Specific strategies for involving women as acceptors, users, managers, and diffusers (change agents) for the introduction of innovative water supply and sanitation technologies are recommended with examples.

TOWARD AN ASIA BUREAU WATER AND SANITATION POLICY STATEMENT

Thomson, J.F.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Technical Report No. 9, December 1981. 27 p, 41 ref, 2 annexes.

Key Words: Sanitation, Water policy, Health care, Water supply, Health education, Community participation, Disease control.

This paper has been prepared with the aim of formulating a water and sanitation policy statement by the Asia Bureau. The discussion and controversy from the seven issues raised may result in a more nearly formed notion of policy. Included are the current health policies and strategies of U.S. AID, as well as those of the Asia Bureau. The relationship between health care and improvements in water supply and sanitation is also discussed. Annexed are case studies dealing with health problems related to poor water supply and sanitation and some relevant experiences.

Category II: PLANNING, MANAGEMENT, EVALUATION AND TRAINING

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WATER: SOLUTIONS TO A PROBLEM OF SUPPLY AND DEMAND

Overman, M.

Doubleday Science Series, Doubleday & Co. Inc., Garden City, New York, 1969. 192 p, 86 fig.

Key Words: Water requirements, Water supply, Water demand, Water budget, Hydrologic cycle, Water measurement, Irrigation, Dams, Water storage, Hydroelectric power, Desalination, Water purification, Water resources, Future planning (projected).

This volume discusses the facts and problems on the world's water crisis. The author explains the basic hydrologic cycle, the distribution of water resources, the engineering, economic, and chemical bases of water supply techniques such as dams, aqueducts, reservoirs, canals, and wells, and reviews important developments in hydro-electricity, desalination, and water purification. The book concludes with an analysis of the new and unusual possibilities for ensuring the availability of water throughout the world.

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NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY

U.S. Department of the Army, Corps of Engineers, North Atlantic Division, North Atlantic Water Resources Study Group, New York.

Appendix R — Water Supply, Prepared for the North Atlantic Regional Water Resources Study Coordinating Committee, May 1972. 193 p, 36 fig, 113 tab.

Key Words: North Atlantic Region (USA), Methodology, Forecasting, Water supply, Industrial water, Water requirements, Domestic water, Stock water, Desalination processes, Water utilization, Water demand, Regional analysis, Water supply forecasting, Water sources, Costs, Water resources development.

This Appendix presents the existing average daily public and industrial water supply in the North Atlantic Region (NAR) as determined for available data. The future requirements were based on projection of population and economic information and are presented as average daily requirements. General determinations were made as to the facilities and programs that would be required to satisfy future needs, and their costs. This data is categorized by the three NAR Study objectives, Environmental Quality, National Efficiency and Regional Development under the Study's three bench mark years, 1980, 2000 and 2020, for the Region's 21 Hydrologic Areas.

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY

Environmental Protection Agency, Water Quality Office, Division of Water Hygiene, New York.

Appendix V — Health Aspects, Prepared for the North Atlantic Regional Water Resources Study Coordinating Committee, May 1972. 77 p, 6 fig, 6 tab, 79 ref.

Key Words: North Atlantic Region (USA), Health, Water supply, Vectors (biology), Air pollution control, Radiation, Sanitation, Recreation, Shellfish, Solid wastes, Epidemiology, Environmental aspects, Policies, Land management, Water resources development, Regional analysis.

This appendix gives an overview of water resource-related health problems that are occurring or could occur in the North Atlantic Regional Study area. It identifies major areas of health needs to be considered by the water resources planner. Due to the diversity of geographical, socio-economic and political aspects in the Region varied health considerations are taken into account. These considerations are dealt with through a discussion of the following: 1) epidemiological assessment, 2) health aspects of water supply, 3) vector control, and 4) environmental health analysis — air pollution control, radiation control, recreation sanitation, shellfish sanitation, solid waste management.

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DROUGHT AND WATER SUPPLY: IMPLICATIONS OF THE MASSACHUSETTS EXPERIENCE FOR MUNICIPAL PLANNING

Russell, C.S., Arey, D.G. and Kates, R.W.

Resources for the Future, Inc., Washington, D.C.

The Johns Hopkins Press, Baltimore, 1970. 232 p, 29 fig, 56 tab, 8 append.

Key Words: Droughts, Water supply, Massachusetts, Planning, Water demand, Water supply systems, Climatic changes, Water shortage, Economic impact, Models, Estimating.

Based on a comprehensive study of the impact of the 1962-66 drought on Massachusetts, this book contains the first estimates of drought losses of municipal water systems. Using a demand-supply ratio, the book projects demand into the drought period and relates observed shortages to the severity of the drought. Information on system capacity, water shortage, and water loss has been evaluated, and a model has been formulated for municipal system expansion. Although based on the experience in Massachusetts, the results and recommendations can be applied to other areas.

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RURAL WATER SYSTEMS PLANNING AND ENGINEERING GUIDE

Campbell, M.D. and Lehr, J.H.

Commission on Rural Water, Washington, D.C.

1973. 150 p, 62 fig, 22 tab, 73 ref.

Key Words: Water supply systems, Project planning, Water resources development, Rural areas, Water wells, Well construction, Pumps, Water treatment, Pumping plants, Water storage, Distribution systems, Cost analysis, Cost comparisons.

The successful development of a rural water supply system requires an understanding of some of its technical problems. This book discusses the overall problem of rural water system planning and development, and examines the essentials of water system development: well-site selection and well construction, requirements for pumping facilities, water treatment, and storage and distribution systems. It also dealt with cost analyses and comparisons for obtaining a water supply system. Guidelines for an adequate well and water system maintenance are included.

THE DEMAND FOR WATER: PROCEDURES AND METHODOLOGIES FOR PROJECTING WATER DEMANDS IN THE CONTEXT OF REGIONAL AND NATIONAL PLANNING

United Nations Department of Economic and Social Affairs, New York.

Natural Resources/Water Series No. 3, New York, 1976. 240 p, 24 fig, 57 tab, 91 ref, 4 append.

Key Words: Water demand, Forecasting, Water resources management, Planning, Water supply, Human settlements, Water utilization, Assessments.

The present publication is primarily addressed to persons interested in regional or national surveys dealing with water demand projections as a basis for long-range planning for water resources and policy formulation. The scope and objectives of the report may be defined as follows: (1) to outline the conceptual and procedural frameworks for water demand forecasting as the basis of long-range planning; (2) to review basic methodological approaches and techniques applicable for forecasting the various categories of water demands and for comparing them with the available supplies; (3) to review and disseminate indicative data on specific water uses and demands to facilitate tentative projections; (4) to assist national and regional governments in establishing or strengthening the institutional framework and the data base for assessing and projecting the demands for water.

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GREAT LAKES BASIN FRAMEWORK STUDY

Great Lakes Basin Commission, Water Supply Work Group, Ann Arbor, Michigan.

Appendix 6 — Water Supply — Municipal, Industrial, and Rural, Sponsored by the U.S. Environmental Protection Agency, Water Supply Section, 1975. 266 p, 62 fig, 128 tab, 72 ref.

Key Words: Great Lakes Basin (USA), Planning, Water resources development, Regional analysis, Water supply, Water supply forecasting, Estimated costs, Water requirements, Water utilization, Water quality, Water users, Lake Superior Basin, Lake Michigan Basin, Lake Huron Basin, Lake Erie Basin, Lake Ontario Basin.

This appendix contains a comprehensive appraisal of water supply requirements for municipal, industrial, and rural sectors of the Great Lakes Basin, so as to outline characteristics of projected water supply problems, and to suggest general solutions. Municipal, industrial, and rural water uses have been assessed for the base year, 1970, and projected to the years 1980, 2000, and 2020. A water supply report for each of the five plan areas and water use projections for each of the 15 planning sub-areas are also included.

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GREAT LAKES BASIN FRAMEWORK STUDY

Great Lakes Basin Commission, Ann Arbor, Michigan.

Appendix 23 — Health Aspects, 1975. 96 p, 9 fig, 29 tab, 65 ref.

Key Words: Great Lakes Basin (USA), Planning, Water resources development, Regional analysis, Health, Vectors (biology), Water supply, Recreation waste, Water quality, Air pollution, Solid wastes, Water treatment, Irrigation effects, Effluents, Waste disposal, Radiation hazards.

Public health factors can influence the degree of success of water resource planning and development. This appendix considers the health aspects of water resource planning in the Great Lakes Basin. It includes a review of disease vector control (the control of disease carriers), public water supply, recreation, air pollution, radiological health, individual water supply, irrigation with sewage treatment plant effluent, and solid waste management.

PLANNING A DOMESTIC GROUNDWATER SUPPLY SYSTEM

Gibb, J.P.

Department of Registration and Education, Illinois. Illinois State Water Survey, Urbana, Illinois.

Circular 116, 1973. 13 p, 4 fig, 1 tab, 8 ref, 2 append.

Key Words: Planning, Domestic water, Groundwater, Water supply systems, Water requirements, Water quality, Groundwater movement, Wells, Pumps, Illinois.

This circular presents basic information needed to plan and develop a domestic groundwater supply. It is part of a continuing program of water-resource investigations being conducted by the Illinois State Water Survey. A logical step-by-step planning summary is outlined. Accepted and recommended methods for a prospective owner of a domestic well to determine his water requirements and to gather meaningful information for planning his supply are presented. Also included are brief discussions on the occurrence, movement, availability, and quality of groundwater in Illinois, and the commonly used types of wells and pumps.

ORGANIZATION AND MANAGEMENT IN PRE-INVESTMENT PLANNING FOR WATER AND SEWERAGE

Shipman, H.R.

Asian Development Bank, Working Group on Pre-Investment Planning for Water Supply and Sewerage Development, Manila. World Health Organization, Geneva.

Document No. 1, 1977. 30 p, 1 annex.

Key Words: Planning, Organization, Institutions, Water supply, Sewerage, Project identification, Financial analysis, Investment, Programs, Objectives, Evaluation, Manpower, Water resources development.

Costs and implications are exigent to help planners reach decisions on budgetary requirements and to be able to assess impact on national development. This paper is in two parts. Part I discusses the national water/sewerage development plan with emphasis on some of the important elements which enter into the preparation and analysis of such plans. Part II discusses the execution of the plan, putting particular emphasis on project identification and project development.

ALTERNATIVE CONCEPTS OF MARGINAL COST FOR PUBLIC UTILITY PRICING: PROBLEMS OF APPLICATION IN THE WATER SUPPLY SECTOR

Saunders, R. J., Warford, J. J. and Mann, P. C.

International Bank for Reconstruction and Development, Energy, Water and Telecommunications Department, Washington, D.C.

World Bank Staff Working Paper No. 259, May 1977. 79 p, 7 fig, 37 tab, 4 annexes.

Key Words: Marginal costs, Pricing, Water supply, Public utilities, Theory, Application methods, Simulation, Evaluation, Economic efficiency. Metering, Revenues, Elasticity of demand.

In view of the difficulty of applying a standard benefit-cost approach to project evaluation in the water supply and sewerage field, marginal cost pricing is a recommended solution. This paper discusses the rationale and problems of implementing marginal cost pricing for water supply and sewage facilities. It examines several frequently used definitions of marginal cost, and evaluates each approach according to its implications for year-to-year price fluctuations, economic efficiency, and revenue generation.

ORGANIZATION AND ADMINISTRATION OF AN INTERNATIONAL PROGRAMME TO ACCELERATE THE PROVISION OF WATER SUPPLY AND SANITATION IN RURAL AREAS OF DEVELOPING COUNTRIES -- DISCUSSION PAPER

Ad Hoc Working Group on Rural Potable Water Supply and Sanitation, Geneva, Switzerland.

September 1975, 3 p.

Key Words: Water supply, Sanitation, Rural areas, Developing countries, Organizations, Administration, Institutions.

This paper discusses the mechanics of organization and administration of an International Programme designed to promote and assist the improvement of domestic water supplies and sanitation in the rural and fringe areas of developing countries. This program is proposed by the Ad Hoc Working Group composed of UNICEF, UNDP, UNEP, IBRD, WHO, IRDC and OECD.

AN INTEGRATED INTERNATIONAL PROGRAMME TO ACCELERATE THE PROVISION OF WATER SUPPLY AND SANITATION IN RURAL AREAS OF DEVELOPING COUNTRIES

Ad Hoc Working Group on Rural Potable Water Supply and Sanitation, Geneva, Switzerland.

A Proposed Two Year Phase II Programme for National Centres in Asia, October 1975. 45 p.

Key Words: Programs, Water supply, Sanitation, Rural areas, Developing countries, Institutions, Bangladesh, India, Indonesia, Pakistan, Budgets.

In the developing countries of Asia, only a small percentage of the large rural population is served by protected water supply systems. It is clear that Asia is a region which could greatly benefit from the Integrated International Programme and yet it has not been possible to identify a suitable regional center which could serve the needs of all developing countries, of the area. Consequently, Bangladesh, India, Indonesia and Pakistan were the countries selected for initial assessment of the possibility of developing activities of international interest in selected national centers or national institutions. The rural water supply, institutions and proposed centre programmed for each country are discussed.

AN INTERNATIONAL PROGRAMME FOR THE IMPROVEMENT OF WATER SUPPLY AND SANITATION IN RURAL AREAS OF DEVELOPING COUNTRIES

Ad Hoc Working Group on Rural Potable Water Supply and Sanitation (WHO, UNDP, IBRD, UNICEF, IDRC, UNEP, OECD)

May 1975. 16 p.

Key Words: Water supply, Sanitation, Development programs, Diseases, Public health, Rural areas, Developing countries.

A growing awareness to the problems of an exploding world population and its effects on the quality of life led to this program. The discussion stresses the concern for the improvement of water supplies and sanitation in the rural areas of developing countries through the establishment of an international network of information, training and research centers. It describes initiatives which have been given in the hope of raising levels of health in rural areas and in the neglected fringes of cities by improving water supply and sanitation services.

REUSE OF EFFLUENTS: METHODS OF WASTEWATER TREATMENT AND HEALTH SAFEGUARDS

World Health Organization (WHO), Geneva.

WHO Technical Report Series No. 517, 1973. 63 p, 3 fig, 5 tab, 61 ref, 2 annexes.

Key Words: Effluent reuse, Waste water treatment, Water reuse, Waste water use, Water quality control, Water quality, Industrial wastes, Public health, Water quality standards, Water supply.

This report reviews and evaluates: the extent of the reuse of wastewater, whether intentional or unintentional; the specific health hazards associated with the use of wastewater for agricultural, industrial, recreational, and domestic purposes; and the latest developments in wastewater treatment technology. It makes recommendations on the research needed on wastewater treatment and on the health safeguards to be observed in the reuse of effluents for various purposes. Two annexes provide an exhaustive bibliography on effluent reuse and an informative survey of wastewater reuse in certain countries.

MUNICIPAL WATER SYSTEMS: THE CHALLENGE FOR URBAN RESOURCE MANAGEMENT

Holtz, D. and Sebastian, S. (eds.), Indiana University Press, Indiana. 307 p, 20 fig, 24 tab, references.

Key Words: Water resources management, Municipal water, Management planning, Water demand, Water supply, Water management (applied), Water quality control, Legal aspects, Waste water use, Water conservation, Water pricing, Environmental aspects.

This book gives a comprehensive review of the most important problems in the management of municipal water systems. Divided into two sections, it first presents a brief overview on the context of municipal water management and planning, and a second part discusses current issues and problems related to the said field. Topics include water planning, planning methodology, water quality legislation, wastewater reuse, water conservation, pricing policies, public relations and professional attitudes, and environmental considerations in water management.

WATER FOR DOMESTIC USE IN RURAL AREAS

Chainarong, L.

Government of Thailand, Health Department, Rural Water Supply Division.

United Nations Water Conference, Mar del Plata, Argentina, Technical Paper No. 35, March 1977. 13 p.

Key Words: Water utilization, Rural areas, Water supply, Domestic water, Water supply systems, Design criteria, Financing, Construction costs, Institutions.

Faced with health hazards and the use of polluted water sources, a domestic water supply programme was set up in Thailand. As far as the programme is concerned, it aims not only to provide water systems, but also to ensure safe water in adequate and reasonable quantities to the consumers. The paper also dealt with the many government agencies engaged in the planning and implementation of the rural water supply program. This paper discusses the water systems, sources of water, the various water treatment methods, design criteria and the construction costs for the piped water system.

URBAN WATER SUPPLY CONDITIONS AND NEEDS IN SEVENTY-FIVE DEVELOPING COUNTRIES

Dieterich, B.H. and Henderson, J.M.

World Health Organization, Geneva, Switzerland.

Public Health Papers No. 23, 1963. 92 p, 3 fig, 9 tab, references, 6 annexes.

Key Words: Water supply, Water requirements, Urban areas, Developing countries, Public health, Economic development, Data collections, Costs, Financing, Future planning (projected).

This study, in addition to estimating present and future water needs, was conducted to evaluate existing conditions and deficiencies of community water supplies in a number of developing countries of the world. Findings indicate that for most of the countries studied: (1) urban water supply conditions are grossly unsatisfactory; (2) waterworks construction proceeds at too slow a rate to close existing gaps and match future needs; and (3) conditions have reached a point where shortcomings are a potential danger to urban health and economic development.

1579

THE EDUCATION AND TRAINING OF ENGINEERS FOR ENVIRONMENTAL HEALTH

Cassel, J., et. al.

World Health Organization, Geneva, Switzerland.

1970. 151 p, 4 fig, 10 tab, 132 ref.

Key Words: Engineering education, Environmental engineering, Training, Public health, Systems analysis, Computer applications, Mathematical analysis.

The general objective of the book is to provide guidelines for the education of the engineer who will be needed in environmental health in the latter third of the 20th century. The book discusses: (a) the changing concepts of environmental health; (b) a review of certain important trends in engineering education; and (c) the new developments in environmental health engineering.

1631

RESOURCES AND NEEDS: ASSESSMENT OF THE WORLD WATER SITUATION

United Nations Water Conference, Mar del Plata, Argentina, March 1977. 54 p, 4 fig, 8 tab.

Key Words: Water supply, Fresh water, Surface waters, Precipitation (atmospheric), Evapotranspiration, Appraisals, Groundwater, Water quality, Assessments, Water demand, Hydroelectric power, Water utilization, Economic aspects, Legal aspects, Environmental effects.

This paper discusses some features of the state and condition of water in the world. It presents the methods of appraising surface water, precipitation and evapotranspiration, groundwater, and groundwater quality with the purpose of providing proposals for action at national and international levels. Furthermore, the paper includes a discussion on water use, water demand, and water supply/demand relationships.

WATER SUPPLY FOR THE HELSINKI METROPOLITAN AREA

Maatta, J., Harjula, H., Ahoilta, P., and Nyroos, H.

Helsinki Metropolitan Area Water Company, Finland. The National Board of Water, Finland.

United Nations Water Conference, Mar del Plata, Argentina, Technical Paper No. 50, March 1977. 19 p, 11 fig, 2 tab.

Key Words: Water supply, Helsinki Metropolitan Area (Finland), Planning, Water resources development, Water conveyance, Tunnels.

This report discusses the development of water supply for the Helsinki Metropolitan area up to the year 2000. The general plan for an increase in the water supply was drawn up by the Government of Finland in co-operation with the communities involved. In 1972, a company was formed to implement the water supply project. The Paijanne Tunnel will be completed in 1982 to satisfy the future need of water for domestic purposes and for industry in the area. Taking water from Lake Paijanne for the water supply of various communities will require that the water be treated in certain ways. Lake Paijanne is one of Finland's most noteworthy lakes and its use for the provision of water supply outside the immediate region will have to be coordinated with other uses of the lake, including its recreational uses.

1671

GROUNDWATER PROTECTION AND WATER SUPPLY PLANNING IN DENMARK

Olesen, M.

National Agency of Environmental Protection, Denmark.

United Nations Water Conference, Mar del Plata, Argentina, Technical Paper No. 209, March 1977. 15 p, 2 fig, 21 ref.

Key Words: Denmark, Groundwater pollution, Groundwater regulations, Planning, Policies, Groundwater quality, Water supply, Seepage, Groundwater management, Mapping.

This paper explains the Danish policies to safeguard its groundwater from pollution. It enumerates the different Acts and Regulations enforced in the country together with the plans and measures to satisfy its future water demand.

1713

HEALTH ASPECTS OF ENVIRONMENTAL POLLUTION CONTROL: PLANNING AND IMPLEMENTATION OF NATIONAL PROGRAMMES

World Health Organization (WHO), Geneva, Switzerland.

WHO Technical Report Series No. 554, 1974, 60 p. 2 fig.

Key Words: Environmental effects, Pollution control, Planning, Programs, Public health, Pollution abatement.

This report lays down general principles for the prevention and abatement of pollution, delineates the functions of health authorities in this field, and provides practical guidelines for the planning and implementation of national programmes for the control of adverse effects of pollutants on man's health and his well-being. It discusses programme components and constraints and gives conclusions and recommendations as to the best action that may be taken.

RURAL WATER SUPPLY PROGRAM IN KOREA

Ministry of Health and Social Affairs, Korea.

Brief Summary, 1978. 12 p, 3 fig, 5 tab.

Key Words: Water supply, Programs, Community development, Municipal water, Administration.

The discussion in this report deals on how the Korean Ministry of Health and Social Affairs was able to provide rural areas with clean, potable water. Earlier water supply programs consisting of privately dug or hand wells failed because of the lack of proper maintenance. In 1967, the Ministry initiated a pilot project with the aim of providing piped water supply systems into every household and was eventually expanded to other areas. The success was attributed to the fact that each family was now willing to provide proper maintenance and financial assistance.

2035

EVALUATION FOR VILLAGE WATER SUPPLY PLANNING

Cairncross, S., Carruthers, I., Curtis, D., Feachem, R. and Bradley, D.

London School of Hygiene and Tropical Medicine, Ross Institute of Tropical Hygiene.

April 1978. 239 p, 21 fig, 18 tab, 55 ref.

Key Words: Evaluation, Water supply, Planning, Design criteria, Estimated costs, Water utilization, Water quality, Health, Administration, Benefits, Benefit sharing, Financial analysis.

Three major objectives are set forth by this book. The main objective is to convince decision makers that, before they rehabilitate sub-standard supplies or before they use scarce resources to construct and operate new supplies, it is worthwhile studying existing schemes from the perspectives set out in this book. The second objective is to convince the specialist health workers, engineers, administrators and others that they need to use each others skills if maximum progress is to be made. The third objective is to assist in the preparation and execution of an appropriate evaluation programme and to give support to those attempting to obtain necessary resources to carry out an evaluation.

2076

DROUGHT SEVERITY AND WATER SUPPLY DEPENDABILITY

Beard, L.R. and Kubik, H.E.

U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California.

Technical Paper No. 30, January 1972. 16 p, 3 fig, 5 tab, 5 ref.

Key Words: Streamflow forecasting, Droughts, Water supply, Water availability.

The characteristics of droughts that determine their severity and the regulatory measures required to provide protection against droughts depend to a large extent on the basic characteristics of meteorological and hydrological phenomena, and on the nature of operations that are affected by droughts. It is the purpose of this paper to examine the effects of droughts from the standpoint of differences in streamflow characteristics and differences in development and use. In connection with this, particular attention is given to the regulatory requirements of reservoirs in relation to the aforementioned factors.

SYSTEMS ANALYSIS FOR WASTEWATER REUSE: A METHODOLOGY FOR MUNICIPAL WATER SUPPLY PLANNING IN WATER-SHORT METROPOLITAN AREAS.

Milliken, J.G. et al.

University of Denver, Research Institute, Industrial Economics Division, Colorado.

Vol. I, July 1977. 377 p, figures, tables, references.

Key Words: Systems analysis, Waste water use, Planning, Water supply, Municipal water, Water allocation (policy), Water demand, Forecasting, Water conservation, Water pricing, Water management (applied), Interbasin water transfers.

This report presents and demonstrates a methodology for water supply planning in semi-arid metropolitan areas where water resources are limited. The methodology involves a comprehensive analysis of alternative policies, and is intended to assist in planning for a water supply that will meet future water demands after consideration of economic, social and environmental consequences. The purposes of this report are: (1) to discuss several alternative water strategies, including wastewater reuse, which can be used to resolve technological, economic, environmental, and social issues of municipal water supply; (2) to present a framework for the analysis of these alternative strategies; and (3) to indicate a method for arriving at a rational least-cost decision based on the analysis.

2238

SYSTEMS ANALYSIS FOR WASTEWATER REUSE: A METHODOLOGY FOR MUNICIPAL WATER SUPPLY PLANNING IN WATER-SHORT METROPOLITAN AREAS

Milliken, J.G. et al.

University of Denver, Research Institute, Industrial Economics Division, Colorado.

Vol. II, July 1977. 363 p, figures, tables, references, 2 append.

Key Words: Systems analysis, Waste water use, Planning, Water supply, Municipal water, Water costs, Aquifers, Groundwater management, Watershed management, Weather modification, Desalination, Decision making, Cost analysis, Benefit-cost analysis.

The methodology proposed here is intended to lead to a thorough systems analysis, which involves economic, social, and environmental considerations of known alternative means to increase water supplies or to reduce water demands, and to help select a least-cost mix of actions that will achieve a supply/demand balance throughout the chosen planning period. The techniques of cost-effectiveness analysis are recommended to help determine the least-cost actions that will achieve the desired goal of matching water supply and demand. This volume also discusses six alternative strategies for closing the water supply/demand gap in a metropolitan area.

2387

RURAL DOMESTIC WATER SYSTEM PEAK FLOWS AND DESIGN INNOVATIONS

Hughes, T.C., Kono, Y. and Canfield, R.

Utah State University, Water Research Laboratory, Logan.

Optimal Water Planning Series, January 1977. 50 p, 15 fig, 12 tab, 30 ref, 5 append.

Key Words: Water supply systems, Water supply, Peak discharge, Design improvements, Domestic water, Water supply forecasting, Water demand.

Peak instantaneous flow rates in a Utah rural system were measured continuously during two summers on three dead-end lines serving various numbers of customers. The second summer included measurement of flows to customers whose maximum flow rate was limited by a simple orifice placed in each meter. Conclusions which emerged from this study included: (1) actual peak demands were lower than those required for design purposes; (2) where extremely small mains are required by the economics of low density situations, or where unforeseen growth is overtaxing system capacity, peak demands can be cut significantly by simple, restricting devices at each meter without a decrease in the quality of water; and (3) field measurements of head loss through 10 year old plastic pipes indicated a Hazen Williams factor average of 133.

A MIXED INTEGER PROGRAMMING APPROACH TO PLANNING MULTIPLE WATER SOURCES FOR MUNICIPAL WATER SUPPLY

Hughes, T.C.

Utah State University, Water Research Laboratory, Logan.

March 1972. 182 p, 14 fig, 36 tab, 72 ref, 2 append.

Key Words: Computer applications, Computer programming, Planning, Water sources, Water supply, Water demand, Computer models.

Conventional manual methods of selecting the source-facility combinations for growing municipal water utilities necessarily ignore many possible combinations of sources due to the large computational effort involved in examining more than two or three solutions. While linear programming is not suited to this finely scaled problem analysis, mixed integer programming has many of the capabilities desired for the municipal planning problem. The format used in this study is to develop a general form of the model which will handle numerous types of sources-facility combinations. The model is then tested by applying it to an actual planning situation for Bountiful City, Utah. One additional application is also made to a hypothetical situation which demonstrates particular capabilities of the model which were not required for the Bountiful City problem.

USER ORIENTED SYSTEMS ANALYSIS FOR REGIONAL MUNICIPAL WATER SUPPLY PLANNING

Pugner, P.E. and Hughes, T.C.

Utah State University, Water Research Laboratory, Logan.

Optimal Water Planning Series, July 1976. 113 p, 2 fig, 1 tab, 23 ref, 9 append.

Key Words: Systems analysis, Municipal water, Water supply, Planning, Computer models, Computer programs, Computer applications, Optimization.

An interactive data and model generator is developed to bridge the gap between planning engineers and the mathematical programming systems approach to municipal and regional water supply planning. The optimization objective is to minimize the total annual cost of existing and future alternative source-related water supply facilities with respect to capital investment and operation and maintenance costs. A matrix generator is developed which formulates the necessary municipal water supply data into the format of a mixed integer linear programming problem for system optimization. The program then calls the integer programming algorithm, solves the optimization problem, and outputs a report in a format and language designed specifically for the problem at hand.

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MANUAL FOR EVALUATING PUBLIC DRINKING WATER SUPPLIES

U.S. Environmental Protection Agency, Water Supply Division, Office of Water and Hazardous Materials, Washington, D.C.

1975. 62 p, 7 fig, 3 tab, 7 ref, 1 append.

Key Words: Manuals, Evaluation, Quality control, Water supply, Potable water, Water treatment, Water quality control, Water distribution (applied), Water quality standards.

The evaluation of a public drinking water supply appraises the origin, treatment, distribution, and storage of water, and the bacteriological, physical, chemical, and radio-chemical qualities of the water as it flows from the tap. This manual recommends procedures for surveying and evaluating a water supply and describes the elements of water treatment generally necessary to ensure the production of water that continuously meet the requirements of the Public Health Service Drinking Water Standards.

SOUTHEAST CONFERENCE ON WATER CONSERVATION AND ALTERNATIVE WATER SUPPLIES: A SUMMARY REPORT

Howells, D.H.

Georgia Institute of Technology, Atlanta. University of North Carolina, Water Resources Research Institute.

Southeast Conference on . . . held at Georgia Institute of Technology, Atlanta, 8-9 November 1978. Vol. 1, No. 2, 1979. 43 p, 13 fig.

Key Words: Conferences, Water conservation, Water supply, Water demand, Water shortage, Planning. Water sources.

The second of a series of working regional conferences, this report dealt with water conservation and alternative new water supplies. The conference was designed to: (1) describe present and emerging conflicts for available water supplies arising out of competing demands from cities, industry, agriculture and instream use; (2) examine alternative new sources of water supply, including interbasin transfer, better use of groundwater, re-allocation of impounded waters, and reclamation of runoff and wastewater for compatible reuse; (3) consider opportunities for the extension of existing supplies through conservation and more efficient water use by cities, industry and agriculture; and (4) recommend courses of remedial action to assure adequate supplies of water to meet future needs in the Southeastern States.

2898

WATER SUPPLY SUPPORT PROGRAMMES

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

United Nations Water Conference, Mar del Plata, Argentina, Technical Paper No. 169, March 1977. 11 p, 4 ref.

Key Words: Water supply, Water resources development, Development programs, Developing countries.

In rural and urban fringe areas in particular, the development of water supply services is dramatically lagging behind the growth of population. An approach to the solution of this problem is through governmental and public awareness of the benefits that water supply facilities provide and assistance in building up expertise for its planning, operation and maintenance. This implies that parallel to, and in support of, investment programs for the construction of water supply works, additional support programmes will have to be developed. Essential elements of such programmes are: (1) motivation of policy makers; (2) education and involvement of the local population; (3) training for different levels especially for the subprofessional level; (4) demonstration programmes on technologies; and (5) transfer of appropriate knowledge and methods. Along these lines, the International Reference Centre for Community Water Supply forms the backbone of a worldwide system through which programmes are initiated, developed and executed.

2918

PRINCIPLES AND METHODS FOR THE PROVISIONS OF ECONOMIC INCENTIVES IN WATER SUPPLY AND WASTE WATER DISPOSAL SYSTEMS

United Nations Economic Commission for Europe (ECE), Committee on Water Problems, New York.

ECE/WATER Report No. 16, 1976. 25 p, 1 annex.

Key Words: Water supply, Water supply systems, Waste disposal, Economic aspects, Economic feasibility, Economic impact, Evaluation, Surveys, Regional analysis.

In addition to technical, administrative and legislative measures, water resources management and development in the majority of ECE member countries show that, in order to achieve the desired balance between water demands and water resources, economic incentives are necessary. The main provisions of economic incentives in water resources management are analyzed herein. The report also summarizes the policies of economic incentives applied in the individual ECE member countries, and outlines general trends in the development of water resources management leading to the introduction of such policies.

PUBLIC WATER SUPPLIES: THE EFFECT OF FEDERAL AND TENNESSEE WATER RESOURCES LAW

Sikora, V.A.

University of Tennessee, Water Resources Research Center, Knoxville.

Research Report No. 72, December 1979. 87 p, 6 tab, references, 1 append.

Key Words: Water law, Water supply, Water rights, Legal aspects.

The existing surface and ground water law in Tennessee was described and evaluated with the objective of determining the effect of the law in securing adequate public water supplies. The opinions of public water suppliers on the nature and extent of their problem in acquiring adequate water supplies were obtained. The study has determined that: (1) under both common law and Tennessee statute, public water suppliers have nearly the same prerogatives as other persons to acquire water rights; (2) public water suppliers under Tennessee riparian doctrine appear to have a priority over other withdrawers from a watercourse, but there seems to be no priority between public and quasi-public organizations' usage of eminent domain powers; (3) public water suppliers favor a state water resource management program operated by a public health agency, though other state and county agencies are also acceptable.

2983

HANDPUMP TESTING AND EVALUATION TO SUPPORT SELECTION AND DEVELOPMENT OF HANDPUMPS FOR RURAL WATER SUPPLY PROGRAMMES

World Health Organization, International Reference Centre for Community Water Supply, Hague, Netherlands.

Report on an International Working Meeting held at Harpenden, Hertfordshire, England, 29 May - 1 June 1979. Bulletin No. 15, December 1979. 54 p, 3 fig, 3 tab, 3 annexes.

Key Words: Pumps, Pump tests, Evaluation, Research and development, Water supply, Rural areas.

Valuable work in field and laboratory testing of handpumps and field performance surveys have been carried out over the past years. But because of the absence of uniform procedures and methods, it is usually impossible to have valid comparisons of tests or survey results between different hand-pump programmes, countries, and regions. The present material provides a good basis for the preparation of a single guidance document (manual) on the subject of handpump testing and evaluation for the selection and development of pumps. Testing in support of quality control in manufacturing pumps is considered, as well as economic analysis for comparative evaluation of cost effectiveness of different types and models of pumps. A survey of handpump testing and evaluation projects is also presented herein.

3085

WATER SUPPLY PLANNING: A CASE STUDY AND SYSTEMS ANALYSIS.

Greenberg, M.R. and Hordon, R.M.

Rutgers State University, Center for Urban Policy Research, New Jersey.

1976. 166 p, 13 fig, 27 tab, 207 ref, 3 append.

Key Words: Planning, Water supply, Systems analysis, Water management (applied), Water supply systems, Statistical models, Potable water, Discriminatory pricing, Simulation.

This study is concerned with water supply planning in a densely developed, metropolitan region on New Jersey plagued by political fragmentation. Two conflicting imperatives are discussed: (a) that of organizational autonomy and self-interest, and (b) the predictability and growth of water demand and supply. The book gets to the root of these conflicts, and the dilemma they pose to the urban system. The importance of regional management as opposed to fragmented management of potable water supply is stressed. A mathematical optimization model is used to test alternative planning strategies. Both population and per capita water use are projected to predict water demand. It also discusses the relationship between water supply/demand and the retail pricing of water in the study areas. Lastly, a system simulation model is used to test the implications of alternative management policies.

A DYNAMIC PROGRAMMING APPROACH TO THE OPTIMIZATION OF A COMPLEX URBAN WATER SUPPLY SCHEME

Codner, G.P.

Australian Water Resources Council (AWRC), Canberra. Department of National Development, Canberra.

AWRC Technical Paper No. 47, Australian Government Publishing Service, Canberra, 1979. 168 p, 12 fig, 7 tab, 58 ref, 7 append.

Key Words: Dynamic programming, Computer programs, Optimization, Water supply systems, Planning.

The present report deals with the problem of trying to operate a water supply system in the best way possible before investing further capital in additional reservoirs or aqueducts for the system. The ultimate goal is to write a general computer program that can be applied to any urban water supply system of reservoirs and pipelines. Results of the study show that Discreet Differential Dynamic Programming (DDDP), is a technique which successfully finds optimal operating modes for complex systems with hindsight or perfect foresight. Fortran listing of the program and detailed flow charts of the main sub-routines are developed.

3779

DEVELOPMENT OF ECONOMIC WATER HARVEST SYSTEMS FOR INCREASING WATER SUPPLY

Cluff, C.B., Dutt, G.R., Ogden, P.R. and Stroehlein, J.L.

University of Arizona, Tucson.

Project Completion Report, September 1971. 53 p, 9 fig, 14 tab, 24 ref.

Key Words: Water supply, Water harvesting, Economic aspects, Water yield improvement, Water utilization, Water conservation.

To provide a more efficient method of collection and storage of precipitation, the development of an efficient water harvesting system is necessary. The major emphasis of the project was devoted to catchment development particularly graveled plastic catchments. As for water storage, being an important aspect of water harvesting systems, the use of the Gravel Extracting Soil Sifter (GESS) and other equipment used in lining reservoirs were also explored.

3832

WATER SUPPLIES AND ECONOMIC GROWTH IN AN ARID ENVIRONMENT: AN ARIZONA CASE STUDY

Kelso, M.M., Martin, W.E. and Mack, L.E.

The University of Arizona Press, Tucson, 1973. 327 p, 39 fig, 82 tab, 65 ref.

Key Words: Water supply, Economic growth, Arid lands, Economic analysis, Water law, Water utilization, Water policy, Water requirements, Water resources development, Planning, Arizona, Economic aspects, Social aspects.

This book presents the relationship between water supplies and economic growth in an arid environment, specifically for the state of Arizona. A description of the physiography and climate of the state, the volume and rate of withdrawal of water supplies, and the economic development and associated water requirements is provided. The discussions have conceptualized an economic analysis of the Arizona water problem and deduced the likely consequences over time in acres cropped, water used and income generated in agriculture, as well as, the resulting effects on the non-agricultural economy.

CONTRACTS TO PROVIDE SPACE IN FEDERAL RESERVOIRS FOR FUTURE WATER SUPPLIES SHOULD BE MORE FLEXIBLE

United States General Accounting Office (GAO), Washington, D.C.

Report by the U.S. GAO, 16 May 1980. 13 p.

Key Words: Contracts, Reservoirs, Water storage, Water supply.

Before building future water storage space in reservoirs, the Corps of Engineers and Interior's Water and Power Resources Service must be reasonably sure that the water supplies are needed for municipal and industrial use and the user will repay the Federal Government. This report discusses Federal contracting procedures for municipal water supply storage at Federal reservoirs and the need to include cost estimates for transporting such water to the user's treatment facilities. It suggests ways to improve current contracting procedures and allow the Federal Government to market unneeded water to other users.

3844

EDA NEEDS TO IMPROVE THE NAVAJO INDIAN SAFE DRINKING WATER PROGRAM

United States General Accounting Office (GAO), Washington, D.C.

Report by the Comptroller General of the United States, 10 September 1980. 93 p, 12 fig, 4 tab, 8 append.

Key Words: Potable water, Water sampling, Water analysis, Water quality standards.

The safety of public drinking water depends on compliance with national regulations which specify maximum contaminant levels. The Environmental Protection Agency's efforts to insure this safety on the Navajo Indian Reservation have not been effective because of its lack of overall supervision and standard sampling and training procedures and inadequate monitoring. This report discusses the need for better planning and coordination of the program and standardization of a sampling and training procedures. Recommendations to improve the program are also given.

3968

WATER SUPPLY SYSTEM IN OSAKA

Osaka Municipal Water Works Bureau, Japan.

n.d. 48 p, 45 fig, 10 tab.

Key Words: Water supply systems, Water demand, Water resources development, Water sources, Water management (applied).

Series of events dating back from the 1860's led to the establishment of a public water supply system in Osaka in 1895. The chronological development of the System is presented herein. The information includes the different aspects involved in its operation. The detailed account is given under the following headings: water sources; water supply facilities; changes in water demand and development of facilities; management; industrial water supply system; and water resources and its quality.

HYDROGEOLOGICAL RECONNAISSANCE OF THE YELIMANE-TAMBACARA AREA WITH REFERENCE TO THE VILLAGE WELLS PROJECT

Taylor (Jr.), G.C.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 32, February 1982. 38 p, 1 fig, 4 ref, 4 append.

Key Words: Hydrogeology, Surveys, Wells, Water supply.

The results of a hydrogeologic reconnaissance of the project are reported. The objectives of the survey were to evaluate the hydrogeologic feasibility of constructing new large-diameter open wells, or of deepening existing wells at twenty-four villages in the area. Discussed at length are the observations and relevant recommendations for the siting of new wells, as well as the general hydrogeologic conditions in the area and criteria for groundwater development for village water supply.

WATER CONSERVATION FOR DOMESTIC USERS: WITH SPECIAL REFERENCE TO WARM DESERT CLIMATES

University of Arizona, Tucson.

1977. 65 p, 13 fig, 6 tab, 4 append.

Key Words: Water conservation, Domestic water, Domestic use, Water utilization, Water supply, Water requirements, Adoption of practices, Water consumption.

Regard for water as a precious commodity is emphasized particularly for households. This publication aims to help the residential water user in detecting areas where domestic water can be conserved and in effecting the appropriate and economical conservation measures. The various indoor water uses are described with some tips on where and when water use can be reduced. Next, the outdoor water uses are considered with particular attention given to landscape irrigation which plays a major role in the consumptive use of residential water supply.

APPROPRIATE TECHNOLOGY FOR WATER SUPPLY AND SANITATION

Feachem, R.G., Bradley, D.J., Garelick, H. and Mara, D.D.

World Bank, Transportation, Water and Telecommunications Department, Washington, D.C.

Volume 3: Health Aspects of Excreta and Sullage Management — A State-of-the-Art Review, June 1981. 318 p, 26 fig, 19 tab, references, 14 append.

Key Words: Appropriate technology, Water supply, Sanitation, Public health, Environmental sanitation, Waste Disposal, Epidemiology.

Public health is of central importance in the design and implementation of improved excreta disposal projects. It is therefore necessary to make available as much information as possible about the interaction between excreta and health in order that engineers and planners may make informed and rational decisions. This book provides information concerning the broad epidemiological issues of the impact on disease of improvements in excreta disposal, and the ways in which particular excreta disposal and reuse technologies affect the survival and dissemination of particular pathogens. A distillation of available knowledge on excreta, night soil, sewage and health is also included.

PARA VILLAGE WATER SUPPLY: PRE-FEASIBILITY REPORT

Turner, W.M.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH),
Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 40, April 1982. 16 p, 1 append.

Key Words: Water supply, Feasibility studies, Brazil, Project summaries, Sanitation.

The scope of the project covers the following: (a) implementation of well drillers training program based on existing capabilities; (b) expansion of existing handpump manufacturing facility; (c) implementation of village well drilling projects by trainees; (d) training of village water supply and health promoters; and (e) development of local capabilities in the construction of a sanitary waste disposal facilities for villages. Duration, starting time and summary of estimated costs of the project are reported herein. A location map of the project is attached.

4078

PLANNING FOR AN INDIVIDUAL WATER SYSTEM

Henderson, G.E. and Jones, E.E.

American Association for Vocational Instructional Materials, Engineering Center, Athens, Georgia.

May 1973. 156 p, 136 fig, 18 tab, 36 ref.

Key Words: Planning, Water supply systems, Water availability, Water sources, Water pollution control, Water treatment, Pumps, Pipes, Electrical equipment, Equipment installation.

Few investments give little thought to planning the installation of a water-supply system for a home or farm. This book tells how to plan for a safe and adequate water supply. Covered in detail are: (1) methods of determining how much water will be needed daily and the amount of available water; (2) determining if water supply is safe; (3) methods of protecting water sources from pollution; (4) methods used for disinfecting water; (5) water-conditioning methods; (6) determining what pumping installation to make; (7) planning of the piping installation; and (8) planning of the electrical installation.

4081

EVALUATION OF YEMEN WATER SUPPLY SYSTEMS MANAGEMENT PROJECT

Lang, M. and Calbert, C.E.

Camp Dresser and McKee International, Inc., Water and Sanitation For Health Project (WASH),
Coordination and Information Center, Arlington, Virginia.

WASH Field report No. 22, September 1981. 63 p, 5 fig, 1 tab, 4 append.

Key Words: Water supply, Water supply systems, Water management (applied), Training programs, Yemen.

The upgrading of the National Water and Sewerage Authority (NWSA) of the Yemen Arab Republic into a self-sufficient and self-financing utility is proposed through the training of a substantial number of people in both long and short term academic, managerial and vocational programs. The evaluation of the project with respect to the original goals or objectives set out at the start is discussed. The present status of the project as well as the overall performance of the National Water and Sewerage Authority as the implementing agency is evaluated. Recommendations proposed for the manpower development of NWSA are likewise considered.

PLAN FOR HEALTH IMPACT EVALUATION OF THE HEALTH SECTOR II BILATERAL ASSISTANCE PROJECT IN THE DOMINICAN REPUBLIC

Howard, P.F. and Struba, R.J.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 23, September 1981. 112 p, 14 fig, 4 tab, 52 ref, 4 append.

Key Words: Health, Public health, Water quality, Waste disposal, Evaluation, Social aspects, Project feasibility, Project planning.

The Health Sector II Bilateral Assistance Project proposes to provide water, latrines, and health education in approximately 500 rural communities in the Dominican Republic. A detailed plan for a two-year evaluation study of the health impacts of this ongoing project is reported. The text discusses: (1) the three health interventions of the project-water supply, excreta disposal and health education; (2) the general nature of impact studies and practical assumptions made; (3) details of the study design and the criteria used; and (4) the monitoring of the implementation, functioning and use of the three interventions.

4083

SCOPE OF WORK FOR THE HEALTH OUTCOME EVALUATION OF THE HEALTH SECTOR LOAN II PROJECT IN THE DOMINICAN REPUBLIC

McLeroy, K.R.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 35, February 1982. 28 p, 4 ref, 3 append.

Key Words: Water supply, Health, Dominican Republic, Estimated costs.

The following report presents a scope of work and cost estimate for a two and a half year evaluation study of the on-going project. Proposal to provide water, latrines and health education in approximately five hundred rural communities is made. Data on mortality and anthropometry are gathered by local health promoters in one hundred communities for evaluation. It is estimated that the evaluation will require approximately 62.4 person weeks of effort with a cost of \$124,000 excluding monitoring activities.

4102

MEASURING AND EVALUATING DIARRHEA AND MALABSORPTION IN ASSOCIATION WITH VILLAGE WATER SUPPLY AND SANITATION

Cvjetanovic, B.et al.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Technical Report No. 12, December 1981. 36 p, 4 ref, 5 append.

Key Words: Measurement, Evaluation, Diarrheal diseases, Sanitation, Water supply, Data collections, Morbidity, Health education, Malabsorption, Health benefits.

The "Food Wastage/Sanitation Cost-Benefit Methodology Project" consists of an experimental and a control program which aims to examine the relationships between improved environmental sanitation and the waste of food energy due to inefficient absorption of food resulting from intestinal diseases. Two data analyses however, revealed two different results. To resolve the discrepancies between them, the WASH project convened an expert review panel. Findings suggest that certain methodological problems preclude making firm conclusions from the available data, particularly with respect to the initial hypothesis concerning relationships between water, sanitation and food wastage.

TECHNICAL TRAINING OF PEACE CORPS VOLUNTEERS IN RURAL WATER SUPPLY SYSTEMS IN MOROCCO

Sherer, K.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 43, May 1982. 106 p, 2 fig, 11 append.

Key Words : Water supply, Morocco, Training, Water supply systems.

An intensive in-country training course for Peace Corps Trainees was conducted in Morocco. It demonstrated that by using a community as a focal point for training was a productive concept. Secondary benefits were achieved for the language and cross-cultural aspects of the training program, as well as for the community involved. In addition, an in-service training based on a survey of the volunteers' needs after four to six months in their field assignment is suggested.

PUBLIC STANDPOSTS FOR DEVELOPING COUNTRIES

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

Proceedings of an international expert meeting held in Achimata (Accra), Ghana, 8-12 August 1977. Bulletin No. 11, May 1978. 61 p, 6 annexes.

Key Words: Public standpipe systems, Water supply systems, Developing countries, Water distribution (applied).

Recognizing the importance of public standposts in meeting the water supply needs in the developing countries, the WHO International Reference Centre for Community Water Supply initiated a study of public standpost systems. Comments on the preliminary results of the study were invited from international agencies, development assistance organizations and water supply organizations in several developing countries. On the basis of these comments, a draft report on public standposts was prepared for review at a meeting of experts, of which the proceedings are presented here.

REPORT ON THE PERU RURAL WATER SYSTEMS AND ENVIRONMENTAL SANITATION PROJECT

Shipman, H.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 6, January 31, 1981. 22 p, 4 annexes.

Key Words : Water supply systems, Environmental sanitation, Rural areas, Technical assistance, Development aid.

The observations contained in this report supplement the various papers left with the AID mission in Lima for translation and referral to the government as aids in preparing the documentation required for loan disbursement. Actions of particular concern include: (1) an implementation plan which includes information on the administrative and managerial arrangements for the project; (2) financing plan; (3) staffing plan; (4) statements on first year's procurement needs and procedures, as well as general requirement for the entire five years; (5) listing of criteria for community eligibility and selection; and (6) decision concerning the three regions to be selected for the first year's program.

A NATIONAL ENVIRONMENTAL SANITATION EDUCATIONAL MASTER PLAN: A PRELIMINARY REVIEW

Warner, D.B. and Woolf, K.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

Field Trip Report No. 7, March 9, 1981. 35 p, 2 fig, 3 append.

Key Words: Environmental sanitation, Education, Development programs, State and education, Educational administration, Educational systems.

This report describes the preparation of a comprehensive sanitation education master plan for the country following the wish of the Government of Tanzania to develop a national plan which would allow it to foresee and then fulfill its personnel needs in environmental sanitation for the United Nations' Drinking Water Supply and Sanitation Decade. Contained are: (1) description of the existing situation regarding environmental sanitation education and training and (2) a need of assessment and implications regarding the urgent need for a broader environmental sanitation education program in Tanzania.

TANZANIA HEALTH AND ENVIRONMENTAL MONITORING PROJECT (HEMP): RECOMMENDATIONS FOR PROJECT PAPER DESIGN TEAM

Warner, D.B. and Woold, K.

Camp Dresser and McKee International, Inc., Water and Sanitation For Health Projects (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 8, March 1981. 27 p, 2 fig, 1 tab, 10 ref, 4 append.

Key Words: Recommendations, Health, Monitoring, Sewerage, Environmental sanitation, Technical assistance.

The Health and Environmental Project (HEMP) undertakes the study of the effects of low-cost sanitation practices upon health. This report describes the design team needed to develop the protocol systems and techniques which are to be employed in a five-year monitoring study of the World Bank-financed sewerage and sanitation project in Dar es Salaam. Included are recommendations on the size, composition, and duration of the Project Paper Design Team. In addition, suggestion for a possible research methodology is included for consideration by the design team which is to consist of both Tanzanian and U.S. personnel.

TECHNICAL RECOMMENDATIONS FOR WASTEWATER TREATMENT DEMONSTRATION (PILOT) PLANTS FOR LEBANON

Kalinske, A.A.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 10, March 1981. 8 p.

Key Words: Recommendations, Waste water treatment, Feasibility studies, Aeration, Sludge treatment, Sewage treatment, Environmental sanitation, Lebanon.

An Environmental Sanitation Project has been undertaken to build two wastewater treatment plants for small villages in the vicinity of Beirut. These treatment plants would be used to refine design criteria suiting Lebanon conditions, and to instruct plant operation personnel from other villages where similar facilities would be built in the future. The steering committee selected the towns of Rabieh and Keifoun for this project. It was found that the extended aeration system must be installed at Keifoun due to site constraints and it was recommended that an aerated lagoon system be selected for the Rabieh site.

RURAL SANITATION AND MANPOWER DEVELOPMENT PROJECT IN INDONESIA: APPROPRIATE TECHNOLOGY AND INFORMATION DISSEMINATION

Gearheart, R.A.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 28, November 1981. 52 p, 2 tab, 6 append.

Key Words: Sanitation, Manpower, Indonesia, Technology, Dissemination (information), Rural areas.

The project under review is a four-year endeavor which aims to provide: (a) laboratory equipment; (b) library resources; (c) appropriate technology; (d) field training exercises; (e) media development; (f) information systems; and (g) a master plan for RSMD faculty development. The nine sanitary schools already completed have a graduating class capacity of forty students in a nine-month program. Courses offered are discussed, as well as different proposals for academic improvement.

4198

RECOMMENDATIONS FOR THE RURAL WATER AND ENVIRONMENTAL SANITATION PROJECT IN PERU

Donaldson, D. and Pineo, C.S.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 38, April 1982. 63 p, 2 fig, 1 tab, 7 ref, 6 append.

Key Words: Recommendations, Environmental sanitation, Rural water supply systems, Peru, Technical assistance, Latrines, Health.

The project under focus calls for providing potable water systems, latrines and health education to about four hundred twenty small communities. Technical assistance in the following areas are provided: (1) the evaluation of the design of the first ten gravity fed water systems; (2) review of the proposed technical assistance package; (3) development and staffing of regional DIS office; (4) review of the proposed training plan; and (5) review of the proposals for procurement and warehousing. Furthermore, review on the Wellin questionnaire, CEPIS/DIS efforts to develop a joint operations and maintenance project, and a proposed handpump effort as it relates to the project are also included.

4201

THE CHOICE OF HEALTH STATUS INDICATORS TO EVALUATE WATER AND SANITATION PROJECTS IN NORTH CAMEROON: A SYNTHESIS OF AVAILABLE INFORMATION

Struba, R.J. and Isely, R.B.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Technical Report No. 5, October 1981. 29 p, 6 fig, 42 ref.

Key Words: Public health, Sanitation, Water supply systems, Diseases, Morbidity, Mortality, Evaluation, Health impact.

Upon its completion, the Mandara Mountains Water Resources project will consist of 35 gravity overspill, water catchment dams in Cameroon. In order to assess the health impact of the planned water, sanitation and health education interventions, a number of health status indicators (HSI) were made available. These ranged from relatively simple measures, such as change in weight and height in children, to laboratory work on samples of blood, urine and stool. In this paper, the relative merits of these HSI are discussed. Particular emphasis is placed on those diseases and health conditions which are endemic in the project area and are most likely to be affected by improvements in water and sanitation.

PARTICIPANTS MANUAL FOR SESSIONS ON WATER SUPPLY AND SANITATION

Isely, R.B. et al.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Technical Report No. 13, February 1982. 165 p, 4 fig, 13 tab, 1 append.

Key Words: Water supply, Sanitation, Project planning, Evaluation, Manuals, Community participation.

The workshop sessions were designed to facilitate participation in the analysis of problems associated with planning, implementation, and evaluation of water supply and sanitation projects, and in the formulation of approaches to those problems. Proceedings of the sessions are presented as: resource documents prepared by the speakers; background papers, checklists, worksheets, and case studies for each workshop, whether for planning, implementation, or evaluation; and appendices consisting of miscellaneous materials.

4226

WOMEN, WATER AND THE DECADE

Elmendorf, M.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Technical Report No. 6, June 1981. 22 p, 74 ref.

Key Words: Water supply, Sanitation, Project planning, Women, Women's work, Education of women, Water management (applied), Water users.

Key roles played by women in traditional societies related to water use and management are pointed out. The need for involving women in planning and implementing decade activities so that effective strategies can be developed for reaching as effectively as possible, the goal of safe water for all are also examined. The four key roles of women discussed in this paper are: (1) women as acceptors of existing water services and sanitation customs; (2) women as users of new water and sanitation facilities; (3) women as managers of household and community water resources and socializers in sanitary practices; and (4) women as change agents in breaking the fecal-oral route of infection through better use of water and sanitation facilities.

Category III: TECHNOLOGY

A. WATER SUPPLY

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THE HYDROLOGICAL FEASIBILITY OF VARIABLE WATER SUPPLY

Bargur, J. and Gablinger, M.

Tahal Consulting Engineers Ltd., Staff Group for Research, Development and Planning, Tel Aviv, Israel.

Circa 1973. 10 p, 3 fig, 10 ref.

Key Words: Water supply system, Israel, Water policy, Stochastic processes, Synthetic hydrology, Simulation, Monte Carlo method.

In regions where scarcity of water resources increases, it seems possible to increase the long-run regional water potential by establishing a variable water supply policy. The hydrological feasibility of allocating water quantities varying from year to year was investigated, using the Israel water supply system as a case study, with the objective of increasing the long-range average supply above the presently allocated quantity. A combination of linear programming and simulation models was applied in a two-stage program. It was found that under the variable supply policy, the average annual allocation can be increased by more than 10%.

ENERGY REQUIREMENTS OF ALTERNATIVES IN WATER SUPPLY, USE, AND CONSERVATION: A PRELIMINARY REPORT

Roberts, E.B. and Hagan, R.M.

University of California, Department of Land, Air and Water Resources, Water Science and Engineering Section, Davis, University of California, Water Resources Center, Davis.

Contribution No. 155, December 1975. 93 p, 12 fig, 38 tab, 114 ref, 6 append.

Key Words: Energy requirements, Water supply, Water utilization, Water conservation, Water treatment, Waste water treatment, Water distribution (applied), Water reuse, Desalination, Energy conversion.

Direct energy requirements for a wide range of alternatives for water supply and use, waste water treatment and water reclamation and reuse are examined in this report. Municipal water supplies considered include surface storage and diversion projects, ground water pumping, desalting, and waste water reuse. Irrigation water supplies evaluated include groundwater pumping, the delivery of water to major service areas and reuse of municipal waste water. Methods used to estimate the amount of energy consumed indirectly for construction and maintenance of facilities are also discussed.

1098

WATER SUPPLY FOR THERMAL AND ATOMIC POWER STATIONS AND WATER PROTECTION

Minosyan, R.G., Zazulin, V.A. and Ageev, G. S.

Ministry of Power and Electrification of the USSR

TP 121, United Nations Water Conference, Mar del Plata, Argentina, March 1977. 30 p, 7 fig, 3 tab.

Key Words: Water supply, Water utilization, Thermal powerplants, Nuclear powerplants, Water loss, Waste heat, Cooling system, Sewage.

Basic trends in the development of energy technology in the USSR and in the development of cooling systems for thermal and atomic power stations are reviewed. Current situation and future outlook as regards changes in water consumption, volume of water used, and volume of waste water discharged by those plants, are discussed. Attention is given to the question of what effects the water discharge from thermal and atomic power stations has on the hydrobiology of water bodies. Also dealt with are: systems for cooling steam by means of combined aeration-condensation equipment, methods for the purification and re-use of discharged water, and the prospects for devising thermal power stations at which there is no discharge of water.

1103

ALTERNATIVE COURSES OF ACTION TO PROVIDE DELTA PROTECTION AND ADEQUATE WATER SUPPLIES FOR CALIFORNIA

The Resources Agency, Department of Water Resources, California.

Phase II, March 1976. 32 p, 11 fig, 6 tab.

Key Words: Deltas, Water supply, California, Evaluation, Water demand, Water management (applied), Flow augmentation, Desalination, Water utilization, Planning.

This report presents a detailed description and important features of the Sacramento-San Joaquin delta. Included herein are various study options, alternatives and plans to provide delta protection and adequate water supplies. It gives the reasons for the elimination or deferral of further study options and prevents the optional and mandatory courses of action still being considered for more detailed evaluation and analysis.

WELLS AND PUMPING SYSTEMS FOR DOMESTIC WATER SUPPLIES

Gibb, J.P.

Department of Registration and Education, Illinois. Illinois State Water Survey, Urbana.

Circular 117, 1973. 17 p, 8 fig, 1 tab, 10 ref.

Key Words: Wells, Pumping, Water supply, Pumps, Domestic water, Construction methods, Construction costs, Disinfection.

This circular presents basic information on wells and pumping systems used for farm and domestic groundwater supplies. It describes the types of wells and their construction, development and costs. It discusses the various types of pumps and pressure tanks, how to select them, and their costs. Suggestions on locating wells to prevent pollution and procedures for disinfecting a home water supply system are included.

1268

THE DESIGN OF WATER SUPPLY SYSTEMS BASED ON DESALINATION

United Nations, Department of Economic and Social Affairs, New York.

1968. 64 p, 8 fig, 6 tab, 5 annexes.

Key Words: Water supply systems, Desalination, Water demand, Water storage, Groundwater sources, Surface waters, Design practices.

This report investigates the establishment of criteria for the selection of the number and size of desalination units and for the selection of the amount and type of storage required to provide a system capable of meeting a local pattern of water demand at the least possible cost. The study examined (a) the variations in seasonal demand and the extent to which peak demand can be supplied from storage so that investments in peak capacity can be avoided, (b) the capital cost of storage facilities required to enable desalination plants to operate at full capacity and at a high degree of reliability in supply, and (c) the economic and technical considerations involved in the planning of water desalination plants with excess capacity intended to meet projected increases in water demand and to obtain savings through economies of scale.

1317

WATER SUPPLY, TREATMENT AND DISTRIBUTION

Walker, R.

Prentice-Hall, Inc., New Jersey, 1978. 420 p, 60 fig, 47 tab, 306 ref, 1 append.

Key Words: Water supply, Water treatment, Water distribution, Water demand, Water quality, Diseases, Algae, Water quality standards, Water resources, Groundwater, Wells, Aeration, Mixing, Flocculation, Filtration, Disinfection, Waste disposal, Stabilization, Demineralization, Distribution systems, Pipelines, Water hammer, Pumps.

The book presents a discussion of the various aspects considered in the planning and construction of a water supply system. It deals on the relevant parameters that determine the quality of water, with special emphasis on its physical, biological and chemical properties. The various water treatment methods are also presented — ranging from simple aeration to the more complex processes such as filtration, disinfection, flocculation and the like. Furthermore, a discussion of how such water could be efficiently distributed is included. This book also deals with the different hydraulic structures and machines that may be used for such systems, and the possible problem areas that may be encountered in their construction and implementation.

WATER SUPPLY

Twort, A.C., Hoather, R.C. and Law, F.M.

Second Edition, Edward Arnold (Publishers) Ltd., London 1974. 478 p, 133 fig, 55 tab, 218 ref.

Key Words: Water supply, Hydrology, Water yield, Dams, Intake structures, Wells, Design criteria, Water chemistry, Microbiology, Water storage, Sedimentation, Coagulation, Filtration, Water softening, Water treatment, Water purification, Hydraulics, Reservoirs, Pumping plants, Pipelines, Valves, Pipe design, Water distribution (applied).

This book endeavours to cover those aspects of water supply practice which are of particular concern to the water engineer. The two primary duties of the water engineer, which are: (1) to safeguard the wholesomeness of water supplied, and (2) to ensure water adequacy, are dealt with fully in this text. It also includes up-to-date practices in public water supply and other aspects most likely to be of practical importance.

1482

WATER SUPPLY AND POLLUTION CONTROL

Clark, J.W., Viessman (Jr.), W. and Hammer, M.J.

New Mexico State University, Las Cruces, Library of Congress, Environment and Natural Resources Policy Division, Washington, D.C. University of Nebraska, Lincoln.

Third Edition, Harper and Row, Publishers, Inc., New York, 1977. 857 p, 327 fig, 99 tab, 401 ref, 1 append.

Key Words: Water supply, Pollution control, Environmental quality, Water requirements, Wastes, Water distribution (applied), Water conveyance, Waste water management, Water quality, Mathematical models, Waste water treatment, Waste treatment, Sludge treatment, Water reuse, Legal aspects.

The third edition presents state-of-the-art practices and recent trends in federal, environmental and pollution control legislation. Emphasis is on application of scientific methods to solve problems related to the development, transportation, distribution, processing and treatment of water and liquid wastes. It treats the subject by discussing the nature of water and waste water systems before presenting the systems components. A new chapter explains the use of water quality models to relate the treatment of waste flows to the overall environment of the receiving body of water.

1693

CRITERIA FOR IMPROVING RURAL WATER SUPPLY SYSTEMS IN ASIA

Pescod, M.B.

Asian Institute of Technology, Bangkok.

ESCAP Regional Preparatory Meeting for the United Nations Water Conference, Bangkok, 1976. 53 p, 8 tab, 1 append.

Key Words: Water supply systems, Rural areas, Asia, Operating criteria, Water allocation (policy), Administration.

The water supply and sanitation services in the developing countries of Asia are generally poor and the staggering population increases expected in the future will inevitably lead to a worsening of existing conditions. The paper provides the various considerations, both economic and technological, for the proper design and implementation of a rural water supply system. It serves to quantify the numerous factors involved as well as work out solutions to the various problems that have to be met.

TECHNOLOGY ASSESSMENT FOR WATER SUPPLIES

Vlachos, E. and Hendricks, D.W.

Water Resources Publications, Fort Collins, 1977. 268 p, 77 fig, 32 tab, 169 ref, 1 glossary.

Key Words: Water resources development, Assessment, Technical feasibility, Water supply, Planning, Water policy, Evaluation, Environmental impact, Forecasting, Water management (applied).

The growing scarcity of the availability of water has induced different sectors of society, notably the environmentalists, to clamor for a comprehensive water resources planning program. This book does not propose formulas for providing such program, but it does attempt to provide a context for a better understanding of how such a program can be approached. Chapters one and two provide an introductory atmosphere pertaining to technology assessment and the roles of some water resources infrastructure. Chapter three deals with the problems and planning options encountered in the final development stage of a water utilization scheme. The next two chapters touch on the principles of evaluating the infrastructure and determining its primary impacts and secondary effects. Finally, Chapter 6 focuses its discussion to the future consequences that might result from a given water source activity.

1704

WATER SUPPLY: ECONOMICS, TECHNOLOGY AND POLICY

Hirschleifer, J., de Haven, J.C. and Milliman, J.W.

Second edition, The University of Chicago Press, Chicago, 1969. 386 p, 29 fig, 57 tab, 170 ref.

Key Words: Water supply, Water resources management, Economic aspects, Technology, Water policy, Water law, Water resources, Cost allocation, Water rates, Benefit-cost analysis.

The goals of this book are to inform the general citizen about water supply and to provide instruction for the administrator and professional in the field as to the application of economic and technological knowledge to the solution of practical problems. Many of the conclusions of the book are likely to be controversial, because these conclusions are often at variance with present practice governing the use of existing water supplies and the development of new supplies. The book had its first publication in 1960, and since then, important developments have occurred in New York and Southern California, which are two main case-study areas. The authors, in 1966, took a second look at the water developments in these two areas — casting considerable light upon the earlier evaluation and recommendations. Their findings are discussed in this edition.

1987

MORE WATER FOR ARID LANDS: PROMISING TECHNOLOGIES AND RESEARCH OPPORTUNITIES

National Academy of Sciences, Washington, D.C.

1974. 154 p, 77 fig, 1 tab, 183 ref.

Key Words: Water supply, Water yield improvement, Water harvesting, Surface irrigation, Saline water, Water reuse, Wells, Water sources, Water conservation, Evaporation control, Evaporation retardants, Seepage control, Trickle irrigation, Transpiration control, Farm management.

Promising technologies, developed through years of research and experience, that are geared toward the use and conservation of scarce water supplies in arid areas are the subject of this report. Part I deals with technologies for enhancing water supplies while Part II covers water conservation. Methods of collecting rainwater and its use for crop irrigation and the use of saline water, found beneath many of the world's deserts, are considered together with water reuse for irrigation. Other sources of water supply like wells and the towing of icebergs from the polar regions are also presented. Some methods for the reduction of evaporation from reservoirs and soil surfaces, seepage and percolation losses, and transpiration are presented; and a number of the more efficient irrigation methods suitable for desert-like conditions discussed. Other promising water-conservation techniques are given, with emphasis on maximization of crop yield.

SYSTEM RELATIONSHIPS FOR PANAMA CANAL WATER SUPPLY STUDY

Hulman, L.G.

U. S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California.

Technical Paper No. 26, April 1971. 15 p, 3 fig.

Key Words: Systems engineering, Water supply, Water management (applied).

The purpose of the study described herein was to determine at what rate supplementary water must be supplied for lockage purposes and how much Gaillard Cut should be deepened to support contemplated levels of traffic. Also discussed are the physical features affecting water use, historical and anticipated shipping use, local water supply requirements, the reservoir and historical runoff patterns and the alternative improvement schemes considered.

SYSTEMS ANALYSIS OF THE PANAMA CANAL WATER SUPPLY

Lewis, D.C. and Beard, L.R.

U. S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California.

Technical Paper No. 27, April 1971. 11 p, 3 fig.

Key Words: Systems analysis, Water supply, Inland waterways.

Panama Canal traffic has increased to where the supply of water for lockage is rapidly becoming the critical element in canal operation. The amount of water required for each lockage depends on the number and sizes of ships in transit (because locks are partitioned), on the sequence of lockage operation, and on the level of Gatun Lake. It is the purpose of the study described herein to determine the most efficient manner of operating the Canal for various levels of projected traffic and for various possible depths of Gaillard Cut; and to develop optimum operation rule curves for power generation and for pumping water back into Gatun Lake.

APPLICATION OF SLOW FILTRATION FOR SURFACE WATER TREATMENT IN TROPICAL DEVELOPING COUNTRIES

Nguyen Cong Thanh and Pescod, M.B.

World Health Organization, International Reference Centre for Community Water Supply, Netherlands. Asian Institute of Technology, Bangkok.

Research Report No. 65, July 1976. 75 p, 19 fig, 16 tab, references, 4 append.

Key Words: Filtration, Water treatment, Tropical regions, Developing countries, Water supply, Experiments, Filters.

Adequate supply of safe water, which has been recognized as a major factor in raising the health standards of the community, are beyond the reach of the majority of people in developing countries. This report reviews some important aspects of rural water supply systems in developing countries and discusses alternative treatment systems for the provision of safe water to rural populations. The emphasis herein is on the technological aspects of utilizing surface waters for potable supply in Asian villages and is aimed to provide an accessible water using simple treatment systems such as the slow sand/burnt-rice husk filter system.

HAND PUMPS FOR USE IN DRINKING WATER SUPPLIES IN DEVELOPING COUNTRIES

McJunkin, F.E.

United Nations Environment Programme, Kenya. World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

Technical Paper No. 10, July 1977. 230 p, 63 fig, 16 tab, references, 5 annexes.

Key Words: Pumps, Potable water, Water supply, Developing countries, Reciprocating pumps, Rotary pumps, Technology, Administration, Research and development, Manufacturing.

A hand pump as used in this paper is any simple water lifting device, powered by human energy, and used in rural village drinking water supplies. Topics discussed include rationale for use of hand pumps, history of hand pumps, and description of the various types of such. The principles of operation, nomenclature, hydraulic, structural and energy analysis, and the design of each component of reciprocating hand pumps are described with examples. In addition, administration of hand pump programs, recent research and development, and description of hand pump manufacture are presented.

2714

HAND DUG WELLS AND THEIR CONSTRUCTION

Hatt, S. B. and Wood, W.E.

Intermediate Technology Publications Ltd., London, December 1977. 234 p, 180 fig.

Key Words: Wells, Artesian wells, Construction methods, Construction equipment, Construction practices, Domestic water, Potable water, Water yield, Aquifers, Groundwater potential, Public health, Construction materials.

Practical guidelines on hand digging village wells in tropical and subtropical areas for domestic use are covered. This manual discusses the following: (1) description of the hygienic source of water and preparatory works in carrying out the construction of a well; (2) instructions on well sinking through sedimentary soil using "dig-down-build-up" in combination with 'caissoning' method; (3) detailed description of materials and equipment used for well sinking through sedimentary soil and other difficult soil conditions; and (4) ways of improving existing wells and well yields. Additional information on water lifting from hand dug wells and on the costs of self help, hand dug, well construction programmes are also presented.

2847

WATER QUALITY AND TREATMENT OF DOMESTIC GROUNDWATER SUPPLIES

Gibb, J.P.

Department of Registration and Education, Illinois. Illinois State Water Survey, Urbana.

Circular No. 118, 1973. 17 p, 3 fig, 1 tab, 21 ref, 2 append.

Key Words: Water quality, Water treatment, Groundwater, Domestic water, Water supply, Water costs.

Desirable water for general domestic use should be of a safe sanitary quality and should not contain objectionable or dangerous concentrations of minerals or gases. This circular presents basic information on water quality and treatment of domestic and farm groundwater supplies. It describes tests and practices that assure safe sanitary water quality and discusses the common minerals and natural gases that are found in home groundwater supplies in Illinois. Water treatment procedures and equipment for disinfection, iron removal, softening, methane and hydrogen sulfide gas removal, and treatment costs are also mentioned.

WATER TREATMENT FOR HVAC AND POTABLE WATER SYSTEMS

Blake, R.T.

McGraw-Hill Book Company, 1980. 181 p, 82 fig, 10 tab, references.

Key Words: Water treatment, Potable water, Water supply systems, Water chemistry, Corrosion, Sludge, Deposits, Equipment.

Corrosion and chemical deposits impair water systems, to operate efficiently. The treatment of water to avoid and correct these conditions of heating, ventilating, and air conditioning (HVAC) and of potable water systems is discussed herein. Detailed aspects of the physical and chemical treatment of water which are unique to HVAC and potable water systems are covered. Included are proven-techniques for measuring the corrosion, chemical deposits, and scaling tendency of a particular water supply.

3122

PUBLIC STANDPOST WATER SUPPLIES

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

Technical Paper No. 13, November 1979. 104 p, 23 fig, 1 tab, 37 ref.

Key Words: Water supply, Water distribution (applied), Public utilities, Planning, Community development.

A public standpost is a suitably supported water pipe, connected to a water distribution system and terminating in a tap or faucet located at a public site, from which water may be drawn for domestic and other uses. The installation of public standposts is often the first step in the development of a totally house-connected water supply. In the planning of public standpost water supplies, many technological, economic, organizational and socio-cultural aspects have to be taken into account in conjunction with each other. This publication presents these important aspects by discussing the interrelationships between the organizational structure, the choice of technology, the financing and revenue collection, the operation and maintenance, the community participation, and the local organizations. All of these are required for an integrated approach towards planning water supplies.

3242

APPROPRIATE TECHNOLOGY IN WATER SUPPLY AND WASTE DISPOSAL

American Society of Civil Engineers, New York.

Gunnerson, C.G. and Kalbermatten, J.M. (eds.), Proceedings of a Session. . . , Chicago, 16-20 October 1978. 270 p, 35 fig, 28 tab, references.

Key Words: Technology, Water supply, Waste disposal, Environmental engineering, Sanitary engineering, Sanitation, Water utilization, Water treatment, Waste treatment, Waste water disposal, Public participation.

The book aims to review current information on policy and technological choice in sanitary and environmental engineering. Included in this volume are twelve papers dealing with historical, behavioral, economic, public health, engineering, and environmental determinants. Information from case studies in both developing and industrial countries is presented. Emphasis is given to the different environmental conditions, different stages of organization and industrial development, and different institutional constraints.

RURAL WATER SUPPLY IN CHINA

Lee Thim Loy and Phoon, P. (trans.), International Development Research Center, Ottawa, Canada, 1981. 92 p, 133 fig, 13 tab, 4 append.

Key Words: Water supply, Wells, Potable water, China (People's Republic), Water treatment, Drilling, Water quality, Repairing, Chlorination.

This translation is a composite of five Chinese manuals: Potable Water Supply in Rural Areas; Waterworks Design and Construction for Rural Areas; Rigging and Repairing Wells; Well Repair and Damage Prevention; and Quality Standards for Domestic and Potable Water Supplies. The substantial progress China has made in meeting the basic water supply and sanitation needs of its vast population is illustrated. A complete discussion on potable water, its source selection and protection, and water treatment is given. A comprehensive description of well construction, including drilling, repair and damage prevention, is also discussed.

3745

WATER SUPPLY AND PLUMBING PRACTICES IN CONTINENTAL EUROPE

Coe, A.L.

Hutchinson Benham, London, 1978. 414 p, figures, tables, 2 ref.

Key Words: Water supply systems, Plumbing, Water sources, Water treatment, Distribution systems, Water costs, Water consumption, Water metering, Installation, Specifications, Test procedures, Europe.

The publication is an in-depth survey of the entire water supply and plumbing in the following European countries: Austria, Belgium, Denmark, Finland, France, Holland, Hungary, Italy, Norway, Portugal, Spain, Sweden, Switzerland, and West Germany. Plumbing practices and the relevant engineering aspects of water supply are examined. Aspects of reliability as well as safety, economy and user convenience are considered. Also included are descriptions of the installation design, pipe materials, diameters and an investigation of the general costs involved.

3928

HANDPUMPS FOR VILLAGE WELLS

Spangler, C.D.

Volunteers in Technical Assistance, Inc., Maryland.

1975. 14 p, 7 fig.

Key Words: Handpumps, Appropriate technology, Direct acting pumps, Deep wells, Shallow wells.

Manually operated pumps of various designs are used in most countries to lift relatively small quantities of water from wells for either family use and/or irrigation. There are two general types of pump: piston and diaphragm. Both types have two check valves, either on each side of the diaphragm or one below the piston, and the other incorporated into the piston. In this publication the piston pump is discussed exclusively. It presents three possible pump designs which are inexpensive, simple, easy to repair, and make maximum use of local materials and skills. These are shallow well pump, deep well pump in cased well, and deep well pump in uncased well.

FERROCEMENT WATER TANK

Sharma, P.C. and Gopalaratnam, V.S.

International Ferrocement Information Center (IFIC), Bangkok.

Do It Yourself Series Booklet No. 2, May 1980. 37 p, 18 fig, 1 tab, 6 ref, 4 append.

Key Words: Reinforced concrete, Water tanks, Concrete construction, Estimating, Inspection, Ferrocement, Specifications.

Problems of water storage and supply are of increasing concern in most parts of the developing countries. Although unhygienic storage results in the spread of waterborne diseases, the vast majority of the rural population, find the non-traditional and more scientific storage structure beyond their means. Hence a need for hygienic and economical water storage structures in rural areas exists. Ferrocement, which is a versatile form of mesh-reinforced mortar, has been proven as an ideal material for water tank construction and the immediate solution to the problem. Divided into two parts, the first section covers material specifications and estimations, tank construction, and post-construction operations. The second part deals with construction details in terms of working drawings.

4184

ASPECTS OF WELL DRILLING: RURAL POTABLE WATER PROJECT

Glaze, M.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 4, February 1981. 19 p, 4 fig, 1 tab, 3 ref.

Key Words: Wells, Drilling, Rural areas, Well casings, Well screens, Drilling equipment, Technical assistance, Development aid.

The Rural Potable Water Project aims to provide a low-cost technology for installing low yield, smaller diameter wells in more remote, less accessible areas of Central Tunisia, where obtaining potable water is difficult. Technical assistance is given on the selection of a suitable water well drilling machine and a suitable adviser to assist in its operation. The methodology used in previous and current installations of PVC casings and screens and the inherent problems which have occurred or are occurring are also discussed. An attempt has also been made to answer questions that have been raised regarding PVC casings and screens.

4189

TECHNICAL ASSISTANCE IN THE MANUFACTURE AND QUALITY CONTROL OF THE AID/BATTELLE HANDPUMP IN THE DOMINICAN REPUBLIC

Knight, R.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 20, June 1981. 27 p, 8 fig, 3 append.

Key Words: Technical assistance, Handpumps, Design, Cost savings, Benefit-cost analysis, Dominican Republic.

The local manufacture, installation and maintenance of handpumps in rural communities was initiated as a rural water supply project. To carry out the objective of the program, two manufacturing firms in Sto. Domingo were awarded contracts. In due time all pumps had been delivered to the mission in Sto. Domingo. From observations on field trips over a five-month period, it was apparent that the project was fairly successful based on the amount of care and maintenance the pump received from the users.

SAFE DRINKING WATER: CURRENT AND FUTURE PROBLEMS

Applied Resources for the future, Inc., Washington, D.C.

Russell, C.S. (ed.), Research Paper R-12, Proceedings of a National Conference, Washington, D.C., 1978, 641 p, 32 fig, 50 tab, references.

Key Words: Potable water, Water policy, Public health, Epidemiology, Toxicity, Water quality, Foods, Water costs, Financing, Water law, Consumers, Water users, Legislation, Legal aspects, Jurisdiction, Local governments.

The papers in this volume look upon the scientific, economic, and administrative aspects of the public policy problem raised by new knowledge in the drinking water area. Presented are the drinking water policy problems as they relate to public health, epidemiology, toxicology and the food industries. Foreign experiences on drinking water quality are included. Cited also are studies on the cost and financing for compliance with the Safe Drinking Water Act, as well as the study on the legislative problems with the Act. In addition, the panel discussion of policy alternatives and lessons from the drinking water conference are also presented.

2849

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS

U.S. Department of Health, Education, and Welfare, Public Health Service, Washington, D.C.

Public Health Service Publication No. 24, 1963. 121 p, 19 fig, 8 tab, 42 ref, 4 append.

Key Words: Manuals, Water supply systems, Water sources, Groundwater, Surface waters, Water treatment, Pumping, Distribution, Storage, Water rights.

An essential requirement for healthful and comfortable living is a dependable supply of water for drinking and other domestic uses. This supply should be palatable, convenient, of good quality, and adequate in quantity. Because of the public health control usually given to these water supplies which are owned or directly controlled by a governmental organization, their use is recommended wherever practicable. This manual emphasizes the sanitation aspects of small supply systems such as those serving individual dwellings, farms, rural schools or similar institutions, recreational or tourist accommodations, camps, or other installations not having access to public water supply systems.

3236

GUIDE TO SIMPLE SANITARY MEASURES FOR THE CONTROL OF ENTERIC DISEASES

Rajagopalan, S.

World Health Organization, Geneva.

1974. 103 p, 41 fig, 3 tab, 25 ref, 14 append.

Key Words: Sanitation, Sanitary engineering, Diseases, Enteric bacteria, Environmental sanitation, Water supply systems, Water treatment, Waste disposal, Foods, Training programs.

A high incidence of enteric diseases associated with poor sanitation is characteristic of the disease pervading in many of the developing countries of the world. The best ways of combating these diseases are the provision of safe drinking water, the practice of food hygiene, and the sanitary disposal of excreta. The present guide provides a compendium of knowledge on simple measures that can be implemented with limited resources to control enteric diseases. It discusses waste collection and disposal, water treatment and food sanitation among other things. Training of personnel who would execute this disease prevention program and measures to be adopted when unexpected events, such as epidemics, occur are also included.

HARDNESS OF DRINKING WATER AND PUBLIC HEALTH

Commission of the European Communities, Luxembourg.

Amavis, R., Hunter, W.J., and Smeets, J.G.P.M. (eds.), *Proceedings of the European Scientific Colloquium, Luxembourg, May 1975*. Pergamon Press, Oxford, Great Britain, 1976. 553 p, 29 fig, 61 tab, 298 ref, 5 annexes.

Key Words: Potable water, Hardness (water), Water quality, Public health, Physicochemical properties, Mineral content, Water consumption, Epidemiology, Mortality, Foods, Trace elements.

The colloquium aimed to study the hardness of drinking water in relation to its other physico-chemical quality parameters and to evaluate the consequences for the health of the population that could arise from the consumption of water with some particular physico-chemical properties. It was divided into a four-part programme and discussions centered around the following: (1) the hardness of water in relation to the other physico-chemical water quality parameters; (2) man's intake of minerals from drinking water and food; (3) statistical evidence relating hardness to a number of diseases and to mortality; and (4) current research on the presence of mineral elements in food and drinking water in connection to public health.

1947

LOW-COST TECHNOLOGY OPTIONS FOR SANITATION: STATE OF THE ART REVIEW AND ANNOTATED BIBLIOGRAPHY

Rybczynski, W., Palprasert, C. and McGarry, M.

International Development Research Centre, Ottawa. World Bank, Washington.

1978. 184 p, 23 fig, 4 tab.

Key Words: Sanitation, Sewerage, Sewage disposal, Sewage treatment, Bibliographies, Reviews.

This comprehensive technology review and bibliography describes alternative approaches to collection, treatment, reuse, and disposal of human wastes. It outlines the broad range of approaches to human wastes management available today. The bibliographic entries contained in this book place their emphasis on technological issues, but institutional, behavioural, and health-related aspects of excreta disposal are also considered.

2425

PUBLIC HEALTH ENGINEERING: SEWERAGE

Bartlett, R.E.

Applied Science Publishers Ltd., Essex, England, 1979. 199 p, 46 fig, 40 tab, 99 ref, 6 append.

Key Words: Sewerage, Sanitary engineering, Public health, Field investigations, Pipes, Contracts, Drainage, Hydraulic design, Pipe design, Manholes, Sewers, Pumping plants.

Public health engineering includes the design and construction of works of water supply, sewerage, sewage treatment and disposal, and refuse disposal. This book limits itself to a discussion of sewerage and its pertinent components. Topics discussed include: 1) site investigations for sewer layout; 2) design aspects; 3) pipe materials and appurtenances; 4) contract and site organization; and 5) surface water and foul sewerage. The more specialized aspects of house drainage and smaller sewerage schemes are also dealt with, together with information on British Standard Specifications.

LABORATORY TESTS ON HAND-OPERATED WATER PUMPS FOR USE IN DEVELOPING COUNTRIES

United Nations Development Program, New York. World Bank, Washington, D.C.

Rural Water Supply Handpumps Project, Report No. 1, March 1982. 124 p, figures, 52 tab, 3 append.

Key Words: Laboratory tests, Pumps, Performance, Fatigue tests, Quality control, Test results, Pump tests, Handpumps.

The present project consists of three phases: laboratory testing, field trials in about fifteen developing countries, and the promotion of the technological development of new types of handpumps that could be maintained at the village level and manufactured in developing countries. This report contains the results of the laboratory testing, conducted on a selected group of handpumps. Tests are conducted on two randomly selected samples of pumps to provide technical data on performance, manufacturing quality, engineering design assessment, ergonomic and user information, and endurance. Various recommendations have been made to assist manufacturers in improving the quality and reliability of their products.

B. SANITATION

1127

THE PRACTICE OF SANITATION

Hopkins, E. S. and Elder, F. B.

The William and Wilkins Company, Baltimore, 1951. 423 p, 110 fig, 29 tab, references.

Key Words: Sanitation, Disinfection, Milk, Water supply, Public health, Sewage disposal, Pollution control, Refuse disposal, Ventilation, Swimming pools, Insect control, Rodenticides, Administration.

Sanitation may be defined as the control of those factors of the environment affecting public health, so that disease is prevented and positive health is gained. This is the basic subject of the book, which also serves as a guide in environmental sanitation procedures for the training of physicians, nurses, sanitarians and students in sanitary engineering for a career in public health. It seeks to bring together the pertinent facts comprising sanitation practices in the United States.

1358

MAN-MADE LAKES AND HUMAN HEALTH

Stanley, N. F. and Alpers, M. P. (eds.), Academic Press Inc., London, 1975. 495 p, 37 fig, 30 tab, references.

Key Words: Balance of nature, Man-made lakes, Public health, Ecology, Planning, Water resources development, Dams, Health, Diseases, Mosquitoes, Fish, Aquatic plants, Mollusks, Insect control, Man, Movement.

Concerned by the ill effect of man-made lakes on human health and the general ignorance on this phenomenon, the book presents ways in which dams produce gross and sudden interference with established ecosystems. The articles are divided into four main sections — health problems, specific geographic areas, ecological factors, and the human aspect. Emphasis is placed throughout on the mistakes of the past, the dangers of the future, and the importance of international planning and co-operation. By defining basic problems involved, indicating possible solutions, and providing lines for further research, it is hoped that sufficient background and data is given to warrant intelligent decisions regarding man-made lakes.

SANITATION IN DEVELOPING COUNTRIES

Pacey, A. (ed.), John Wiley & Sons, Chichester, 1978. 238 p, 38 fig, 20 tab, 308 ref.

Key Words: Sanitation, Developing countries, Health, Technology, Sewerage, Latrines, Public health, Treatment.

Deprivation in many poor countries are sometimes caused by poor sanitary conditions. A conference was convened to review the problem and come up with solutions to combat it. As a result, a collection of papers has been presented providing a coherent perspective on each of the four main issues discussed namely: (1) the relationship between sanitation and health; (2) latrine technology; (3) the implementation of improvements in excreta disposal; and finally, the treatment and recycling of wastes.

3258

SANITARY ENGINEERING PROBLEMS AND CALCULATION FOR THE PROFESSIONAL ENGINEER

Harbord, H.S.

Ann Arbor Science Publishers Inc., 1979. 292 p, 44 fig, 48 tab, 56 ref, 6 append.

Key Words: Sanitary engineering, Fluid flow, Water supply, Water treatment, Waste water treatment, Sludge treatment, Sludge disposal, Engineering economy, Chemical analysis.

The whole spectrum of sanitary engineering with an exclusive attention focused on engineering calculations is covered in this book. Theoretical discussion and common problems solved by using empirical equations have been purposely omitted. In other words, solutions to problems are based on the analysis and interpretation of engineering data. Four main subject areas are presented: (1) fluid flow; (2) water supply and treatment; (3) wastewater treatment; and (4) economics.

3505

SANITATION STRATEGY FOR A LAKEFRONT METROPOLIS: THE CASE OF CHICAGO

Cain, L.P.

Northern Illinois University Press, DeKalb, 1978. 173 p, 32 fig, 32 tab, references, 3 append.

Key Words: Sanitation, Cities, Water supply, Canals, Sewerage, Sewage disposal, Sewage treatment, Water pollution, Evaluation, History, Water supply systems, Waterworks, Sewage treatment plants, Water utilization.

Cities located on freshwater lakes, such as Chicago, typically draw their water supply and discharge their wastes into the lake. Water pollution and a high incidence of water-borne disease are the predictable results of this approach. This book is an examination of the problem of sanitation in Chicago by an economic historian. It focuses on the economic and technological decisions affecting the utilization and conservation of Lake Michigan, the city's principal water resource. Herein the author discusses the city's underlying industrial growth, especially the changing pattern of land use within the drainage area and the rapid underlying technological changes in the field of sewage treatment.

SANITATION IN DEVELOPING COUNTRIES

International Development Research Centre; Ottawa.

Proceedings of a workshop on training held in Lobatse, Botswana, 14-20 August 1980. 172 p, 14 fig, 10 tab, references.

Key Words: Sanitation, Developing countries, Latrine, Waste disposal, Septic tanks, Sewerage, Diseases, Water pollution, Health, Water supply, Social aspects, Public participation, Finance, Financing, Training, Sanitary engineering.

The regions of East and Southern Africa are areas where the scarcity of adequately trained personnel is acute and there is a lack of information on newly developed low-cost technologies. Consequently, a workshop on sanitation was held in Botswana in order to further disseminate the information on low-cost technologies and discuss the implementation of curricula changes and training needs recommended at the regional meetings. The proceedings include papers presented at the conference, summaries of the resulting discussions, descriptions of the field visits, resolutions, and action plans.

4049

POSSIBLE DISINFECTION OF ORAL REHYDRATION SOLUTIONS

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Technical Report No. 2, November 1980. 5 p, 4 append.

Key Words: Water treatment, Water quality control, Disinfection, Environmental effects.

The question of whether or not to consider the introduction of a disinfectant into oral rehydration packages was considered. Several problems are however attendant upon the use of a disinfectant in this capacity, among them possible chemical interactions with other components of the package, biologic reactions with the inflamed gut, and problems of cost, taste and acceptability. Because of these problems, it was deemed necessary to hold a serious discussion of the issues before deciding to routinely include a disinfectant in oral rehydration packages.

4192

WATER AND SANITATION ALTERNATIVE FOR SOUTHERN ITALY DISASTER RELIEF, DECEMBER 1980

Goff, D.R. and Kostur, M.A.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 25, December 1981. 29 p.

Key Words: Sanitation, Italy, Disasters, Water treatment, Disposal, Waste disposal, Sanitary engineering, Facilities, Chlorination, Chemicals.

Sanitary problems in Italy were put under scrutiny by some USAID representatives during a recent field investigation. Areas were categorized into: (a) communal excreta disposal; (b) bathing and laundry facilities; and (c) individual family excreta disposal and water supply treatment. Several alternatives and criteria to remedy the problems are discussed in this report, as well as the advantages and disadvantages of their application.

Category IV: COMMUNITY PARTICIPATION AND HEALTH EDUCATION

895

VILLAGE WATER SUPPLY: ECONOMIES AND POLICY IN THE DEVELOPING WORLD

Saunders, R.J. and Warford, J.J.

The Johns Hopkins University Press, Baltimore, Maryland, 1976. 279 p, 2 fig, 40 tab, 358 ref, 4 append.

Key Words: Water resources development, Developing countries, Rural areas, Economic impact, Investment, Water supply, Sanitation, Project planning, Evaluation, Administration, Economics, Policies, Health, Economies of scale.

The authors examine a wide range of factors — physical, social, and economic — that are involved in improving the adequacy of water supply and sanitation in the rural areas of developing countries for the coming years. Among the principal topics covered in detail are: (1) the character and extent of the problems connected with water supply and sanitation; (2) the goal of improved health, with specific reference to the relation between water supply and water-borne disease, on one hand, and social and economic activity, on the other; (3) the effects of improved water supply and sanitation on productivity, incomes, rural-to-urban migration, and overall development; (4) problems of, and strategies for, program planning and administration; (5) special problems of operation and maintenance; and, (6) the importance of recovering program costs from beneficiaries.

965

WATER SUPPLY FOR RURAL AREAS AND SMALL COMMUNITIES

Wagner, E.G. and Lanoix, J.N.

Institute of Inter-American Affairs, Division of Health and Sanitation, Rio de Janeiro, Brazil. World Health Organization, Division of Environmental Sanitation, Geneva, Switzerland.

WHO Monograph Series No. 42, 1969. 340 p, 85 fig, 9 tab, 50 ref, 9 annex.

Key Words: Water supply, Rural areas, Water supply systems, Planning, Groundwater, Pumps, Surface waters, Water treatment, Water distribution (applied), Water utilization, Administration, Personnel, Training, Operation and maintenance.

This monograph examines critically many of the administrative as well as technical factors which contribute to a successful water supply program. It also discusses the management and installation of water-supply systems. Sufficient reference and bibliographical material is given to permit health official to seek out necessary details and to enable the engineer to develop plans and mathematical designs for water-supply installations.

1092

GUIDELINES AND CRITERIA FOR COMMUNITY WATER SUPPLIES IN THE DEVELOPING COUNTRIES

U.S. Department of State, Agency for International Development, Washington, D.C. Department of Health, Education and Welfare, Public Health Service, Maryland.

1969. 101 p, 1 fig, 5 append.

Key Words: Water supply, Developing countries, Policies, Water law, Institutions, Financing, Manpower, Management training, Project planning, Contracts, Construction, Operation and maintenance, Water management (applied).

This report is based on an evaluation of the community water supply programs and projects in 12 developing countries throughout the world. It attempts to cover the broad phases of community water supply programs including legal authority, planning, financing, and training institutions at the central, state, and local government levels. It also includes the engineering and administrative aspects of individual community water supply projects.

SOLID WASTES DISPOSAL AND CONTROL

World Health Organization (WHO), Geneva.

WHO Technical Report Series No. 464, 1971. 34 p.

Key Words: Solid wastes, Waste disposal, Public health, Industrial wastes, Waste treatment, Planning.

This report reviews existing knowledge on the socio-economic factors and the impact on health of improper handling of solid wastes; makes an appraisal of current practices in solid wastes management; identifies areas which require further study; and provides guidelines for policy and action.

PROBLEMS IN COMMUNITY WASTES MANAGEMENT

Ellis, H.M., et. al.

World Health Organization, Geneva, Switzerland.

Public Health Papers No. 38, 1969. 89 p, 3 tab, 80 ref.

Key Words: Waste disposal, Community development, Waste treatment, Management planning, Solid wastes, Sewage, Waste water treatment, Public health, Waste water use.

Urbanization and industrialization have made the satisfactory management of liquid and solid wastes a vast and complicated problem. In this regard, the paper discusses present and projected trends in municipal disposal of solid wastes. It explains methods of collecting, transporting or conveying, and disposal of waste in a hygienically, aesthetically and economically acceptable manner and suggests the possibilities of dealing with liquid and solid wastes using an integrated approach. A description of the processes for the protection of water and the purification of sewage is presented. It also catalogues the research needs from which specific activities for proper waste water management may be selected and adapted to local situations. Lastly, it discusses the various health considerations in the reuse of "treated" waste water.

COMMUNITY WATER SUPPLY

World Health Organization (WHO), Geneva.

WHO Technical Report Series No. 420, 1969. 21 p.

Key Words: Water supply, Community development, Public health, Water management (applied), Municipal water, Planning.

This report identifies continuing and new problems in water supply; evaluates progress and trends in the community water supply programmes in the world; discusses the technical, organizational, economic and financial aspects of the programme; indicates areas of study in which further research and developmental work are required; and advises on the education, training and recruitment of personnel.

A SYSTEMATIC APPROACH TO BASIC UTILITIES IN DEVELOPING COUNTRIES

U.S. Department of Housing and Urban Development, Office of International Affairs, Washington, D.C.

Ideas and Methods Exchange No. 70, Prepared for the Agency for International Development, May 1974. 59 p, 25 fig, 1 tab, 69 ref.

Key Words: Utilities, Developing countries, Planning, Water supply, Sewerage, Sewage disposal, Road construction, Community development, Public health.

The immediate objective of a basic utilities system is to satisfy elemental human needs and minimum health requirements. In selecting a basic utilities system, several factors must be considered. These include among others, consumer needs, availability of resources, practicality of methods, and financial feasibility. Using this premise, this paper enumerates simple methods and approaches which if applied over periods of time, can raise the level of consumer convenience. Actual cases are cited to emphasize the necessity of a systematic approach.

ADMINISTRATION OF ENVIRONMENTAL HEALTH PROGRAMMES: A SYSTEMS VIEW

Schaefer, M.

World Health Organization, Geneva.

Public Health Papers No. 59, Belgium, 1974. 242 p, figures, 1 tab.

Key Words: Environmental aspects, Public health, Adoption of practices, Management planning.

The aim of this volume is to formulate within a unified framework the concepts of planning, management, and evaluation that are relevant to environmental health programmes, and to apply these concepts directly to the special problems and circumstances encountered by the administrators of such programmes. The first part of the volume deals with certain fundamental concerns and concepts of administration. The latter part, weaves the concepts discussed in the preliminary section into the pattern of application that leads the administrator through the various stages of planning into the management of programme implementation and operation.

DISPOSAL OF COMMUNITY WASTEWATER

World Health Organization, Geneva.

Technical Report Series No. 541, 1974. 72 p, 12 ref.

Key Words: Waste water disposal, Community development, Sanitation, Sewerage, Planning, Economic aspects.

The purpose of this report submitted by the World Health Organization (WHO) is to intensify an on-going programme for the advancement and transfer of knowledge and for the development of methods designed to promote community water supply and waste disposal. This report mentions the significance of wastewater collection and disposal in their relation to health, environment, socio-economic and cultural aspects. Methods of wastewater collection and treatment employed by developing countries and the problems that each confronts are discussed. Also presented are management problems affecting the proper administration of the collection and disposal programmes and recommendations on how to go about solving such problems.

GUIDE TO THE INTEGRATION OF HEALTH EDUCATION IN ENVIRONMENTAL HEALTH PROGRAMS

Pisharoti, K.A.

World Health Organization (WHO), Geneva.

WHO Offset Publication No. 20, 1975. 81 p, 17 ref, 8 annexes.

Key Words: Education, Environmental sanitation, Health, Training programs, Instruction, Programmed instruction.

Divided into three sections, the present guide is intended for environmental health personnel responsible for planning and supervising the health education components of environmental health programs. These sections deal with: (1) methods of incorporating health education into environmental health program planning; (2) the systematic integration of community-oriented health education in the basic and in-service preparation of environmental health manpower; and (3) the introduction of environmental health teaching in the school system.

1849

EXCRETA DISPOSAL FOR RURAL AREAS AND SMALL COMMUNITIES

Wagner, E.G. and Lanoix, J.N.

World Health Organization (WHO), Geneva.

WHO Monograph Series No. 39, 1958. 187 p, 73 fig, 12 tab, 46 ref, 2 annexes.

Key Words: Waste disposal, Rural areas, Public health, Sanitation, Sanitary engineering, Septic tanks, Sewage disposal.

Excreta disposal is an important part of environmental sanitation. This report provides not only technical data relating to particular rural excreta disposal facilities, but also information on what is believed to be needed or to be done in order to achieve success in programmes of excreta disposal in rural areas and small communities. The role of the health department, the need for securing the active participation of the community and of the family, the planning of programmes, and the training of the necessary personnel are covered, as well as the latest accepted practices in excreta disposal for rural areas.

1886

REPORT ON COMMUNITY WATER SUPPLY AND SANITATION

United Nations Economic and Social Council, Committee on Natural Resources

1977. 29 p, 2 fig, 5 tab, 4 ref, 1 annex.

Key Words: Water supply, Sanitation, Waste disposal, Policies, Programs, Water resources development.

The alarming number of people deprived of the basic minimum level of community water supply and sanitation services has alerted authorities of the World Health Organization to lay down plans, guidelines, and targets to be implemented in the hope of alleviating the pathetic state of the affected population. The WHO has accepted the recommendations to: (1) adopt programmes with realistic standards for quality and quantity to provide water for urban and rural areas by 1990; and (2) adopt and accelerate programmes for the sanitary disposal of excreta and waste water in urban and rural areas. In connection with this, the present report discusses the courses of action, and the social and political difficulties that may have to be encountered in order to achieve the desired targets.

UNICEF ASSISTANCE TO POTABLE WATER SUPPLY IN ASIA REGION

United Nations Children's Fund (UNICEF), East Asia and Pakistan Regional Office

14 p, 1 annex.

Key Words: Allotments, Financing, Potable water, Water supply, Programs.

The aims of UNICEF assistance in this field are to improve health and social conditions for children, adolescents and their families by providing rural communities with potable water. UNICEF sees the programmes not as ends in themselves, but as demonstrational, stimulatory or educational in nature, leading toward a national programme to be implemented as early as possible. This report contains a summary of the UNICEF-assisted to programmes in different countries in the Asia region. The programmes generally provide technical, educational and financial assistance in varying degrees.

2207

ANALYSIS OF ORGANIC COMPOUNDS IN WATER TO SUPPORT HEALTH EFFECT STUDIES: A CONSULTANTS REPORT

Garrison, A.W.

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

Technical Paper No. 9, September 1978. 90 p, 2 tab, 59 ref, 4 append.

Key Words: Organic compounds, Water analysis, Potable water, Chemical analysis, Public health, Analytical techniques.

The evaluation of health effects to ensure the continuing safety of community water supplies requires identification and characterization of suspect substances in waters. This paper examines and classifies the data available on organic compounds thus far identified in water. Summaries of the current status and needs in analytical methodology for organic compounds are presented. In addition, consideration of protocols for chemical analysis to support epidemiological studies are outlined.

2210

HEALTH EFFECTS RELATING TO DIRECT AND INDIRECT RE-USE OF WASTEWATER FOR HUMAN CONSUMPTION

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

Technical Paper No. 7, September 1975. Report of an International Working Meeting, Amsterdam, Netherlands, 13-16 January 1975. 164 p, 2 fig, 11 tab, 111 ref, 4 append.

Key Words: Public health, Water reuse, Water consumption, Water pollution, Research projects, Research and development.

The aim of this report is to present the current knowledge of experts relating to refractory water contaminants and their possible impact on health in relation to direct or indirect waste water reuse for human consumption. For this purpose a detailed survey of maximum reported concentrations of organic and inorganic compounds as well as microbiological contaminants in water is presented. The report also presents an evaluation of the health implications of the detected chemical contaminants. Based on this evaluation, recommendations are set up for research priorities in the field of toxicity testing of chemicals and for testing of the removal efficiency of toxic chemicals in water.

WATER SUPPLY AND WASTEWATER DISPOSAL IN DEVELOPING COUNTRIES

Asian Institute of Technology, Bangkok.

Pescod, M.B. and Okun, D.A. (eds.), Proceedings of a Water Supply and Sanitation Seminar, Bangkok, 19-23 January 1970. 309 p, figures, tables, references.

Key Words: Water supply, Waste water disposal, Sanitation, Planning, Water resources development, Water quality control, Waste water management, Systems engineering, Desalination.

The technology for implementation of water supply and sanitation programs in developing countries is well developed, but implementation of programs for the construction of water supplies and wastewater collection systems has been slow. It is hoped that the proceedings of this seminar will help stimulate programs in water supply and sanitation for communities in developing countries. The topics cover the following subjects: the importance of water in community health and economic development; water supply and sanitation problems in developing countries; planning water projects; water resources development; water quality and wastewater management; systems operation and management; and new developments in water supply and sanitation.

2221

SLOW SAND FILTRATION FOR COMMUNITY WATER SUPPLY IN DEVELOPING COUNTRIES: A DESIGN AND CONSTRUCTION MANUAL

Van Dijk, J.C. and Oomen, J.H.C.M.

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

Technical Paper No. 11, December 1978. 175 p, figures, 12 tab, 26 ref, 9 append.

Key Words: Sand filters, Water supply, Water filters, Water quality control, Filtration, Water treatment, Water purification, Design criteria, Specifications.

Slow sand filtration is a useful low-cost purification technique for polluted surface waters in tropical developing countries. Topics discussed include the principles of slow sand filtration, its performance and applicability, suitable pre-treatment techniques for the removal of turbidity, and comprehensive guidelines for the design and construction of small slow sand filters. The manual comprises four typical designs, with capacities between 25-960 m³ /d, including sets of constructional drawings and bills of quantities.

2326

INTERNATIONAL TRAINING SEMINAR ON COMMUNITY WATER SUPPLY IN DEVELOPING COUNTRIES

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

Papers presented at the Seminar on . . . Amsterdam, Netherlands, 6-10 September 1976. Bulletin No. 10, November 1977. 272 p, figures, tables, references.

Key Words: Training programs, Water supply, Developing countries, Planning, Finance, Water management (applied), Operation and maintenance, Manpower, Resource development, Technology, Water treatment, Distribution systems.

The seminar was conducted for the purpose of exchanging ideas and experiences and to discuss approaches, methods, and techniques that can contribute to an accelerated provision of water supply and sanitation facilities to larger sectors of the population in developing countries. The papers deal with various aspects of water supply, such as policy, planning, organization and management, finance, human factors, and technology. Short summaries have been made to assist the reader in the identification of papers of particular interest to him.

HEALTH ASPECTS RELATING TO THE USE OF UPVC PIPES FOR COMMUNITY WATER SUPPLY: A REPORT OF A CONSULTANT GROUP

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

Technical Paper No. 4, July 1973. Paper presented at a Consultant Group Meeting, The Hague, Netherlands, 8-12 February 1973. 56 p, 6 fig, 8 tab, 21 ref, 3 append.

Key Words: Public health, Water supply systems, Pipes, Toxicity, Pipe tests, Test procedures, Standards.

UPVC pipes are widely used in water supply distribution systems and their very wide use has brought to the fore the question of toxicity arising out of the leaching of heavy metal stabilizers and associated impurities from the pipe-wall material into the water. This paper is geared at reconciling the differences in the studies and procedures adopted in different countries, giving guidance on the health hazards of using UPVC pipes and on how to ensure their safety, recommending procedures for the formulation and administration of standards by governments, and delineating areas of research and coordination at the international level.

COMMUNITY WATER SUPPLY AND EXCRETA DISPOSAL SITUATION IN THE DEVELOPING COUNTRIES: A COMMENTARY

Pimeo, C.S. and Subrahmanyam, D.V.

World Health Organization (WHO), Geneva.

WHO Offset Publication No. 15, 1975. 41 p, 7 fig, 9 tab, 13 ref, 3 annexes.

Key Words: Water supply, Waste disposal, Developing countries, Information centers, Reports, Progress reports, Objectives, Future planning (projected).

Ignorance, poverty and disease constitute the vicious circle that hampers achievement of developing countries in the provision of basic sanitary amenities such as safe water supply and sanitary disposal of wastes. The WHO has therefore embarked on the preparation of a guide for the evaluation and planning of community water supply and wastewater disposal programmes. Regional and global situation and trend reports are stressed to set up corresponding regional and global goals, encourage collaboration, and serve as a tool for directing international assistance where it is needed. The situation and progress of community water supply and excreta disposal achievements from 1962 to 1970 are reviewed. Based on these past trends, estimation of prospects are made and targets were adopted for the Second United Nations Development Decade.

DEVELOPMENT OF ENVIRONMENTAL HEALTH CRITERIA FOR URBAN PLANNING

World Health Organization, Geneva.

Technical Report Series No. 511, 1972. 35 p, 1 annex.

Key Words: Health, City planning, Environmental protection, Pollution control.

The WHO Scientific Group on the Development of Environmental Health Criteria for Urban Planning met in Geneva sometime in June 1974 to develop solutions to environmental health problems associated with the rapid growth of urban areas. The Group considered the following: (1) a review of environmental health factors of primary importance in urban and regional planning; (2) an analysis of the adequacy of existing and available environmental health criteria for use in urban planning; (3) a definition of areas where environmental health criteria are lacking; and (4) the submission of recommendations concerning the development of criteria, standards, and guidelines pertaining to the environment that may be used in operational health and physical planning programmes.

HEALTH AND THE ENVIRONMENT

World Health Organization, Regional Office for Europe, Copenhagen.

Public Health in Europe No. 8, 1979, 161 p, figures, tables, references.

Key Words: Public health, Environments, Environmental sanitation, Environmental quality, Environmental protection, Water supply, Sanitation, Pollution control, Environmental management, Housing (residential), Epidemiology, Tourism, Developing countries, Manpower, Foods.

The wide coverage of the present publication highlights some environmental health problems of developing countries in Europe. Rural water supply and sanitation, wastes removal, housing, and topics concerning environmental quality and pollution control, environmental management and manpower requirement in management are covered herein. The effects of environmental management and manpower health are dealt with. Papers on food safety and control, industrialization effect on the environment, tourism, and the results of studies on environmental pollution effects are presented.

3341

SYMPOSIUM ON COMMUNITY WATER SUPPLY IN DEVELOPMENT COOPERATION

World Health Organization, International Reference Centre for Community Water Supply, Hague, Netherlands.

Report of the Symposium on . . . , Amsterdam, Netherlands, 7-10 February 1977. 72 p, 4 annexes.

Key Words: Community development, Water supply, Water policy, Planning, Technology, Finance, Manpower.

All the participants of the symposium accepted water as a basic need and a human right. The conference recommended the setting of high priority targets by nations to provide water and sanitation for urban and rural communities. The discussions concentrated on the rural and urban fringe communities where the problems are almost severe. For significant progress the meeting found it necessary for: a world-wide increase in money and trained personnel for construction, operation and maintenance of installations; improvements in organization; and the encouragement of an active participation of the said recipients.

3467

REPORT ON COMMUNITY WATER SUPPLIES

World Health Organization, Geneva. World Bank, Washington, D.C.

United Nations Water Conference, Mar del Plata, Argentina, March 1977. 29 p, 2 fig, 5 tab, 4 ref, 1 annex.

Key Words: Water supply, Reports, Water management (applied), Water policy.

The urgent need for safe community water supply and sanitation services in developing countries led to the preparation of this report. An examination of global community water supply and sanitation data showed the necessity for adopting programs or targets with realistic standards for quality and quantity to supply water for urban and rural areas, and to provide for the sanitary disposal of excreta and waste water. To implement these, targets were set, and strategies for development were identified together with the corresponding course or plan of action to be undertaken.

OZONE AND ULTRAVIOLET RADIATION DISINFECTION FOR SMALL COMMUNITY WATER SYSTEMS

Witherell, L.E., Solomon, R.L. and Stone, K.M.

U.S. Environmental Protection Agency, Municipal Environmental Research Laboratory, Office of Research and Development, Cincinnati, Ohio.

July 1979. 40 p, 5 fig, 15 tab, 41 ref.

Key Words: Ozone, Radiation, Disinfection, Water supply systems, Water supply, Water treatment.

Ozone and ultraviolet radiation were used as alternatives to chlorine for disinfection in several small existing community water systems. Parameters such as disinfection capability, operation and maintenance requirements, and costs were investigated and compared with a traditional chlorination facility. Specific data collected and summarized in the present paper include: coliform and standard plate count results for raw, finished, and distribution samples; capital and maintenance costs for ozonators, ultraviolet light disinfection units, and sodium hypochlorite chemical feed equipment; and problems encountered with the equipment while it was in operation. Results indicate that both ozone and ultraviolet light were inferior to chlorination from the standpoint of operation and maintenance requirements, and maintaining disinfection in the distribution system.

3728

SELF-HELP AND POPULAR PARTICIPATION IN RURAL WATER SYSTEMS

Miller, D.

Organization for Economic Co-Operation and Development, Development Centre, Paris.

1979. 149 p, 9 fig, 22 tab, references.

Key Words: Public participation, Water supply systems, Research and development, Planning, Design, Irrigation practices.

This paper is structured in the following manner. The first section is an attempt to clarify the concepts of self-help and popular participation in the context of promoting rural development. A scheme or paradigm of self-help and participation within rural water supply programmes, both small-scale irrigation and household uses is presented in the second section. A series of hypothetical relationships are advanced in the third section. In the final section, major findings and other evidences and experiences are reviewed from available literature in the light of the hypotheses.

3806

HEALTH ASPECTS OF TREATED SEWAGE RE-USE

World Health Organization (WHO), Regional Office for Europe, Copenhagen.

Report on a WHO Seminar held at Algiers, 1-5 June 1980. Euro Reports and Studies No. 42, 1981. 42 p, 3 tab, 48 ref, 2 annexes.

Key Words: Waste water use, Water reuse, Sewage, Health, Sewage treatment, Waste water treatment.

The interregional seminar which included 12 working papers on the subject was believed to make a valuable contribution by formulating clear recommendations which might eventually lead to a code of practice and some assessment of the environmental impact of water re-use. Herein summarized are some of the most significant points raised: the principal forms of water re-use-agriculture, aquifer re-charge, industrial re-use and potable re-use; the hazards of re-used water, primarily, the risks of infection by bacteria, viruses, protozoa and worms and chemical hazards limiting the potential for re-use of sewage; and treatment alternatives from simple land treatment to more complex and costly advanced waste treatment systems.

HEALTH ASPECTS RELATING TO THE USE OF POLYELECTROLYTES IN WATER TREATMENT FOR COMMUNITY WATER SUPPLY

World Health Organization, International Reference Centre for Community Water Supply, Netherlands.

Technical Paper Series No. 5, July 1973. 33 p, 1 fig, 1 tab, 22 ref, 2 append.

Key Words: Health aspects, Polyelectrolytes, Toxicity, Water treatment, Water supply.

Modern methods of purification of water for community water supplies involve the application of polyelectrolytes. An important limitation of their broader use is the possible health hazard due to the toxicity of certain kinds of polyelectrolytes. Taking cognizance of this fact, an international meeting was organized to review health aspects of the use of polyelectrolytes in water treatment. The conditions ensuring their safe use, recommendations for the formulation and administration of standards by governments and the delineation of research areas and coordination at international level were taken up as well.

3986

COMMUNITY EDUCATION AND PARTICIPATION IN THE SLOW SAND FILTRATION PROJECT

World Health Organization, International Reference Centre for Community Water Supply and Sanitation, Netherlands.

Report of an International Meeting held in Voorburg, Netherlands, 29 May - 2 June 1978. Bulletin Series No. 14, July 1979. 58 p, 7 annexes.

Key Words: Community education, Public participation, Filtration, Water supply.

The conference was convened to promote the large scale application of slow sand filtration for community water supply in developing countries. The project comprises applied research programmes, demonstration projects, and the exchange of information and the transfer of knowledge and experience. Participants gave both a brief account of the status of community education and participation in the field of water supply and sanitation in their countries and an introduction on the set-up and implementation of the specific programmes. The general outline and the outlines for the country programmes were the working documents for the meeting reported in the present publication.

4047

SLOW SAND FILTRATION FOR COMMUNITY WATER SUPPLY IN DEVELOPING COUNTRIES

World Health Organization, International Reference Centre for Community Water Supply and Sanitation, Netherlands.

Bulletin Report No. 16, March 1981. 63 p, figures, tables, 3 annexes.

Key Words: Slow sand filtration, Water supply, Developing countries, Recommendations.

Slow sand filtration is a water treatment technique useful to many rural water supply systems in the developing countries. This document is an appraisal of the results and experience of the participating countries in the development, implementation and evaluation of demonstration projects in selected villages on the basis of community participation. Recommendations for design, construction and operation of village level slow sand filters are outlined, as well as guidelines for planning and implementation of rural water supply schemes in general.

INTEGRATION OF HEALTH EDUCATION IN THE "CARE" WATER AND SANITATION PROJECT IN INDONESIA

Drucker, D.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 39, April 1982. 32 p, figures, 3 append.

Key Words: Health education, Sanitation, Health personnel, Training, Audiovisual materials, Water supply, Indonesia.

The CARE water systems and sanitation facilities project seeks to improve the public health of Indonesia's rural villages. Efforts have been made mainly through the provision of adequate facilities. The addition or integration of health education and community participation component to the project is proposed. This report contains the evaluation of the health education and community participation programs. The discussion covers: basic problems encountered; possible approaches to program implementation; available resources; and long range plans.

4182

SOCIO-CULTURAL AND ECONOMIC CHARACTERISTICS OF CONDITIONS IN ANCASH AND LA LIBERTAD, PERU

Miller, C.I.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 1, November 1980. 38 p, 5 fig, 22 ref.

Key Words: Socio-cultural aspects, Social values, Economic aspects, Sociology, Sewage, Health, Education, Sanitation, Peru.

This paper provides the evaluation team reviewing CARE-implemented water, sewage and health projects in Ancash and La Libertad, Peru with information on socio-cultural and economic patterns of the study area. Since most of the CARE projects covered in this evaluation are located in the Callejones de Huaylas and Conchucos, emphasis is given to these valleys. Data on ecology, demography, health of children, economic patterns, rural-urban migration, communal labor, language use, household structure and education are presented herein. Also included are recommendations for evaluating field work procedures.

4190

PLAN FOR A HEALTH EDUCATION ON COMPONENT FOR THE HEALTH SECTOR II BILATERAL ASSISTANCE PROJECT IN THE DOMINICAN REPUBLIC

Llewellyn (III), C.E.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 21, October 1981. 42 p, 3 fig, 3 ref, 5 append.

Key Words: Health education, Health personnel, Environmental health, Community health workers, Audiovisual materials, Training.

This report proposes a program structure and program content to meet the health education needs of the target communities in relation to the water and sanitation program. An attempt is made to identify the needs and provide recommendations for training health workers, health committees and supervisors to meet such requirements based on health education theory and practice.

COMMUNITY WATER SUPPLY AND SANITATION IN BURUNDI: REPORT OF AN EVALUATION TEAM

Isely, R.B., Goff, D. and Blank, H.E.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 24, October 1981. 61 p, 4 fig, 1 tab, 20 ref, 5 append.

Key Words: Water supply, Sanitation, Burundi, Rural development, Recommendations, Training, Project benefits, Evaluation.

A USAID evaluation team visited Burundi to examine the UNICEF rural water and sanitation project in terms of the priorities and resources of the country, USAID and other donors. The evaluation was assessed from three angles namely: (1) program inputs, both material and human; (2) program operations, both technical and managerial; and (3) program effects in various categories. Recommendations on the various aspects of the project are also provided.

PARTICIPATION IN A WORKSHOP ON PRIMARY HEALTH CARE

Isely, R.B.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 29, November 1981. 25 p, 5 append.

Key Words: Public participation, Health, Sanitation, Water supply, Health care, Health education.

The workshop, attended by public health officials and practitioners from various developing countries aims to discuss the technical, institutional and operational aspects of primary health care programs and their component parts. The major issues discussed during the ensuing sessions were: (a) oral dehydration; (b) whether health care be delivered by trained health care professionals only, or whether cooperation and assistance of lay community members be sought; (c) the intersectoral nature of family planning, nutrition, and water/sanitation; and (d) public participation.

INTENSIVE SESSION ON WATER, SANITATION AND HEALTH EDUCATION

Isely, R.B.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 31, December 1981. 16 p, 1 fig, 4 append.

Key Words: Water, Sanitation, Health education, Water supply.

This in-house workshop aims to reduce infant and child mortality and morbidity. The two specific objectives being pursued are as follows; (1) to examine a series of issues surrounding the interrelationships of UNICEF's water and sanitation programs and the agreed upon goals of UNICEF pertaining to maternal and child health, and to produce an agenda for discussing these issues in a regional and country-specific sense; and (2) to sensitize those attending the meeting to the complexities of the interrelationships of factors that influence the outcome of water and sanitation program.

ENVIRONMENTAL HEALTH IN EGYPT: A SECTORAL ASSESSMENT AND RECOMMENDATIONS

Warner, D.B., Donaldson, D. and Haratani, J.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Field Report No. 33, April 1982. 139 p, 9 fig, 10 tab, 5 append.

Key Words: Environmental health, Health, Egypt, Environmental protection, Pollution, Environmental engineering.

Various elements of current environmental health conditions in Egypt are examined in this reports. Overviews of each of the traditional environmental health areas are presented. A discussion of the needs of Egypt in the environmental health sector follows: In doing so, several aspects of Egypt and its institutions which affect conditions in the health sector are looked into. Finally, recommendations for USAID interventions to assist the country in taking corrective actions are proposed.

4199

TRAINING OF RURAL COMMUNITY DEVELOPMENT WORKERS IN HEALTH EDUCATION

Steuart, G. and Rull, C.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Technical Report No. 3, March 1981. 15 p, 18 ref.

Key Words: Training, Health education, Water supply, Sanitation, Operation and maintenance, Public health, Rural communities, Rural development, Health personnel.

This report is drawn considerably from a body of literature which frequently reports experiences or recommends training methods and strategies that are notably lacking in critical evaluation. The contrasting recommendations approach the task from the point of view of worker development in which the "course" itself is only a part of the learning experience for producing and maintaining optimal performance and effectiveness. For simplification, the recommended competencies have been grouped into five main areas: (1) social diagnostic; (2) social and behavioral change facilitation; (3) technical water-related health and sanitation content; (4) support system and recourse-linking; and (5) evaluation.

4200

EVALUATION METHODS FOR COMMUNITY RURAL WATER SUPPLY AND SANITATION PROJECTS IN DEVELOPING COUNTRIES: A SYNTHESIS OF AVAILABLE INFORMATION

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Technical Report No. 4, March 1981. 29 p, 1 fig, 2 tab, 25 ref.

Key Words: Water supply, Sanitation, Project evaluation, Project planning, Resources, Feasibility, Projects, Developing countries.

Generally, function and process measures are the main features of evaluation methods and resources for community water supply and sanitation projects in developing countries. These measures are the most accessible and the data generated by such evaluations can be extremely useful in operating existing projects and in the planning of future ones. This report aims to keep the developing countries particularly the Republic of Malawi of such existing methodology.

FACILITATION OF COMMUNITY ORGANIZATION: AN APPROACH TO WATER AND SANITATION PROGRAMS IN DEVELOPING COUNTRIES

laely, R.B.

Camp Dresser and McKee International, Inc., Water and Sanitation for Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

WASH Technical Report No. 7, June 1981. 14 p, 3 fig, 25 ref.

Key Words: Water supply, Sanitation, Organizations, Personnel, Information, Evaluation.

Experience to date points to community organization as an imperative to the success of water supply and sanitation programs among most rural populations of developing countries. For water and sanitation, four conditions are needed to achieve success in facilitating community organization: (a) Trained personnel; (b) Information about the community; (c) Integrated approaches among sectors; and (d) Available technology and information. A generic description of the process of facilitating community organization in a population group is included in the report.

Category V: PHILIPPINE MATERIALS

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PRIORITIES IN WATER SUPPLY DEVELOPMENT OF PHILIPPINE MUNICIPALITIES

Alejandrino, A.A. and Castro, P.M.

National Hydraulic Research Center, Diliman, Quezon City.

Report No. 8, October 1974. 12 p, 2 tab.

Key Words: Water supply, Water distribution.

This report identifies 20 municipalities in the Philippines with the most pressing need for a new or better water supply system in accordance with size, population characteristics, income, and the capacity of the existing system. Out of the 75 towns and cities investigated, 20 communities have high rankings which are relatively insensitive to the variation of the relative weights of the parameters. These are: 1) Rosario, Cavite 2) Baguio City, Benguet 3) Mandausa City, Cebu 4) Cavite City, Cavite 5) Cainta, Rizal 6) Jolo, Sulu 7) Olongapo City, Zambales 8) Taguig, Rizal 9) Toledo City, Cebu 10) Iloilo City, Iloilo 11) Valenzuela, Bulacan 12) Las Pifias, Rizal 13) Angeles City, Pampanga 14) Pateros, Rizal 15) Marawi City, Lanao del Sur 16) Bacolod City, Negros Occidental 17) Noveleta, Cavite 18) Meycauayan, Bulacan 19) Dagupan City, Pangasinan 20) Cebu City, Cebu.

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REPORT OF FEASIBILITY IMPROVEMENT AND EXPANSION OF URBAN WATER SYSTEM — DAVAO CITY AREA

Adrian Wilson, International Associates, Inc. Philippines, and James M. Montgomery Consulting Engineers, Inc., California.

Provincial Water Feasibility Studies, National Economic Development Authority, Manila, June 1973. 112 p, 24 fig, 46 tab, 28 ref.

Key Words: Water supply systems, Davao City, Water requirements, Financial feasibility, Technical feasibility, Economic feasibility, Capital costs, Social aspects, Environmental effects, Urban water system.

The report concerns the feasibility of water system improvements proposed for the Davao City area. The studies include: (a) the survey and evaluation of socio-economic and environmental aspects of the Davao City area; existing water systems; available water resources; existing organizations related to utility operations; (b) the development of criteria for the preliminary design of a future Davao water utility; projections of future populations, service connections, required water production and consumption; a master plan of phased water system improvements; future organizational structure and operational procedures; estimated capital costs related to future water system development; (c) the preparation of a financial analysis of future revenues and expenses; a socio-economic analysis including the development of a schedule of proposed water rates and changes and an investigation of cost-benefit relationship.

REPORT OF FEASIBILITY IMPROVEMENT AND EXPANSION OF URBAN WATER SYSTEM — LEYTE METROPOLITAN WATERWORKS

Adrian Wilson International Associates, Inc., Philippines and James M. Montgomery Consulting Engineers, Inc., California.

Provincial Water Feasibility Studies, National Economic and Development Authority, Manila, June 1973. 126 p, 32 fig, 49 tab, 26 ref.

Key Words: Water supply systems, Leyte Metropolitan Waterworks, Water requirements, Financial feasibility, Technical feasibility, Economic feasibility, Capital costs, Social aspects, Environmental effects, Urban water systems, Leyte.

The report concerns the feasibility of water system improvements proposed for the National Leyte area. The studies include: (a) the survey and evaluation of socio-economic and environmental aspects of the Northeast Leyte area; existing water systems; available water resources; existing organizations related to utility operations; (b) the development of criteria for the preliminary design of a future Northeast Leyte area utility; projections of future populations, service connections, required water production and consumption; a master plan of phased water system improvements; future organizational structure and operational procedures; estimated capital costs related to future water system development; (c) the preparation of a financial analysis of future revenues and expenses; a socio-economic analysis including the development of a schedule of proposed water rates and charges and an investigation of cost-benefit relationship.

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LAND PREPARATION IN LOWLAND RICE: ITS SPEED IN RELATION TO RATE OF WATER SUPPLY

Valera, A. and Wickham, T.

International Rice Research Institute, Los Baños, Laguna.

Philippine Society of Agricultural Engineers' Annual Convention, Manila, April 8-19, 1974. 10 p, 9 fig, 4 tab, 2 ref.

Key Words: Land preparation, Rice, Water supply, Water requirements, Irrigation practices.

Limited water supply during the 1973-74 wet and dry seasons retarded land preparation in traditional irrigation systems, but over irrigation did not result in complete transplanting in less than 8½ weeks. Cumulative water deliveries of 600-700 mm. at the turnout were sufficient to complete land preparation, but they should be 800-1000 mm. for command areas of larger systems and over 1000 mm. for areas with light soils. Rainfed areas received only 500-600 mm. to complete land preparation in 13-15 weeks duration. No sufficient difference in speed of land preparation was observed among rainfed farms located near the top, intermediate and bottom terraces of the watershed. Land preparation along the second half of a larger canal system which was not supplied with enough water took as long as for rainfed farms, and one month longer than farms located along the first half of the same canal.

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SURFACE WATER SUPPLY STUDY: BICOL RIVER BASIN

Arbhabhirama, A., Pescod, M. B., Tingsanchali, T., Okamoto, M., Sahagun, V.A. and Selvalingam, S.

Asian Institute of Technology, Division of Water Resources and Environmental Engineering, Bangkok, Thailand.

Research Report No. 54, January 1976. 113 p, 71 fig, 16 tab, 8 append.

Key Words: Bicol River Basin, Surface waters, Water supply, Water quality, Streamflow records, Statistical analysis, Rainfall, Hydrologic data, Specific yield.

This surface water supply study was conducted to provide information for irrigation planning and improvement in the Bicol River Basin. An investigation was made of the available surface water supply with respect to quality and quantity. The geographical and seasonal variations of rainfall and streamflow throughout the basin were analyzed; the probability of occurrence of streamflow during dry seasons and the frequency of minimum low flows of the Bicol River and its tributaries were determined. The present and future conditions of water pollution in the basin were estimated using population projections, effluent discharges from major populated areas and BOD loadings.

GUIDELINES: WATER QUALITY CONTROL AND WATER SUPPLY DEVELOPMENT FOR LAGUNA LAKE

Keup, L.E.

Environmental Protection Agency, Water Quality Office, Division of Field Investigations, Cincinnati, Ohio.

Prepared for the Laguna Lake Development Authority, Pasig, Rizal. Circa 1970. 70 p, 1 fig.

Key Words: Laguna de Bay, Water quality control, Wastewater disposal, Water supply, Water management (applied), Evaluation, Estimated costs, Policies.

A portion of Laguna Lake Development Authority's activities will be to develop a water supply, principally for the Manila metropolitan area, and to provide for the maintenance and enhancement of water quality in the lake. This report is a review of existing information, and a plan for the Authority to initiate obtaining consultants to design and establish a water quality control program and perform necessary water supply development activities prior to construction of a plant for treating the lake waters for sale to domestic and industrial water systems.

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WATER SUPPLY FEASIBILITY STUDY — CABANATUAN CITY WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Summary Final Report, Prepared for the Local Water Utilities Administration, July 1976. 24 p, 7 fig, 13 tab.

Key Words: Water supply, Water supply systems, Cabanatuan City Water District (Nueva Ecija), Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources development, Forecasting, Planning, Recommendations.

The feasibility study report on the water supply of the Cabanatuan City Water District is presented in two parts — the summary final report and technical final report which is composed of 2 volumes. This text is a summary of the findings and recommendations of the study conducted. Topics covered include: (1) study criteria, (2) population and water demand projections, (3) water resources, (4) alternatives, (5) recommendations, (6) financial feasibility, and (7) implementation plans.

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WATER SUPPLY FEASIBILITY STUDY — CABANATUAN CITY WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. 1 (Text), Prepared for the Local Water Utilities Administration, July 1976. 148 p, 16 fig, 38 tab.

Key Words: Water supply, Water supply systems, Cabanatuan City Water District (Nueva Ecija), Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources, Evaluation, Cost analysis, Cost allocation, Social aspects, Waterworks, Water consumption, Water distribution (applied), Recommendations, Water resources development, Planning, Forecasting.

This text, the first volume of the technical final report, provides the detailed analysis and support information on the study conducted. A discussion of the existing conditions and proposed improvements of the Cabanatuan City Water District Water System is given. Topics covered include: 1) a description of the study area, 2) existing water supply facilities, 3) feasibility study criteria, 4) population and water demand projections, 5) water resources, 6) analysis and evaluation of alternatives, 7) description and cost of the recommended plan, 8) financial feasibility analysis, 9) economic feasibility analysis, and 10) findings and recommendations.

WATER SUPPLY FEASIBILITY STUDY — CABANATUAN CITY WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. II (Appendices), Prepared for the Local Water Utilities Administration, July 1976. 139 p, 24 fig, 44 tab.

Key Words: Water supply, Water supply systems, Cabanatuan City Water District (Nueva Ecija), Financial feasibility, Economic feasibility, Feasibility studies, Design criteria, Estimated costs, Construction materials, Construction methods, Specifications, Groundwater sources, Cost analysis, Planning, Water resources development, Recommendations.

This text, the second volume of the technical final report, consists of appendices relating to the first volume. Appendices A, B, C and D generally refer to several chapters of Volume I. Appendix A deals with the design criteria, B on the basis of cost estimates, while C and D are related to Appendix B and to the construction of the recommended plan. Moreover, other appendices provide detailed information to specific sections of Chapters VII to XI in Volume I. These appendices are numbered according to Volume I chapters and sections to which they refer.

WATER SUPPLY FEASIBILITY STUDY — CAMARINES NORTE WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Summary Final Report, Prepared for the Local Water Utilities Administration, March 1976. 23 p, 7 fig, 12 tab.

Key Words: Water supply, Water supply systems, Camarines Norte Water District, Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources development, Forecasting, Planning, Recommendations.

The feasibility study report on the water supply of the Camarines Norte Water District is presented in two parts — the summary final report and technical final report which is composed of 2 volumes. This text is a summary of the findings and recommendations of the study conducted. Topics covered include: (1) study criteria, (2) population and water demand projections, (3) water resources, (4) alternatives, (5) recommendations, (6) financial feasibility, and (7) implementation plans.

WATER SUPPLY FEASIBILITY STUDY — CAMARINES NORTE WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. I (Text), Prepared for the Local Water Utilities Administration, March 1976. 126 p, 16 fig, 37 tab.

Key Words: Water supply, Water supply systems, Camarines Norte Water District, Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources, Evaluation, Cost analysis, Cost allocation, Social aspects, Waterworks, Water consumption, Water distribution (applied), Recommendations, Water resources development, Planning, Forecasting.

This text, the first volume of the technical final report, provides the detailed analysis and support information on the study conducted. A discussion of the existing conditions and proposed improvements of the Camarines Norte Water District Water System is given. Topics covered include: (1) a description of the study area, (2) existing water supply facilities, (3) feasibility study criteria, (4) population and water demand projections, (5) water resources, (6) analysis and evaluation of alternatives, (7) description and cost of the recommended plan, (8) financial feasibility analysis, (9) economic feasibility analysis, and (10) findings and recommendations.

WATER SUPPLY FEASIBILITY STUDY — CAMARINES NORTE WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. II (Appendices), Prepared for the Local Water Utilities Administration, March 1976. 102 p, 13 fig, 34 tab.

Key Words: Water supply, Water supply systems, Camarines Norte Water District, Financial feasibility, Economic feasibility, Feasibility studies, Design criteria, Estimated costs, Construction materials, Construction methods, Specifications, Groundwater sources, Cost analysis, Planning, Water resources development, Recommendations.

This text, the second volume of the technical final report, consists of appendices relating to the first volume. Appendices A, B, C and D generally refer to several chapters of Volume I. Appendix A deals with the design criteria, B on the basis of cost estimates, while C and D are related to Appendix B and to the construction of the recommended plan. Moreover, other appendices provide detailed information to specific sections of Chapters VII to XI in Volume I. These appendices are numbered according to Volume I chapters and sections to which they refer.

WATER SUPPLY FEASIBILITY STUDY — TARLAC WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Summary Final Report, Prepared for the Local Water Utilities Administration, July 1976. 23 p, 7 fig, 12 tab.

Key Words: Water supply, Water supply systems, Tarlac Water District, Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources development, Forecasting, Planning, Recommendations.

The feasibility study report on the water supply of the Tarlac Water District is presented in two parts — the summary final report and technical final report which is composed of 2 volumes. This text is a summary of the findings and recommendations of the study conducted. Topics covered include: 1) study criteria, 2) population and water demand projections, 3) water resources, 4) alternatives, 5) recommendations, 6) financial feasibility, and 7) implementation plans.

WATER SUPPLY FEASIBILITY STUDY — TARLAC WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. I (Text), Prepared for the Local Water Utilities Administration, July 1976. 146 p, 22 fig, 38 tab.

Key Words: Water supply, Water supply systems, Tarlac Water District, Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources, Evaluation, Cost analysis, Cost allocation, Social aspects, Waterworks, Water consumption, Water distribution (applied), Recommendations, Water resources development, Planning, Forecasting.

This text, the first volume of the technical final report, provides the detailed analysis and support information on the study conducted. A discussion of the existing conditions and proposed improvements of the Tarlac Water District Water System is given. Topics covered include: 1) a description of the study area, 2) existing water supply facilities, 3) feasibility study criteria, 4) population and water demand projections, 5) water resources, 6) analysis and evaluation of alternatives, 7) description and cost of the recommended plan, 8) financial feasibility analysis, 9) economic feasibility analysis, and 10) findings and recommendations.

WATER SUPPLY FEASIBILITY STUDY — TARLAC WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. II (Appendices), Prepared for the Local Water Utilities Administration, July 1976. 143 p, 29 fig, 36 tab.

Key Words: Water supply, Water supply systems, Tarlac Water District, Financial feasibility, Economic feasibility, Feasibility studies, Design criteria, Estimated costs, Construction materials, Construction methods, Specifications, Groundwater sources, Cost analysis, Planning, Water resources development, Recommendations.

This text, the second volume of the technical final report, consists of appendices relating to the first volume. Appendices A, B, C and D generally refer to several chapters of Volume I. Appendix A deals with the design criteria, B on the basis of cost estimates, while C and D are related to Appendix B and to the construction of the recommended plan. Moreover, other appendices provide detailed information to specific sections of Chapters VII to XI in Volume I. These appendices are numbered according to Volume I chapters and sections to which they refer.

WATER SUPPLY FEASIBILITY STUDY — ZAMBOANGA CITY WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Summary Final Report, Prepared for the Local Water Utilities Administration, March 1976. 24 p, 8 fig, 13 tab.

Key Words: Water supply, Water supply systems, Zamboanga City Water District (Zamboanga del Sur), Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources development, Forecasting, Planning, Recommendations.

The feasibility study report on the water supply of the Zamboanga City Water District is presented in two parts — the summary final report and technical final report which is composed of 2 volumes. This text is a summary of the findings and recommendations of the study conducted. Topics covered include: (1) study criteria, (2) population and water demand projections, (3) water resources, (4) alternatives, (5) recommendations, (6) financial feasibility, and (7) implementation plans.

WATER SUPPLY FEASIBILITY STUDY — ZAMBOANGA CITY WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. I (Text), Prepared for the Local Water Utilities Administration, March 1976. 148 p, 24 fig, 45 tab.

Key Words: Water supply, Water supply systems, Zamboanga City Water District (Zamboanga del Sur), Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources, Evaluation, Cost analysis, Cost allocation, Social aspects, Waterworks, Water consumption, Water distribution (applied), Recommendations, Water resources development, Planning, Forecasting.

This text, the first volume of the technical final report, provides the detailed analysis and support information on the study conducted. A discussion of the existing conditions and proposed improvements of the Zamboanga City Water District Water System is given. Topics covered include: (1) a description of the study area, (2) existing water supply facilities, (3) feasibility study criteria, (4) population and water demand projections, (5) water resources, (6) analysis and evaluation of alternatives, (7) description and cost of the recommended plan, (8) financial feasibility analysis, (9) economic feasibility analysis, and (10) findings and recommendations.

WATER SUPPLY FEASIBILITY STUDY — ZAMBOANGA CITY WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. II (Appendices), Prepared for the Local Water Utilities Administration, March 1976. 159 p, 20 fig, 34 tab.

Key Words: Water supply, Water supply systems, Zamboanga Water District (Zamboanga del Sur), Financial feasibility, Economic feasibility, Feasibility studies, Design criteria, Estimated costs, Construction materials, Construction methods, Specifications, Groundwater sources, Cost analysis, Specifications, Groundwater sources, Cost analysis, Planning, Water resources development, Recommendations.

This text, the second volume of the technical final report, consists of appendices relating to the first volume. Appendices A, B, C and D generally refer to several chapters of Volume I. Appendix A deals with the design criteria, B on the basis of cost estimates, while C and D are related to Appendix B and to the construction of the recommended plan. Moreover, other appendices provide detailed information to specific sections of Chapters VII to XI in Volume I. These appendices are numbered according to Volume I chapters and sections to which they refer.

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WATER SUPPLY FEASIBILITY STUDY — BUTUAN CITY WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Summary Final Report, Prepared for the Local Water Utilities Administration, June 1976. 24 p, 3 fig, 13 tab.

Key Words: Water supply, Water supply systems, Butuan City Water District (Agusan del Norte), Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources development, Forecasting, Planning, Recommendations.

The feasibility study report on the water supply of the Butuan City Water District is presented in two parts — the summary final report and technical final report, composed of 2 volumes. This text is a summary of the findings and recommendations of the study conducted. Topics covered include: 1) study criteria, 2) population and water demand projections, 3) water resources, 4) alternatives, 5) recommendations, 6) financial feasibility, and 7) implementation plans.

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WATER SUPPLY FEASIBILITY STUDY — BUTUAN CITY WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. I (Text), Prepared for the Local Water Utilities Administration, April 1976. 142 p, 12 fig, 36 tab.

Key Words: Water supply, Water supply systems, Butuan City Water District (Agusan del Norte), Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources, Evaluation, Estimated costs, Benefit-cost analysis, Social aspects, Waterworks, Recommendations, Water resources development, Planning, Forecasting.

This text, the first volume of the technical final report, provides the detailed analysis and support information on the study conducted. A discussion of the existing conditions and proposed improvements of the Butuan City Water District Water System is given. Topics covered include: 1) a description of the study area, 2) existing water supply facilities, 3) feasibility study criteria, 4) population and water demand projections, 5) water resources, 6) analysis and evaluation of alternatives, 7) description and cost of the recommended plan, 8) financial feasibility analysis, 9) economic feasibility analysis, and 10) findings and recommendations.

WATER SUPPLY FEASIBILITY STUDY — BUTUAN CITY WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. II (Appendices), Prepared for the Local Water Utilities Administration, April 1976. 179 p, 42 fig, 63 tab.

Key Words: Water supply, Water supply systems, Butuan City Water District (Agusan del Norte), Financial feasibility, Economic feasibility, Feasibility studies, Design criteria, Estimated costs, Construction materials, Construction methods, Specifications, Water resources, Water treatment, Ground-water management, Water conservation, Wells, Water resources development, Forecasting, Planning, Recommendations.

This text, the second volume of the technical final reports, consists of appendices relating to the first volume. Appendices A, B, C and D generally refer to several chapters of Volume I. Appendix A deals with the design criteria, B on the basis of cost estimates, while C and D are related to Appendix B and to the construction of the recommended plan. Moreover, other appendices provide detailed information to specific sections of Chapters VII to XI in Volume I. These appendices are numbered according to Volume I chapters and sections to which they refer.

WATER SUPPLY FEASIBILITY STUDY — LA UNION WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Summary Final Report, Prepared for the Local Water Utilities Administration, July 1976. 27 p, 7 fig, 12 tab.

Key Words: Water supply, Water supply systems, La Union Water District, Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources development, Forecasting, Planning, Recommendations.

The feasibility study report on the water supply of the La Union Water District is presented in two parts — the summary final report and technical final report, composed of 2 volumes. This text is a summary of the findings and recommendations of the study conducted. Topics covered include: 1) study criteria, 2) population and water demand projections, 3) water resources, 4) alternatives, 5) recommendations, 6) financial feasibility, and 7) implementation plans.

WATER SUPPLY FEASIBILITY STUDY — LA UNION WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. I (Text), Prepared for the Local Water Utilities Administration, July 1976. 194 p, 44 tab, 28 fig.

Key Words: Water supply, Water supply systems, La Union Water District, Financial feasibility, Economic feasibility, Feasibility studies, Water demand, Water resources, Evaluation, Benefit-cost analysis, Estimated costs, Social aspects, Waterworks, Recommendations, Forecasting, Water resources development, Planning.

This text provides the detailed analysis and support information on the study conducted. Topics covered include: (1) a description of the study area, (2) existing water supply facilities, (3) feasibility study criteria, (4) population and water demand projections, (5) water resources, (6) analysis and evaluation of alternatives, (7) description and cost of the recommended plan, (8) financial feasibility analysis, (9) economic feasibility analysis, and (10) findings and recommendations.

WATER SUPPLY FEASIBILITY STUDY — LA UNION WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. II (Appendices), Prepared for the Local Water Utilities Administration, July 1976. 169 p, 16 fig, 32 tab.

Key Words: Water supply, Water supply systems, La Union Water District, Financial feasibility, Economic feasibility, Feasibility studies, Design criteria, Estimated costs, Construction materials, Construction methods, Specifications, Water resources, Water treatment, Water conservation, Groundwater conservation, Groundwater management, Forecasting, Wells, Planning, Water resources development, Recommendations.

This text, the second volume of the technical final report, consists of appendices relating to the first volume. Appendices A, B, C and D generally refer to several chapters of Volume I. Appendix A deals with the design criteria, B on the basis of cost estimates, while C and D are related to Appendix B and to the construction of the recommended plan. Moreover, other appendices provide detailed information to specific sections of Chapters VII to XI in Volume I. These appendices are numbered according to the Volume I chapter and section to which they refer.

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WATER SUPPLY FEASIBILITY STUDY — LIPA CITY WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Summary Final Report, Prepared for the Local Water Utilities Administration, July 1976. 25 p, 7 fig, 21 tab.

Key Words: Water supply, Water supply systems, Lipa City Water District (Batangas), Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources development, Forecasting, Planning, Recommendations.

The feasibility study report on the water supply of the Lipa City Water District is presented in two parts — the summary final report and technical final report, composed of 2 volumes. This text is a summary of the findings and recommendations of the study conducted. Topics covered include: 1) study criteria, 2) population and water demand projections, 3) water resources, 4) alternatives, 5) recommendations, 6) financial feasibility, and 7) implementation plans.

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WATER SUPPLY FEASIBILITY STUDY — LIPA CITY WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. I (Text), Prepared for the Local Water Utilities Administration, June 1976. 176 p, 18 fig, 42 tab.

Key Words: Water supply, Water supply systems, Lipa City Water District (Batangas), Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources, Evaluation, Benefit-cost analysis, Estimated costs, Social aspects, Waterworks, Recommendations, Water resources development, Planning, Forecasting.

This text, the first volume of the technical final report, provides the detailed analysis and support information on the study conducted. Topics covered include: (1) a description of the study area, (2) existing water supply facilities, (3) feasibility study criteria, (4) population and water demand projections, (5) water resources, (6) analysis and evaluation of alternatives, (7) description and cost of recommended plan, (8) financial feasibility analysis, (9) economic feasibility analysis, and (10) findings and recommendations.

WATER SUPPLY FEASIBILITY STUDY — LIPA CITY WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. II (Appendices), Prepared for the Local Water Utilities Administration, June 1976. 153 p, 15 fig, 45 tab.

Key Words: Water supply, Water supply systems, Lipa City Water District (Batangas), Financial feasibility, Economic feasibility, Feasibility studies, Design criteria, Estimated costs, Construction materials, Construction methods, Specifications, Water resources, Water treatment, Water conservation, Groundwater management, Wells, Forecasting, Planning, Water resources development, Recommendations.

This text, the second volume of the technical final report, consists of appendices relating to the first volume. Appendices A, B, C and D generally refer to several chapters of Volume I. Appendix A deals with the design criteria, B on the basis of cost estimates, while C and D are related to Appendix B and to the construction of the recommended plan. Moreover, other appendices provide detailed information to specific sections of Chapters VII to XI in Volume I. These appendices are numbered according to Volume I chapter and section to which they refer.

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WATERSHED MANAGEMENT AND DEVELOPMENT: THEIR APPLICATION TO AGRICULTURAL WATER SUPPLY

Sims, B.D. and Bonita, M.L.

University of the Philippines, College of Forestry, Department of Forest Resources Management, Los Baños, Laguna.

Workshop on Water Resources, Continuing Education Center, U.P. at Los Baños, Laguna, 9-10 December 1976. 10 p, 11 ref.

Key Words: Watershed management, Water supply, Water yield, Soil erosion, Agricultural watersheds.

This paper deals with watershed problems, focusing on watershed management practices and their effects on water supply and erosion. The first part deals with potential methods for increasing water yield. The second part deals specifically with soil erosion mitigation associated with agricultural management, range management, timber harvesting, and road construction.

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WATER SUPPLY FEASIBILITY STUDY — LUCENA, PAGBILAO, TAYABAS WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Summary Final Report, Prepared for the Local Water Utilities Administration, July 1976. 27 p, 7 fig, 12 tab.

Key Words: Water supply, Water supply systems, Lucena-Pagbilao-Tayabas Water District (Quezon), Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources, Forecasting, Planning, Recommendations.

The feasibility study report on the water supply of the Lucena, Pagbilao, Tayabas Water District is presented in two parts — the summary final report and the technical final report composed of 2 volumes. This text is a summary of the findings and recommendations of the study conducted. Topics covered include: 1) study criteria, 2) population and water demand projections, 3) water resources, 4) alternatives, 5) recommendations, 6) financial feasibility, and 7) implementation plans.

WATER SUPPLY FEASIBILITY STUDY — LUCENA, PAGBILAO, TAYABAS WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. I (Text), Prepared for the Local Water Utilities Administration, June 1976. 175 p, 35 fig, 50 tab.

Key Words: Water supply, Water supply systems, Lucena-Pagbilao-Tayabas Water District (Quezon), Financial feasibility, Economic feasibility, Feasibility studies, Water demand, Water resources, Evaluation, Benefit-cost analysis, Estimated costs, Social aspects, Waterworks, Recommendations, Forecasting, Water resources development, Planning.

This text provides the detailed analysis and support information on the study conducted. Topics covered include: 1) description of the study area, 2) existing water supply facilities, 3) feasibility study criteria, 4) population and water demand projections, 5) water resources, 6) alternative studies, 7) description and cost of the recommended plan, 8) financial feasibility analysis, 9) economic feasibility analysis, and 10) findings and recommendations.

WATER SUPPLY FEASIBILITY STUDY — LUCENA, PAGBILAO, TAYABAS WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. II (Appendices), Prepared for the Local Water Utilities Administration, June 1976. 184 p, 22 fig, 47 tab.

Key Words: Water supply, Water supply systems, Lucena-Pagbilao-Tayabas Water District (Quezon), Economic feasibility, Financial feasibility, Feasibility studies, Design criteria, Estimated costs, Construction materials, Construction methods, Specifications, Water resources, Evaluation, Water treatment, Water conservation, Groundwater management, Water rates, Benefit-cost analysis, Planning, Water resources development, Recommendations.

This text, the second volume of the technical final report, consists of appendices relating to the first volume. Appendices A, B, C and D generally refer to several chapters of Volume I. Appendix A deals with the design criteria, B on the basis of cost estimates, while C and D are related to Appendix B and to the construction of the recommended plan. Moreover, other appendices provide detailed information to specific sections of Chapters VII to XI in Volume I. These appendices are numbered according to the Volume I chapter and section to which they refer.

WATER SUPPLY FEASIBILITY STUDY — METROPOLITAN CEBU WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Summary Final Report, Prepared for the Local Water Utilities Administration, February 1976. 26 p, 6 fig, 15 tab.

Key Words: Water supply, Water supply systems, Metropolitan Cebu Water District, Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Forecasting, Planning, Recommendations.

The feasibility study report on the water supply of the Metropolitan Cebu Water District is presented in two parts — the summary final report and the technical final report, composed of 2 volumes. This text is a summary of the findings and recommendations of the study conducted. Topics covered include: 1) study criteria, 2) population and water demand projections, 3) alternatives, 4) recommendations, 5) financial feasibility, and 6) implementation plans.

WATER SUPPLY FEASIBILITY STUDY — METROPOLITAN CEBU WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. I (Text), Prepared for the Local Water Utilities Administration, February 1976. 192 p, 33 fig, 51 tab.

Key Words: Water supply, Water supply systems, Metropolitan Cebu Water District, Financial feasibility, Economic feasibility, Feasibility studies, Water demand, Water resources, Evaluation, Benefit-cost analysis, Estimated costs, Social aspects, Waterworks, Recommendations, Forecasting, Water resources development, Planning.

This text, the first volume of the technical final report, provides the detailed analysis and support information on the study conducted. Topics covered include: 1) a description of the study area, 2) existing water supply facilities, 3) feasibility study criteria, 4) population and water demand projections, 5) water resources, 6) alternative studies, 7) description and cost of the recommended plan, 8) economic feasibility analysis, 9) financial feasibility analysis, and 10) findings and recommendations.

WATER SUPPLY FEASIBILITY STUDY — METROPOLITAN CEBU WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. II (Appendices), Prepared for the Local Water Utilities Administration, February 1976. 205 p, 40 fig, 61 tab.

Key Words: Water supply, Water supply systems, Metropolitan Cebu Water District, Financial feasibility, Economic feasibility, Feasibility studies, Design criteria, Estimated costs, Construction materials, Construction methods, Specifications, Water resources, Water utilization, Metering, Water treatment, Water conservation, Water rates, Planning, Water resources development, Recommendations.

This text, the second volume of the technical final report, consists of appendices relating to the first volume. Appendices A, B, C and D generally refer to several chapters of Volume I. Appendix A deals with the design criteria, B on the basis of cost estimates, while C and D are related to Appendix B and to the construction of the recommended plan. Moreover, other appendices provide detailed information to specific sections of Chapters VII and XI in Volume I. These appendices are numbered according to the Volume I chapter and section to which they refer.

WATER SUPPLY FEASIBILITY STUDY — MISAMIS OCCIDENTAL WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Summary Final Report, Prepared for the Local Water Utilities Administration, January 1976. 22 p, 6 fig, 13 tab.

Key Words: Water supply, Water supply systems, Misamis Occidental Water District, Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources development, Forecasting, Planning, Recommendations.

The feasibility study report on the water supply of the Misamis Occidental Water District is presented in two parts — the summary final report and the technical final report, composed of 2 volumes. This text is a summary of the findings and recommendations of the study conducted. Topics covered include: 1) study criteria, 2) population and water demand projections, 3) water resources, 4) alternatives, 5) recommendations, 6) financial feasibility, and 7) implementation plans.

WATER SUPPLY FEASIBILITY STUDY — MISAMIS OCCIDENTAL WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. I (Text), Prepared for the Local Water Utilities Administration, January 1976. 132 p, 18 fig, 36 tab.

Key Words: Water supply, Water supply systems, Misamis Occidental Water District, Economic feasibility, Financial feasibility, Feasibility studies, Water demand, Water resources, Evaluation, Benefit-cost analysis, Estimated costs, Social aspects, Waterworks, Recommendations, Water resources development, Forecasting.

This text, the first volume of the technical final report, provides the detailed analysis and support information on the study conducted. Topics covered include: 1) a description of the study area, 2) existing water supply facilities, 3) feasibility study criteria, 4) population and water demand projections, 5) water resources, 6) analysis and evaluation of alternatives, 7) description and cost of the recommended plan, 8) financial feasibility analysis, 9) economic feasibility analysis, and 10) findings and recommendations.

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WATER SUPPLY FEASIBILITY STUDY — MISAMIS OCCIDENTAL WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Technical Final Report — Vol. II (Appendices), Prepared for the Local Water Utilities Administration, January 1976. 163 p, 19 fig, 51 tab.

Key Words: Water supply, Water supply systems, Misamis Occidental Water District, Economic feasibility, Financial feasibility, Feasibility studies, Design criteria, Estimated costs, Construction materials, Construction methods, Specifications, Water resources, Evaluation, Water treatment, Water conservation, Benefit-cost analysis, Planning, Water resources development, Recommendations.

This text, the second volume of the technical final report, consists of appendices relating to the first volume. Appendices A, B, C and D generally refer to several chapters of Volume I. Appendix A deals with the design criteria, B on the basis of cost estimates, while C and D are related to Appendix B and to the construction of the recommended plan. Moreover, other appendices provide detailed information to specific sections of Chapters VII to XI in Volume I. These appendices are numbered according to the Volume I chapter and section to which they refer.

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PLANNING SURVEY OF 110 WATER SYSTEMS

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Vol. I. — Surveys of Water Systems for Planning Purposes, Prepared for the Local Water Utilities Administration, March 1976. 53 p, 13 fig, 28 tab, 3 annexes.

Key Words: Water supply, Water demand, Water supply systems, Technical feasibility, Projects, Planning, Surveys (data collection), Estimated costs, Recommendations.

This volume summarizes the results of the so-called 100 Cities Project. Prefeasibility studies were actually made on 131 cities served by 110 water systems. The study found that 65 of these water systems were suitable as interim capital assistance projects for water supply improvements and that an additional 16 were suitable as projects for partial improvement. The study further found that 48 of the 110 water systems require special technical studies, most of which relate to groundwater investigations. Fifteen of them were for water systems included among the 65 systems recommended as interim capital assistance projects, and five were for systems among the partial capital assistance projects.

PLANNING SURVEY OF 110 WATER SYSTEMS

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Vol. II-A — Final Report Surveys of Systems in Region I & II, Prepared for the Local Water Utilities Administration, March 1976. 367 p, 30 fig.

Key Words: Water supply, Water demand, Water supply systems, Projects, Planning, Surveys (data collection), Abra, Benguet, Ilocos Norte, Ilocos Sur, Pangasinan, Cagayan, Isabela, Nueva Vizcaya, Estimated costs, Recommendations.

This volume covers 11 water systems in Region I — Benguet in Abra; Itogon in Benguet; Laoag-Bacarra-Pasuquin and Batac in Ilocos Norte; Vigan-Bantay in Ilocos Sur; and Dagupan, Lingayen, Malasiqui, Rosales, San Carlos, Urdaneta in Pangasinan — and 6 systems in Region II — Aparri, Ilagan, Solana, Tuguegarao in Cagayan; Santiago in Isabela and Bayombong-Solano in Nueva Vizcaya. Basic information, population, service area, water demand, existing water system data, alternate improvements and estimated costs are given.

PLANNING SURVEY OF 110 WATER SYSTEMS

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Vol. II-B — Final Report Surveys of Systems in Region III, Prepared for the Local Water Utilities Administration, March 1976. 393 p, 30 fig.

Key Words: Water supply, Water demand, Water supply systems, Projects, Planning, Surveys (data collection), Bulacan, Nueva Ecija, Pampanga, Tarlac, Zambales, Estimated costs, Recommendations.

This volume embraces 18 water systems in Region III — Baliwag, Hagonoy, Malolos and Meycauayan in Bulacan; Gapan, Guimba and San Jose in Nueva Ecija; Angeles, Guagua, Lubao, Macabebe and San Fernando in Pampanga; Camiling, Concepcion & Paniqui in Tarlac; Olongapo, San Antonio and Subic in Zambales. Basic information, population, service area, water demand, existing water system data, alternate improvements, estimated costs and well and pump data of each water system are given.

PLANNING SURVEY OF 110 WATER SYSTEMS

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Vol. II-C — Final Report Surveys of Systems in Region IV, Prepared for the Local Water Utilities Administration, March 1976. 375 p, 42 fig.

Key Words: Water supply, Water demand, Water supply systems, Projects, Planning, Survey (data collection), Batangas, Laguna, Marinduque, Mindoro Oriental, Palawan, Quezon, Rizal, Estimated costs, Recommendations.

This report covers twenty-one (21) water systems in Region IV — Bauan, Lemery, Nasugbu, San Juan and Tanauan in Batangas; Cabuyao-Sta. Rosa-Bifian, Calamba, Los Baños, Sta. Cruz and Siniloan in Laguna; Boac and Sta. Cruz in Marinduque; Bongabong, Naujan and Pinamalayan in Mindoro Oriental; Puerto Princesa in Palawan; Atimonan, Candelaria, Mauban and Sariaya in Quezon; Binangonan in Rizal. Basic information, population, service area, water demand, existing water system data, alternate improvements and estimated costs are given.

PLANNING SURVEY OF 110 WATER SYSTEMS

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Vol. II-D — Final Report Surveys of Systems in Region V & VI, Prepared for the Local Water Utilities Administration, March 1976. 542 p, 49 fig.

Key Words: Water supply, Water demand, Water supply systems, Projects, Planning, Surveys (data collection), Albay, Camarines Sur, Catanduanes, Masbate, Sorsogon, Aklan, Antique, Capiz, Iloilo, Negros Occidental, Estimated costs, Recommendations.

This volume covers twelve (12) water systems in Region V — Legaspi-Daraga, Ligao-Oas, Polangui and Tabaco in Albay; Iriga, Libmanan-Cabusao and Naga-Carnaligan-Caraman-Magarao in Camarines Sur; Bato and Virac in Catanduanes; Masbate in Masbate; Bulan and Sorsogon in Sorsogon; — and thirteen (13) water systems in Region VI — Kalibo in Aklan; San Jose and Sibalom in Antique; Roxas in Capiz; Dingle-Pototan and Iloilo-Pavia-Sta. Barbara-Cabatuan-Maasin in Iloilo; Binalbagan, Cadiz, La Carlota, La Castellana, San Carlos, Silay and Talisay in Negros Occidental. Basic information, population, service area, water demand, existing water system data, alternate improvements and estimated costs are given.

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PLANNING SURVEY OF 110 WATER SYSTEMS

Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Vol. II-E — Final Report Surveys of Systems in Region VII & VIII, Prepared for the Local Water Utilities Administration. March 1976. 348 p, 40 fig.

Key Words: Water supply, Water demand, Water supply systems, Projects, Planning Surveys (data collection), Bohol, Cebu, Negros Oriental, Leyte del Norte, Leyte del Sur, Northern Samar, Western Samar, Estimated costs, Recommendations.

This report includes eleven (11) water systems in Region VII — Leon and Tagbilaran in Bohol; Bogo, Carcar, Dalaguete, Danao, Toledo and Tuburan in Cebu; Dumaguete, Guihulñgan and Tanjay in Negros Oriental; and seven (7) systems in region VIII — Baybay, Cangara-Barugo-Tungo and Ormoc in Leyte del Norte; Maasin in Leyte del Sur; Catarman in Northern Samar; Basey, Calbayog and Catbalogan in Western Samar. Basic information, population, service area, water demand, existing water system data, alternate improvements and estimated costs are given.

1169

AN INTEGRATED INTERNATIONAL PROGRAMME TO ACCELERATE THE PROVISION OF WATER SUPPLY AND SANITATION IN RURAL AREAS OF DEVELOPING COUNTRIES

Ad Hoc Working Group on Rural Potable Water Supply and Sanitation, Geneva, Switzerland.

A Proposed Two Year Phase II Programme for a National Center in the Republic of the Philippines, 1975. 10 p.

Key Words: Water supply, Sanitation, Rural areas, Developing countries, Institutions, Budgets.

Government departments, agencies and institutes concerned with integrated rural development and water supply and sanitation were visited to ascertain their functions and responsibilities. A series of meetings were held at which objectives, linkages and procedures of the proposed Integrated International Programme were explained and areas of possible participation explored. Project activities, together with estimated budgets were proposed by form institutions. The National Water Resources Council was also proposed to be designated as the National Center within the international network of the Proposed Integrated International Programme.

MANILA WATER SUPPLY PROJECT

Metropolitan Waterworks and Sewerage System (MWSS), Manila. Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Vol. I — Text, Supply Report, May 1976. 196 p, 59 fig, 30 tab, 18 ref, 1 append.

Key Words: Water supply systems, Project summaries, Hydrology, Systems analysis, Reservoir operation, Project feasibility.

A study is made of the proposed improvements to the MWSS supply, treatment, and distribution systems that would sufficiently meet expected water demands of the area through 1982. The supply system covers all storage, regulation and conveyance facilities supplying raw water to treatment plants, and several alternative treated-water aqueducts terminating at the proposed Bagbag distribution storage reservoir. The site for a new treatment plant, together with the aqueducts upstream and downstream, was selected. A review of previous reports, recommendations, analysis of previously proposed facilities and selection of design capacities and characteristics of proposed facilities to be constructed is also included.

1873

RINCONADA INTEGRATED DEVELOPMENT AREA PROJECT: BICOL RIVER BASIN FEASIBILITY STUDY

Tippetts-Abbett-McCarthy-Stratton, New York. Trans-Asia Engineering Associates, Inc., Manila, Bicol River Basin Development Program, Pili, Camarines Sur.

Volume VI — Municipal Water Supply, August 1978. 118 p, 6 fig, 37 tab, 3 append.

Key Words: Bicol River Basin, Rinconada Project (Camarines Sur), Feasibility studies, River basin development, Municipal water, Water supply, Water demand, Water sources, Estimated costs.

In the Rinconada area, the availability of a dependable supply of potable water is needed. Changing times and living habits have imposed greater pollution loads on the environment. Thus, the majority of the rural populations obtain their water supply from questionable sources, mostly shallow ground and surface waters. These are often contaminated by agricultural activities and human carelessness, such as application of pesticides, herbicides, fertilizers and disposal of human wastes. The present report studies two alternative designs for providing a community-type water supply system to the urban centers of Baao, Bato, Balatan, Buhí, Nabua and Iriga City. It is expected that these designs may have to be modified or abbreviated during the implementation phase to adjust to the realities of financing.

2027

WATER SUPPLY FEASIBILITY STUDIES IN THE PHILIPPINES

Gutierrez, L. V.

World Open University

A Dissertation submitted to the Faculty of Advanced Engineering and Technology of the World Open University, Published by American Society of Civil Engineers, July 1977. 16 p, 3 fig, 1 tab.

Key Words: Water supply, Water management (applied), Feasibility studies, Philippines, Benefit-cost analysis, Economic analysis.

This paper discusses the different aspects of the water supply feasibility studies which were made for ten provincial urban areas of the Philippines. More specifically, the paper provides a discussion of the various guidelines which were used for the feasibility studies. One of these guidelines stipulates that a water district must be financially self-sufficient. In connection with this, water rates have been developed which are within the ability-to-pay of the average householder. Aside from the above, an interim plan was selected from an array of alternatives on water sources, source development, water treatment, water transmission and distribution of treated water. The technical and institutional recommendations which were set forth are included in this publication.

WATER SUPPLY AND SANITATION COMPONENTS OF PRIMARY HEALTH CARE IN THE PHILIPPINES

National Hydraulic Research Center, Quezon City.

Report No. 33, April 1978. 221 p, 32 tab, 90 ref, 9 annexes.

Key Words: Water supply, Sanitation, Health, Water policy, Projects, Project purposes, Project summaries, Community development.

The objective of this study is to develop specific recommendations to WHO and UNICEF as to how they can improve their assistance to planning, implementation, use and maintenance of community water supply, and sanitation facilities and services as components of primary health care. The study took into account economic, social, and cultural issues and examined the role of water supply and sanitation within the framework of integrated development. It focused on: priority needs, institutional arrangements, financial aspects, community health and socio-economic well-being, technology, behavioral aspects, and information, training and educational purposes. The study was undertaken by factually studying on-going country experiences and reviewing and analyzing past experiences. The country analysis was made at three levels namely: policy level, project level and local level.

2256

THE SOCIAL SOUNDNESS OF IMPROVING THE WATER SUPPLY SYSTEM IN FIVE PROVINCIAL CITIES: FINAL REPORT

Garcia-Yangas, R. and Unson, D.C.O.

Ateneo de Manila University, Institute of Philippine Culture, Quezon City.

Final report submitted to the Local Water Utilities Administration, April 1976. 104 p, 11 tab, 35 ref, 2 append.

Key Words: Social aspects, Water supply, Water supply systems, Community development, Water resources development, Social change, Social impact.

Presented in this report is a social soundness analysis of a plan to improve the water supply systems in five selected Philippine provincial cities, namely: Bacolod, Cagayan de Oro, Davao, San Pablo and Tacloban. To ascertain the suitability of the projects, the following factors were assessed: (1) the socio-cultural profile of each city's residents; (2) the socio-cultural feasibility; (3) the potential spread of benefits to those who were not included in the initial target population; and (4) the social consequences of the project. Findings indicate that the health, local economy, and quality of life in general will improve with the advent of the systems. In addition, careful monitoring is necessary to make the scheme as closely compatible with and responsive to the needs of the populace.

2257

THE HEALTH AND ECONOMIC IMPACT OF IMPROVED WATER SYSTEMS ON PROVINCIAL CITIES, 1976-1979: RESEARCH PROPOSAL

Ateneo de Manila University, Institute of Philippine Culture, Quezon City.

Research proposal submitted to the Local Water Utilities Administration, August 1976. 178 p, figures, tables, 34 ref, 6 append.

Key Words: Public health, Economic impact, Water supply, Water supply systems, Water distribution (applied), Community development, Research projects.

The research presented in this report identifies the health and economic benefits, and/or deficiencies arising from improved water supply systems. Special attention is given to the effects on the lower-income sector, with squatter groups distinguished from other low and low-middle income groups. Also meriting close scrutiny are the preschool children and women, with attention directed to changes in women's status. The research further attempts to measure the impact of the water supply systems on broad institutional areas of development like commerce and industry. A secondary aim is to assess the actual performance levels of these systems as reflected in directly planned physical and service output.

FEASIBILITY REPORT ON MARAWI CITY WATER DISTRICT

Local Water Utilities Administration, Quezon City, Kampax-Krüger, Copenhagen, DCCD Engineering Corporation, Makati.

November 1976. 275 p, 99 fig, 45 tab, 17 ref, 21 append.

Key Words: Feasibility studies, Water districts, Marawi City, Geomorphology, Water demand, Water supply, Groundwater, Water resources, Design criteria, Planning, Water resources development, Estimated costs, Economic aspects.

A contract was signed between the Local Water Utilities Administration and Kampax-Krüger consulting engineers to perform the feasibility studies, design, and construction supervision for the Marawi City water supply development. The present publication finalizes the feasibility studies and updates, revises and includes additional information and recommendations for the overall Master Plan for the development of the future water supply system. The various topics discussed include: (1) a description of the existing facilities; (2) water demand prognoses; (3) sources of water supply; (4) investigation of groundwater resources; (5) design criteria; and (6) layout and general principles for first phase development.

2450

FEASIBILITY REPORT ON BATANGAS CITY WATER DISTRICT

Local Water Utilities Administration, Quezon City, Kampax-Krüger, Copenhagen, DCCD Engineering Corporation, Makati.

April 1976. 347 p, 50 fig, 47 tab, 18 ref, 30 append.

Key Words: Feasibility studies, Water districts, Batangas, Geomorphology, Water demand, Water supply, Groundwater, Water resources, Design criteria, Planning, Water resources development, Estimated costs, Economic aspects.

The feasibility studies, design, and the construction supervision for the Batangas City water supply development are presented in this report. The present work includes additional information, and revises and updates the preceding Interim Feasibility Report. Recommendations contained herein are for the overall master plan for: (1) the development of the future water supply system; (2) the design criteria; (3) the source of water supply; and (4) the layout and general principles for first phase development. In addition, the report describes the study area and existing water facilities, and presents principal factors affecting water demand, analyzes such, and develops prognoses.

2466

PAMPANGA DELTA/CANDABA SWAMP AREA DEVELOPMENT PROJECT

Department of Public Works, Transportation and Communications, Planning and Project Development Office, Quezon City. Tahal Consulting Engineers Ltd., Israel. University of the Philippines, Institute of Environmental Planning, Quezon City.

Appendix E: Water Supply Studies, 1978. 36 p, 2 fig, 13 tab.

Key Words: Pampanga River Basin, Candaba Swamp (Pampanga), Area redevelopment, Project feasibility, Project planning, Water supply, Water demand, Water quality, Water distribution (applied), Water supply systems.

A review of the present state of domestic and industrial water supply in the project area is presented herein. The appendix sets down some recommendations on the planning of waterworks for future supply with particular emphasis on water quality. Data are presented on present populations and water consumption; and on population projections and forecast water demand up to year 2000. The findings of a water quality survey, conducted in six watersheds in the area, are described and compared to Philippine and U.S. drinking water standards. Finally, the appendix outlines the principles governing the design of the components of urban and rural water supply systems, applying these principles to project requirements.

PROJECT REPORT FOR THE INTERIM IMPROVEMENT OF MONCADA WATER DISTRICT

Local Water Utilities Administration, Quezon City.

Interim Demonstration Program, March 1979. 63 p, 8 fig, 22 tab, 4 append.

Key Words: Water supply systems, Water districts, Water distribution (applied), Water delivery, Water demand, Water resources development, Water supply forecasting, Water resources, Financial analysis, Economic analysis, Progress reports.

Discussed in this report are the engineering and feasibility studies conducted for the Moncada Water District service area. The results of the study revealed that the project is financially viable and sufficient to meet the water needs of the district up to the year 1984. The program includes the planning, design and construction of improvements requiring a relatively low capital investment. It involves: (1) bringing the existing water system up to acceptable standards; (2) extending service to high density areas; and (3) providing a sufficient supply of high quality water to meet the needs of the people within the service area for a short period of time into the future.

PROJECT REPORT FOR THE INTERIM IMPROVEMENT OF PANIQUE WATER DISTRICT

Local Water Utilities Administration (LWUA), Quezon City.

Interim Demonstration Program, July 1978. 63 p, 8 fig, 23 tab, 3 append.

Key Words: Water supply systems, Water districts, Water resources development, Project summaries, Water demand, Water supply forecasting, Water resources, Financial analysis, Economic analysis.

The result of the engineering and financial-economic studies undertaken for the Panique Water District (PAN-WD) are presented. The studies show that there is a need to upgrade the present water system of Panique to bring it to acceptable standards. The recommendations given are: (1) PAN-WD should adopt and implement the construction of the water system improvements as proposed in the report; (2) PAN-WD should obtain the Conditional Certification of Conformance (CCC) and execute a loan agreement with LWUA for the funding of the project; (3) PAN-WD shall proceed with the purchase of additional land where the existing Asamblea Pumping Station is situated; (4) PAN-WD should obtain water rights of its existing sources; and (5) LWUA shall prepare the necessary contract documents for the project, and once the District has achieved a satisfactory level of institutional development, solicit bids from prequalified contractors.

PROJECT REPORT FOR THE INTERIM IMPROVEMENT OF CAMILING WATER DISTRICT

Local Water Utilities Administration, Quezon City.

Interim Demonstration Program, February 1978. 54 p, 7 fig, 20 tab, 2 append.

Key Words: Water supply systems, Water districts, Water distribution (applied), Water delivery, Water demand, Water resources development, Water supply forecasting, Water resources, Financial analysis, Economic analysis, Progress reports.

The report discussed herein describes engineering and feasibility studies conducted for the Camiling Water District service area. The study includes: (1) survey and evaluation of existing water system and available water resources; (2) projection of future population, service area, required water production and consumption; (3) preparation of a water supply plan; (4) preparation of a financial analysis of future revenues and expenses along with proposed water rates; and (5) preparation of socio-economic analysis including an investigation of cost-benefit relationships. The result of the study, as concluded, shows the necessity of upgrading the present water system of Camiling to bring it to acceptable standards.

IMMEDIATE IMPROVEMENT PROGRAM: CALAMBA WATER DISTRICT

Camp Dresser and McKee International, Inc., Boston, Massachusetts. Local Water Utilities Administration, Quezon City.

Interim Report, 1977. 37 p, 7 fig, 17 tab.

Key Words: Water supply, Water supply systems, Water district, Calamba (Laguna), Feasibility studies, Waterworks, Planning, Water resources development, Water demand, Financial feasibility.

The objective of the immediate improvement program of the Calamba Water District is to increase source, transmission and distribution system capability to provide service to its growing population within the 2-year period of the program. This will be done primarily by the construction of a new pumping station replacing the existing one at Bukal Spring, and the installation of 8.71 km of 100,150 and 20-mm pipelines. The main report gives a detailed description of the program, while the addendum to the interim report provides the economic justification of the project.

2672

NORTH COTABATO WATER DISTRICT: WATER SUPPLY FEASIBILITY STUDY

Local Water Utilities Administration, Quezon City.

Final Report, June 1979. 308 p, 44 fig, 86 tab, 5 annexes.

Key Words: Water supply, Feasibility studies, Water districts, North Cotabato, Geomorphology, Waterworks, Population forecasting, Water demand, Water resources, Water resources development, Plan formulation, Construction management, Financial analysis, Economic feasibility.

An engineering, financial and economic feasibility study was conducted for the improvement and expansion of the water systems of Kidapawan, Makilala, and Matalam municipalities of the North Cotabato Water District. From the results of the study, a program of development was formulated. The development plan recommends that: (1) Kidapawan and Makilala should have a water supply system totally independent from that of Matalam by tapping four springs and constructing a ground storage and three reservoirs; and (2) the Matalam system should be expanded by building two deep-wells and two elevated storage tanks. These developments are envisaged to be done in phases from 1979 to the year 2000.

2771

WATER SUPPLY FEASIBILITY STUDIES: METHODOLOGY MANUAL

Local Water Utilities Administration, Quezon City. Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Volume I, 1976. 163 p, 8 fig, 32 tab, 7 ref, 4 append.

Key Words: Water supply, Feasibility studies, Manuals, Project planning, Data collections, Field investigations, Population forecasting, Land use, Water demand, Waste water, Forecasting, Ground-water sources, Wells, Drilling, Construction methods, Surface waters, Design criteria, Water treatment plants, Water distribution (applied).

A compilation of training seminar handouts distributed between January and August 1975, this manual consists of two volumes containing the building blocks in the development of a water supply feasibility study. Bases for planning such as a review and evaluation of existing conditions, problem(s) identification, analysis of existing and future water resources, development of alternative solutions, and selection of a recommended plan are explored in this two-volume project study guide. Volume one discusses among others the study plan and its management, data collection, field studies, ground-water sources, surface water sources, planning and economic criteria, design criteria and water distribution analyses.

WATER SUPPLY FEASIBILITY STUDIES — METHODOLOGY MANUAL

Local Water Utilities Administration, Quezon City. Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Volume II, 1976. 136 p, 18 fig, 35 tab.

Key Words: Water supply, Feasibility studies, Manuals, Construction methods, Construction materials, Estimated costs, Report writing, Water quality control, Water pollution sources, Sewerage, Water pricing, Financial feasibility, Corrosion control.

This second volume provides continuity to the discussions given in volume one. Similarly, topics have been compartmentalized, setting guidelines on the following: material and construction methods; basis of cost estimates; technical report writing; sewerage/wastewater aspects of the water supply feasibility studies; financial feasibility methodology; and corrosion control techniques. Two case studies are presented: one on the identification, analysis and evaluation of alternative solutions and the selection of the recommended program; and the other on comprehensive sewerage plan proposed for Taipei. The ability to pay of low income groups is also analyzed in depth.

2912

PROJECT REPORT FOR THE INTERIM IMPROVEMENT OF VILLASIS WATER DISTRICT

Local Water Utilities Administration, Quezon City.

June 1980. 64 p, 16 fig, 23 tab.

Key Words: Project summaries, Area redevelopment, Villasias water district (Pangasinan), Water district, Water supply systems, Water demand, Population forecasting, Water resources development, Planning, Financial analysis, Economic analysis, Environmental impact.

The report presented herein describes the engineering and feasibility studies conducted for the Villasias Water District service areas. The study particularly includes the following: (1) survey and evaluation of the existing water system and available water resources; (2) projection of the future population, service area, required water consumption and production; (3) preparation of a water supply plan; (4) preparation of a financial analysis of future revenues and expenses with a schedule of proposed water rates; and (5) preparation of a socio-economic analysis including an investigation of cost-benefit relationships.

2915

PROJECT REPORT FOR THE INTERIM IMPROVEMENT OF APARRI WATER DISTRICT

Local Water Utilities Administration, Quezon City.

July 1980. 43 p, 10 fig, 20 tab.

Key Words: Feasibility studies, Aparri water district (Cagayan), Water supply systems, Population forecasting, Water demand, Water resources, Evaluation, Planning, Financial analysis, Economic analysis, Environmental impact.

The results of the study conducted for the improvement of the Aparri Water District in Cagayan are contained herein. Aside from the program's recommendations, the report includes: (1) identification of the needs of the Aparri Water District; (2) definition of the optimum improvements which should be designed and constructed; (3) presentation of the total cost of the project for allocating funds; (4) justification of the expenditure of such funds with regard to the Water District's ability to repay a loan and be self-supporting; and (5) presentation of an economic cost-benefit analysis.

PROJECT REPORT FOR THE INTERIM IMPROVEMENT OF KALIBO WATER DISTRICT

Local Water Utilities Administration, Quezon City. James M. Montgomery Consulting Engineers, Inc., California.

October 1980. 57 p, 9 fig, 24 tab, 2 append.

Key Words: Feasibility studies, Kalibo water district (Aklan), Water supply systems, Population forecasting, Water demand, Water resources, Financial analysis, Economic analysis.

The results of the engineering and financial-economic studies undertaken for the Kalibo Water District as presented in this report, show the need of upgrading the current water system of Kalibo to bring it up to acceptable standards. The extent of work itemized in the study is financially viable and sufficient to meet the water requirements of the district up to the year 1985. Specifically, the studies included the following: (1) survey and evaluation of the existing water system and available water resources; (2) population and water demand projections; (3) preparation of a water supply plan; and (4) preparation of financial and socio-economic analyses.

3118

PHILIPPINES: WATER SUPPLY AND SEWERAGE SECTOR STUDY

World Health Organization, Geneva. International Bank for Reconstruction and Development (World Bank), Washington, D.C.

Volume 1: Main Report, January 1977. 24 p, 1 fig, 25 ref.

Key Words: Water supply, Sewerage, Water resources, Public health, Water quality, Technology, Sewage disposal, Philippines.

The present report contains an assessment of the present situation and an evaluation of the proposed programme of investment in relation to water supply and sanitation, specifically sewage disposal. The study conducted did not only take into account the geography and climate of the country but also considered its population growth and distribution. Recommendations given are not only concerned with economic aspects but also with public health. Suggestions rendered include: (1) high priority for the establishment of proper data base necessary for the development of realistic policies for urban as well as rural areas; (2) improvement of institutional arrangements for better service; (3) improved technology specially in the construction of wells; (4) manpower training; and (5) full utilization of personnel.

8119

PHILIPPINES: WATER SUPPLY AND SEWERAGE SECTOR STUDY

World Health Organization, Geneva. International Bank for Reconstruction and Development (World Bank), Washington, D.C.

Volume 2: Annexes, January 1977. 39 p, 17 tab, 21 annexes.

Key Words: Water supply, Sewerage, Water resources, Water quality, Data collections, Philippines.

The second of two volumes, this publication primarily contains annexes discussing the problems of water supply, possible water resources and waste disposal. Based on researches made, groundwater reservoirs are believed to cover a wide area in the region of Luzon as well as in the other two regions of the country. Data about the rate of water supply both in urban and rural areas are analyzed. Programs and forthcoming investments of the government in relation to the problem of potable water supply and waste pollution are evaluated taking into consideration the important role of population growth. The possibility of accepting assistance from other countries for the installation of wells to avail the rural folk of potable water is also discussed.

PROJECT REPORT FOR THE INTERIM IMPROVEMENT OF TANAY WATER DISTRICT

Local Water Utilities Administration, Quezon City.

March 1980. 56 p, 13 fig, 18 tab.

Key Words: Tanay Water District (Rizal), Feasibility studies, Projects, Project planning, Water supply systems, Population forecasting, Water demand, Water resources, Evaluation, Financial analysis, Environmental impact, Economic analysis.

The engineering and feasibility studies conducted for the service area of Tanay Water District are described herein. The investigations particularly include the following: survey and evaluations of the existing water system and the available water resources; projection of future population, service area, required water production and consumption; preparation of a water supply plan; preparation of a financial analysis of future revenues and expenses together with the development of a schedule of proposed water rates; and the preparation of a socio-economic analysis including an investigation of cost-benefit relationships. Recommendations are also given.

3710

RURAL WATER SUPPLY: DESIGN MANUAL

National Water Resources Council, Quezon City.

Volume I, March 1980. 168 p, 50 fig, 7 tab, 20 ref, 14 append.

Key Words: Water supply, Water supply systems, Design, Manuals, Water sources, Water quality, Water resources development, Wells, Disinfection, Water treatment, Water demand, Hydraulics, Measurement, Distribution systems, Reservoirs, Storage tanks, Pumps.

In line with the national government program of providing water to all areas of the country through technical, financial and institutional assistance to local communities, the National Water Resources Council through its Task Force conducted studies on rural water supply systems and organized their investigations into a three-volume technical manual. The present volume contains reference and training materials for the design and feasibility studies of rural water supply projects in the provinces, and may be used in the design of water systems with a population up to about 4,000 where, only the basic water needs of the intended consumers are catered to by the design criteria chosen.

3711

RURAL WATER SUPPLY: CONSTRUCTION AND INSTALLATION MANUAL

National Water Resources Council, Quezon City.

Volume II, July 1981. 241 p, 68 fig, 9 tab, 34 ref.

Key Words: Water supply, Water supply systems, Construction, Installation, Manuals, Construction materials, Earthworks, Pipes, Pipeline, Valves, Fittings, Wells, Water sources, Concrete construction, Design, Concrete masonry, Metalwork, Reservoirs, Sand filters, Pumps, Paints, Coatings, Cleaning, Tests, Disinfection, Operations.

Providing continuity in the series is this second volume of the Technical Manual which contains reference and training materials for local engineers who are involved in the construction and supervision of water supply systems serving a population of not more than 4,000. The construction and installation of the different components of a small water supply system are discussed in detail with accompanying illustrations.

RURAL WATER SUPPLY: OPERATION AND MAINTENANCE MANUAL

National Water Resources Council, Quezon City.

Volume III, November 1980. 96 p, 25 fig, 10 tab, 22 ref, 2 append.

Key Words: Water supply, Water supply systems, Operation and maintenance, Manuals, Administration, Maintenance, Pumps, Distribution systems, Reservoirs, Sand filters, Chlorination, Disinfection.

Complimenting the previous volume is this final book of the Technical Manual which discusses the operation and maintenance of the different components of a small water supply system. The art of managing small water supply systems is discussed briefly while the operation and upkeep of the following are dealt with in detail: water sources and related facilities; pumping facilities; water distribution systems; reservoirs; slow sand filters; and chlorinators.

4065

URDANETA WATER DISTRICT: IMMEDIATE IMPROVEMENT PROGRAM

Camp Dresser and McKee International, Inc., Boston, Massachusetts. Local Water Utilities Administration (LWUA), Quezon City.

Interim Report, February 1977. 40 p, 7 fig, 14 tab.

Key Words: Urdaneta Water District (Pangasinan), Water districts, Forecasting, Water demand, Water resources, Water supply systems, Population forecasting, Estimated costs.

The preliminary data for the long-range water master plan are contained herein. The necessary "early action" or "immediate improvement" program that may be implemented even before completion or acceptance of the long-range master plan are included. The initial improvements are intended to: provide a high impact/visibility to the consumers in the water district; upgrade the existing water supply facilities; and to provide a strong basis for further expansion of the water supply system.

4066

WATER SUPPLY FEASIBILITY STUDY: BANGUED WATER DISTRICT — VOLUME I

Local Water Utilities Administration (LWUA), Quezon City. Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Final Report, August 1977. 256 p, 47 fig, 73 tab, 11 annexes.

Key Words: Bangued Water District (Abra), Water districts, Feasibility studies, Water supply, Water supply systems, Water plans, Economic analysis, Water resources development, Planning.

Recommended plan to upgrade and expand the water supply systems of the Bangued Water District and related information are presented in two volumes. The present one which is the main report, contains the recommended plan, the description of the water district and existing facilities, the feasibility study criteria, the population and water demand projections, the resources, the analysis and evaluation of alternatives, the description and cost of the recommended plan, the economic and financial feasibility analysis, and the methodology memoranda.

WATER SUPPLY FEASIBILITY STUDY: LOS BAÑOS WATER DISTRICT — VOLUME I

Local Water Utilities Administration (LWUA), Quezon City. Camp Dresser and McKee International, Inc., Boston, Massachusetts.

Final Report, April 1978. 405 p, 67 fig, 69 tab, 11 annexes.

Key Words: Los Baños Water District (Laguna), Feasibility studies, Water supply, Water supply systems, Water districts, Economic feasibility, Water resources, Planning, Urban areas, Water demand, Financial feasibility, Financial analysis.

The recommended plan for the upgrading and expansion of the water supply system of the Los Baños Water District is a technically and economically feasible program for providing the water district adequate water supply up to the year 2000. This volume which contains the recommended plan and the methodology memoranda also includes the description of the water district and the existing facilities, the feasibility study criteria, the population and water demand projections, the resources, the analysis and evaluation of alternatives, the description and cost of the recommended plan, and the economic and financial feasibility analysis.

4068

WATER SUPPLY FEASIBILITY STUDY: PHILIPPINE PROVINCIAL UBBAN AREAS

Local Water Utilities Administration (LWUA), Quezon City. Camp Dresser and McKee International, Inc., Boston, Massachusetts.

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Highlights of the water supply feasibility studies for the urban areas of Ozamis, Daet, Butuan, Zamboanga, Cebu, Lucena, Lipa, Tarlac, Cabanatuan and San Fernando (La Union) are summarized in this report. The investigations involve more than eight percent of all people living in provincial urban areas of the Philippines. The summary findings on pre-feasibility surveys of 131 communities served by 110 waterwork systems are included.

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FEASIBILITY OF LOCAL MANUFACTURE OF THE AID HAND-OPERATED WATER PUMP AND OTHER TECHNOLOGY APPROPRIATE FOR RURAL WATER SUPPLY PROGRAMS IN THE PHILIPPINES

Potts, P.W., Knight, R. and Sternberg, Y.M.

Camp Dresser and McKee International, Inc., Water and Sanitation For Health Project (WASH), Coordination and Information Center, Arlington, Virginia.

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The purpose of this report is to present the findings of a three-man team that visited the Republic of the Philippines to investigate the feasibility of local manufacture of the AID hand-operated water pump and other hardware that might be appropriate for use for rural water supply programs. In summary, the need for a cost-effective shallow well and deep-well hand pump, such as the AID pump, faucet, meter and screen is readily apparent in the light of the need for rural water supplies. It was concluded that the manufacturing capabilities of foundries and machine shops explored in the Philippines for possible production of the AID hand pump, plastic screens, water faucets, and water meters are diverse.