Tampereen teknillinen korkeakoulu
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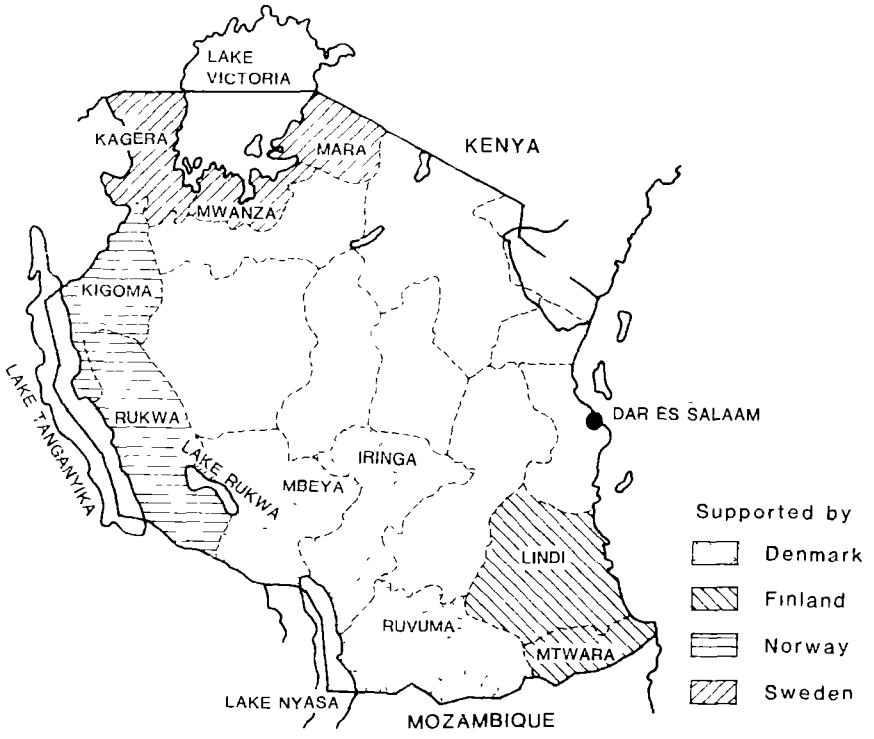
Vesi- ja ympäristötekniikan laitos

Tampere University of Technology
Department of Civil Engineering
Institute of Water and Environmental Engineering

N:o 34

Katko Tapio

Comparison of Four Nordic-Supported Rural Water Supply Projects in Tanzania



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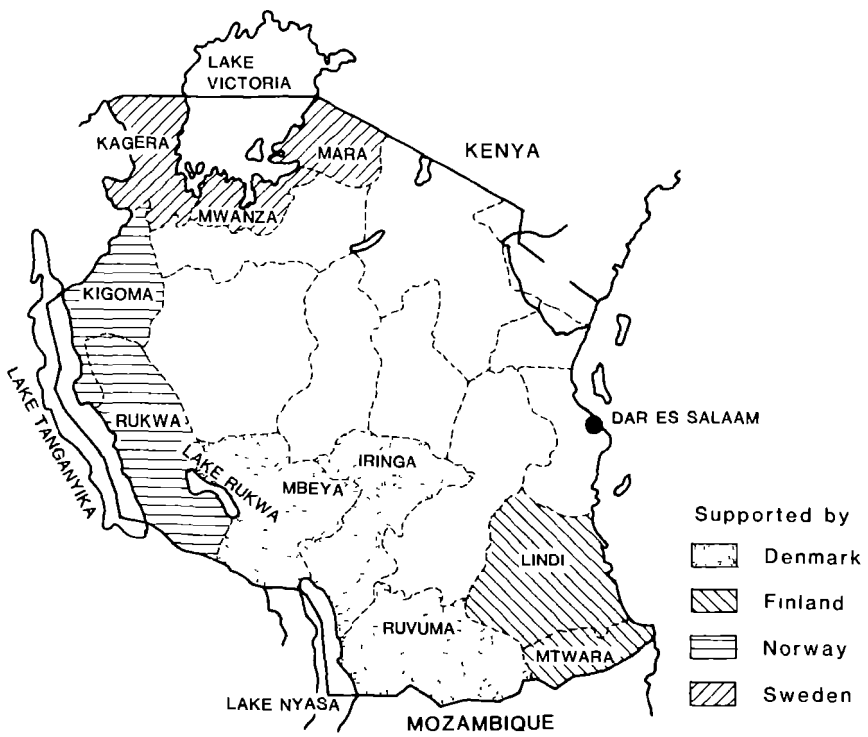

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PREFACE

This study was carried out at Tampere University of Technology (TUT), the Institute of Water and Environmental Engineering, mainly in 1986 - 1987. The study and the preceding survey were both financed by the Academy of Finland. This support is gratefully acknowledged.

The research topic "Development Cooperation Projects in Rural Water Supply and Sanitation - Alternatives for Transferring Responsibility to the Recipients" has been inspired by TUT's involvement in various water sector activities, particularly the postgraduate training programme in and for East-Africa. The theses prepared by the African participants in this programme have made valuable contributions to my work. In the study I have also utilized my field experiences in Malawi and Tanzania.

The study consists of two parts. The first part covers widely the technical and non-technical aspects of externally supported rural water supply projects and was published as a separate volume. That volume is shortly summarized in this report. The major focus of this study is on comparing the approaches of four Nordic-supported rural water supply projects in Tanzania. In December 1987 the two studies combined were accepted as the author's licentiate thesis by the Department of Civil Engineering, Tampere University of Technology.

I would like to express my sincere gratitude to Professor M. Viitasaari from TUT for continuous encouragement and supervision of my study. I also thank the external supervisor of the study, Ms. G. Kurtén from FINNIDA. The views and support, particularly from Messrs. P. Rantala and R. Häkkinen at TUT are also highly appreciated.

A major part of this study is based on experiences of numerous experts and project staff members, particularly from the Nordic countries and Tanzania, who have given their responses and shared their experiences. I thank them all warmly for their voluntary contribution. Special thanks go to Messrs. I. Andersson, J. Heinänen, and T. Laugerud, Dr. R. Lucas, Dr. A. Mashauri, Mr. S. Mukoyogo and Mr. O. Therkildsen for commenting on the manuscript. The Tanzania National Scientific Research Council has granted clearance to conduct this research which is gratefully acknowledged.

The final typing was done by Mrs. P. Lehtonen, Mrs. M. Mäkelä and Mrs. R. Ranta and the figures were drawn by Ms. Sari Merontausta.

Last, but not least, I want to thank my wife Päivi and our son Jemi for their support and patience.

Tampere, December 1987 Tapio Katko

Katko, T. 1987.
Comparison of Four Nordic-Supported Rural Water Supply Projects in Tanzania. Tampere University of Technology, Institute of Water and Environmental Engineering. Publication A 34. 154 p.

ABSTRACT

This study concentrates on analysing and comparing four Nordic-supported rural water supply projects in Tanzania up to the end of 1986. The study also contains a short introduction to technical and non-technical components of rural water supply in developing countries.

A survey was conducted on major constraints on the rural water supply sector in four developing countries. Inadequate operation and maintenance was the most severe constraint. The developing countries laid stress on the lack of trained personnel whereas the foreign experts and supporting agencies were more concerned about inadequate cost-recovery. Multilateral, bilateral and non-governmental organizations are probably all needed in the water supply sector. However, because of their large number, coordination is imperative but also problematic.

The four projects in Tanzania were started by the preparation of regional water master plans. The implementation of the Finnish-supported project was originally based on a crash programme with a quite autonomous organization. After a high rate of construction for several years the responsibility has gradually been shifted to regional water authorities. The Swedish support has been partly based on the total integration of health education, sanitation and water supply. The Norwegian and Danish approaches represent compromises between the above-mentioned projects.

The study was based on analysing literature and project documents, a fairly large questionnaire and a limited amount of interviews mainly in Finland and Tanzania. The study shows that the sooner the responsibility is transferred to the national institutions, the more severe are the typical implementation constraints. Thus the success of a project is strongly related to the objectives. It is, however, difficult to estimate which of the approaches will be the most sustainable in the long run. There is a trend towards integrated projects and institutional capacity building, although some technical systems must be implemented to guarantee the confidence of consumers.

There is potential for private sector development in water supply in Tanzania. In addition to annual reviews, evaluation by independent teams should be encouraged. Reporting could be arranged more systematically and appropriate indicators on institutional building should be developed.

The role of supporting agencies in the operation and maintenance is becoming a key policy issue. In principle, the consumers should be responsible for the schemes. However, some external support will be needed to ascertain operative systems. Pricing of water is becoming absolutely necessary to raise operation and maintenance funds.

Key words: external support, rural water supply, developing countries, major constraints, appropriate technology, human resources development, organizational approaches, Nordic support, Tanzania.

Katko, T. 1987.
Comparison of Four Nordic-Supported Rural Water Supply Projects in Tanzania. Tampereen teknillinen korkeakoulu, Vesi- ja ympäristötekniikan laitos. Julkaisu A 34. 154 s.

TIIVISTELMÄ

Tämä tutkimus analysoi ja vertaa neljää Pohjoismaiden rahoittamaa maaseudun vesihuoltohanketta Tansaniassa. Tutkimus käsittää myös johdannon kehitysmaiden maaseudun vesihuollon teknisiin ja ei-teknisiin komponenteihin.

Tutkimus sisältää maaseudun vesihuollon pääongelmien kartoituksen neljässä kehitysmaassa, mm. Tansaniassa. Käytön- ja kunnossapidon puute todettiin suurimmaksi ongelmaksi. Kehitysmaat painottivat koulutetun henkilökunnan puutetta, kun taas ulkomaiset asiantuntijat ja rahoittajat olivat huolissaan alhaisesta kustannusvastaavuudesta. Kaikkia sektorilla toimivia kansainvälisiä järjestöjä ilmeisesti tarvitaan. Koordinaatio on hyvin tärkeä avunantajien suuren määrän vuoksi, mutta samalla vaikea toteuttaa.

Neljässä pohjoismaisessa vesihuoltohankkeessa Tansaniassa laadittiin ensin läänikohtaiset vesihuollon yleissuunnitelmat. Suomen rahoittama hanke toteutettiin tehokkaalla, sangen itsenäisellä organisaatiolla. Usean vuoden rakentamisen jälkeen vastuuta on siirretty vähitellen paikallisille vesiviranomaisille. Osa ruotsalaisten tukemaa hanketta edistää terveyskasvatusta, sanitaatiota ja vedenhankintaa yhtäaikaisesti. Norjalaisten ja tanskalaisten lähestymistavat ovat edellisten välimuotoja.

Tutkimus perustui kirjallisuuteen ja projektidokumentteihin, laajahkoon kyselyyn sekä rajoitettuihin haastatteluihin lähinnä Suomessa ja Tansaniassa. Mitä aikaisemmin vastuuta siirretään kohdemaan organisaatioille, sitä enemmän joudutaan tekemisiin kehitysmaiden tyypillisten ongelmien kanssa. Projektin onnistuminen riippuu asetetuista tavoitteista. Näiden tavoitteiden paremmuutta pitkällä tähtäimellä on kuitenkin vaikea arvioida. Vaikka integroidut ja institutioita kehittävät hankkeet ovat tärkeitä, tarvitaan myös varmatoimisia teknisiä ratkaisuja kuluttajien luottamuksen säilyttämiseksi.

Tansaniassa on mahdollisuuksia kehittää yksityissektoria vesihuollossa. Vuosittaisten arviointien ohella hankkeet tulisi evaluoida puolueettomasti. Hankkeiden raportointia, kustannusseurantaa ja valvontaa tulisi kehittää.

Rahoittajien mahdollinen osavastuu käytöstä ja kunnossapidosta tulee ratkaistavaksi. Periaatteessa kuluttajien tulisi olla vastuussa laitoksista. Ulkopuolista apua tarvitaan kuitenkin toimivuuden varmistamiseksi. Kuluttajamaksut tulevat ehdottoman välttämättömiksi, jotta käyttöön ja kunnossapitoon saadaan varoja.

Hakusanat: external support, rural water supply, developing countries, major constraints, appropriate technology, human resources development, organizational approaches, Nordic support, Tanzania

LIST OF ABBREVIATIONS

AFYA	Ministry of Health
AMREF	African Medical Research Foundation
CDD	Community Development Department
CPHE	Community Participation and Health Education
DANIDA	Danish International Development Agency
DED	District Executive Director
DWE	District Water Engineer
FIM	Finnish Mark
FINNIDA	Finnish International Development Agency
GTZ	German Agency for Technical Cooperation
Hesawa	Health, sanitation and water
IRA	Institute of Resource Assesment
IRC	International Reference Centre for Community Water Supply and Sanitation
MAENDELEO	Ministry/Department of Community Development
MAJI	Ministry/Department of Water Development
MRIDEP	Mwanza Rural Integrated Development Programme
NORAD	Norwegian International Agency for Development
PMO	Prime Ministers Office
RDD	Regional Development Director
RIPED	Rural Integrated Development Plan
RWE	Regional Water Engineer
SIDA	Swedish International Development Authority
TAS	Tanzanian Shilling
TC RS	Tanzanian Christian Refugee Service
TUT	Tampere University of Technology
UNDP	United Nations Development Programme
UNICEF	United Nations' Children Fund
WDID	Water Development and Irrigation Division
WHO	World Health Organization
WMP	Water Master Plan
WMPCU	Water Maste Plan Coordination Unit
WRI	Water Resources Institute

COMPARISON OF FOUR NORDIC-SUPPORTED RURAL WATER SUPPLY PROJECTS IN TANZANIA

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Background of the Study

Rural water supply and sanitation is often seen as one of the most important sectors of development programmes in third world countries. Many of the developing countries have set an ambitious goal of supplying water and proper sanitation to their people during this international water supply and sanitation decade. The results have, however, been commonly disappointing.

Water supply is also among the main assistance sectors of many external support agencies, although its share of the total allocations is normally only a few per cent.

There are three alternative approaches for meeting the goals of the water decade. We can start by developing appropriate technology which is low-cost but also durable in the conditions of developing countries. Secondly, we can develop the organizations channelling the support and implementing the projects. Thirdly, we can increase funds for the sector. External support seems to be rather declining than increasing. The systems implemented will be sustainable only if adeguate resources are allocated to operation and maintenance. For these reasons local funding is becoming a necessity.

The major focus of the research is on the second option - organizational alternatives for implementing externally supported rural water supply in developing countries. The alternatives are, however, strongly linked with the choice of technology.

The original research topic "Development Cooperation Projects in Rural Water Supply and Sanitation - Alternatives for Transferring Responsibility to the Recipients" is based on the previous studies carried out at the Institute of Water and Environmental Engineering, Tampere University of Technology (TUT). In 1983 a presurvey was made to find out where development and research were most needed in the sector. In 1984 the study was continued with the emphasis on development cooperation projects. This bore the need for research on alternatives for transferring responsibility to recipients. Since 1979 East-African water engineers have been trained at TUT and they have contributed to this research through their M.Sc. theses and doctoral dissertations. The author's field work in Malawi and Tanzania as well as several shorter visits to the East-African region have given necessary background orientation to the research topic.

1.2 Objectives and Hypothesis of the Study

The primary objectives of this study focus on the following two questions:

1) What types and levels of technology should be used in development cooperation projects in the field of water supply and sanitation so that these could be implemented, if possible, under the responsibility of the national institutions?
2) What are the organizational requirements for implementing the above mentioned projects?

Additionally, the concrete planning and implementation constraints are to be studied. It is **hypothesized** in this study that the sooner the responsibility is transferred to the national institutions, the more the projects face typical implementation constraints in developing countries. These constraints affect the possibilities for achieving the goals and they can be

- bureaucracy,
- lack of cooperation and coordination,
- unclear rules and by-laws and difficulties in their interpretation.
- import restrictions, and
- lack of foreign currency,

With careful planning some of those constraints can be avoided. However, because of continuously changing conditions, certain flexibility is always needed.

The topic on responsibility transfer was especially relevant to the projects supported by FINNIDA and implemented by autonomous or distinct management units. In this study it was also necessary to deal with other approaches stressing more institutional capacity building.

1.3 Structure of the Study

The study consists of two parts: the first one gives a summarized framework of the externally supported water supply sector including technical and non-technical aspects and the second one is a comparative study on four Nordic-supported projects in Tanzania.

The first part includes the justification of water supply and sanitation, trends of external support in the sector, a survey on major constraints in the sector in four countries, classification of appropriate technology, human resources development as well as institutional and organizational alternatives for external support in rural water supply. These aspects are shortly summarized at the beginning of this report.

The main focus of this report is on the analysis and comparison of the four Nordic-supported rural water supply projects in Tanzania. All these projects started with the preparation of regional water master plans. This was followed by implementation, the major concern in this context. In 1978 the Finnish International Development Agency (FINNIDA)-supported project in south-eastern Tanzania started implementation as the first of these four projects. It was for long based on an autonomous and efficient implementation organization. Later the responsibility has been transferred gradually while increasing efforts on institutional building.

Since the mid-1960s the Swedish International Development Authority (SIDA) was the first external agency to support the sector through programme-type assistance. After the preparation of the water master plan and two implementation plans the actual implementation was started in 1983. This project presents the opposite approach which concentrates on motivation, promotion and institutional capacity building at the first stage aiming at

gradual increase of construction at later stages. The project aims at integrating fully the three sectors of water supply, sanitation and health education.

The histories of the Danish International Development Agency (DANIDA)- and the Norwegian International Agency for Development (NORAD)-supported projects are shorter. They are based on approaches which in many aspects combine the characteristics of the two earlier projects.

This study concentrates on rural water supply and deals with sanitation and health education to a limited amount only. The study starts with an outline on the water sector resources and water supply development. Thereafter the history of the projects is described and selected input and output data with time correlation are presented. However, the aim is by no means to make any cost-benefit analysis for comparing the projects. Because of different backgrounds, objectives and conditions of the projects the cost-benefit analysis is not considered feasible. The history and the data are mainly based on project documents. The results of the fairly comprehensive questionnaire are analysed. The projects are divided into various stages according to their approaches which do not necessarily correspond to administrative and financial phases of projects. On the basis of the questionnaire a project profile of fifteen selected characteristics is formed for the stages with adequate responses. Those responding to the questionnaire were project staff members, donor representatives or national professionals. Because of practical limitations the study did not cover the views of the ultimate beneficiaries, the consumers.

In the discussion primary inputs and outputs of the projects are compared. Five selected characteristics describing all the stages of each project are analysed. These selected common characteristics between the projects, the interest groups and the professional backgrounds of the respondents are compared. The results of the two parts of the whole study are synthesized by a project process model applicable particularly to distinct or autonomous management units. Finally conclusions and recommendations are presented.

Parts of this study have been published separately, namely

Katko, T., 1986.
Major Constraints in Water Supply in Developing Countries. Aqua Fennica. Vol. 16, no. 2. p. 231 - 244.

Katko, T., 1987b.
Organizational Alternatives for Externally Supported Rural Water Supply. Aqua Fennica. Vol. 17, no. 1. p. 3 - 15.

Katko, T. 1987c.
Technical and Non-Technical Aspects of Externally Supported Rural Water Supply Development in Developing Countries. Tampere University of Technology, Institute of Water and Environmental Engineering. Publication A 33. 112 p.

2 TECHNICAL AND NON-TECHNICAL ASPECTS OF EXTERNALLY SUPPORTED RURAL WATER SUPPLY DEVELOPMENT

2.1 Contents of External Support in Rural Water Supply

The development of rural water supply and external support in developing countries include many aspects. They are commonly classified as technical and non-technical or as "hard" and "soft" components. This study focuses rather on balancing the different components which are all necessary.

Figure 2.1 shows the approach and the structure for external support in rural water supply in this study. The chapter 2.2 discusses the justification of improved water supply and sanitation. The following part deals with trends and forms of external support in the sector. Major constraints in the sector, particularly in Kenya, Malawi, Sri Lanka and Tanzania, are then discussed. Appropriate technology focuses on technical alternatives and the scope of "appropriatness" including technical, environmental, economical, financial, social and cultural dimensions. Views on human resources development in the sector are presented in the chapter 2.6. The final chapter covers the institutional and organizational alternatives for channeling external support. The contents of the whole chapter 2 are discussed in more detail in Katko (1987c).

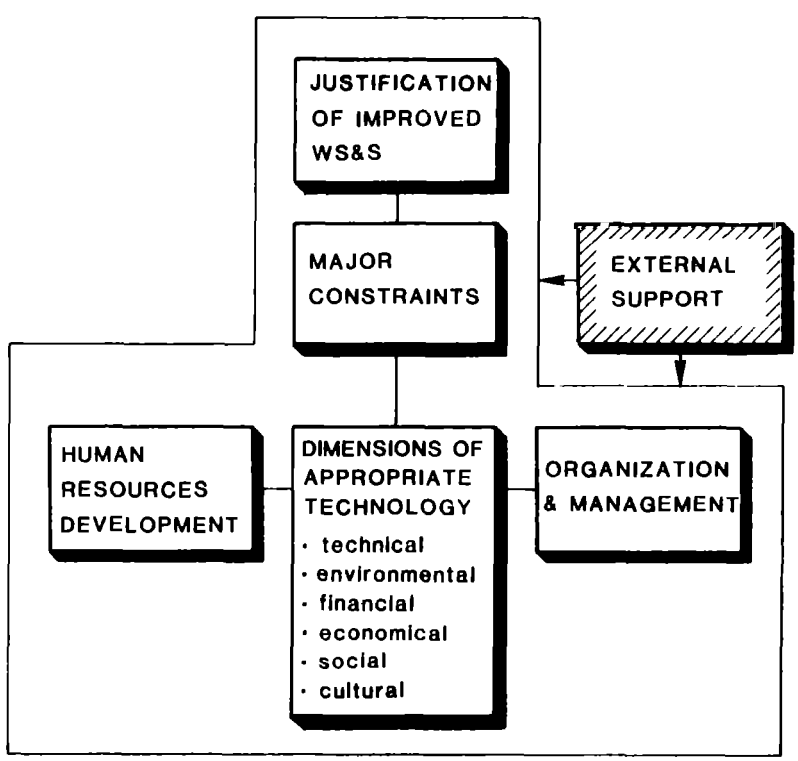


Figure 2.1 Structure of external support in water supply.

2.2 Justification of Improved Water Supply and Sanitation

The World Health Organization has estimated that 80 per cent of all diseases in the world are water-related. It is assumed that

improved water supply and sanitation will improve health and thereby overall living conditions. However, the studies made in several parts of the world show that proper water supply alone improves health conditions fairly little. Drinking water often gets contaminated on the way from the source to where it is used.

Thus a safe water supply by itself is not adequate although it is the basic requirement for improved health. Additional sanitation and health education components are needed.

It is obvious that the potential of economic effects caused by improved water supply and sanitation has not been adequately considered. Particularly time and energy are saved by organized water supply and sanitation. On the contrary what is sometimes claimed there seems to be enough evidence on the value of time in developing countries. There is some evidence that consumers even in rural areas are willing to pay for water if not otherwise available.

Improved water supply can also be used for productive purposes and thus it will have direct or indirect economic benefits.

Family planning is perhaps what the developing countries need most urgently. It is probably not possible without improving the living conditions. Water supply and sanitation are some of the basic requirements for improving those conditions.

2.3 Supporting Agencies in Drinking Water Supply and Sanitation

There are many bilateral, multilateral and non-governmental organizations involved in the water sector. The present International Drinking Water Supply and Sanitation Decade (IDWSSD) has hardly managed to attract additional resources to the sector. On the other hand, it is obvious that the sector allocations would have been lower without the Decade.

As for the volume of assistance the share of multilateral organizations such as the World Bank and the development banks is slightly decreasing. Respectively the bilateral and non-governmental support is increasing relatively slightly. However, an increasing amount of bilateral support is channelled via multilateral organizations as so-called multi-bi support. Additionally, the cooperation and coordination of different organizations is getting more and more important.

Bilateral agencies typically give 2 to 4 per cent of their total assistance to the drinking water supply and sanitation sector. The WHO, which acts as a coordinator of the Water Decade, gives only about 4 per cent of its total funds to the sector. The respective figure for the World Bank has been about 5 per cent.

The dissemination and development of appropriate technology is probably well suited to the roles of international organizations, particularly the World Bank. Bilateral organizations are often more suitable for supporting the implementation of rural water supply and sanitation. The international assistance to water supply and sanitation has so far concentrated on investments, mainly on

constructing new schemes. The needs for rehabilitation and, above all, operation and maintenance have become very important issues.

The different supporting agencies seem to have their own preferences in water supply and sanitation development. The argument concerning the best supporting agency in the sector is, however, irrelevant. The key issue is the coordination between the different organizations to make the support as efficient as possible.

2.4 Major Constraints in Water Supply in Developing Countries

The survey on the major constraints in the sector was based on a literature review, a questionnaire and some structured interviews (Katko 1986).

A modified version of the WHO form on major constraints was utilized in the questionnaire. The questionnaire covered the rural water supply sector in four countries: Kenya, Malawi, Sri Lanka and Tanzania.

In spite of differences between the selected countries and between the different areas in each country, there is a remarkable number of similarities. **Lack of proper operation and maintenance combined with logistics is seen as the most severe constraints** both by national governments in developing countries and by foreign experts. The developing countries place more stress on the need for trained personnel and funding, whereas foreign experts are more concerned about **cost-recovery.**

The water sector has a high number of supporting agencies, e.g. in Tanzania there are more than ten bilateral agencies in the sector in addition to multilateral and non-governmental organizations. In this study especially the few professionals from developing countries mentioned the need for more coordination.

Coordination seems to be quite a difficult issue in practice. Instead of maximizing the number of official meetings coordination should be optimized. Thus cooperation in formal and informal ways is quite dependent on the positive attitudes of the personnel of different parties.

There are several ways to overcome the constraints such as

- allowing more time for development,
- reorganizing the use of resources,
- attracting more internal resources,
- attracting more external resources,
- developing appropriate technology,
- building and developing institutional capacity,
- using the experience from other developing areas, and
- developing human resources.

The first issue is difficult for the external agencies since they want to have measurable results. It seems to be impossible to attract significantly more external resources to the sector. By

developing appropriate technology it is possible to decrease the cost and increase the reliability of schemes. Institutional capacity building and development of managerial skills are important. The experiences from other developing areas in a country and different countries should be utilized more. In fact, the dissemination of information is quite inadequate among the external agencies, too.

Although all the above aspects are important, it seems obvious that we should seriously try to attract more internal resources. Since the central and even the local governments will not be able to increase their allocations, the consumers should pay for water in one form or another.

2.5 Appropriate Technology

Appropriate technology involves technical, economical and socio-cultural dimensions.

Technical appropriateness

Water consumption for domestic purposes often seems to be less than the commonly used design criteria of 30 l/c · d in rural areas. However, there are cultural differences regarding the use of water for washing and other purposes. The watering of cattle and other productive uses can increase consumption significantly.

Where available, ground water should be the primary source of domestic water supply because of its better bacteriological quality. However, ground water can contain dissolved inorganic solids demanding treatment. In areas of fast population growth in developing countries there is also a risk of ground water pollution.

The deficient knowledge about existing water resources and insufficient exploration efforts are a much bigger problem than the limited water resources.

The worldwide efforts during one decade on hand-pump development have brought good results. International and bilateral organizations, hand-pump manufacturers and a number of developing countries participated in this development. However, other appropriate technologies should also be developed.

Many developing countries have, particularly earlier, concentrated on piped and pumped water supply schemes in rural areas. With the economic and operational problems more simple and lower-cost technology is in many cases needed.

Water treatment should be avoided as much as possible. The sources should rather be protected and treatment should be introduced only if absolutely necessary. The author is very concerned about the promotion of boiling of water even by international agencies such as UNICEF. With the common lack of fuel wood, boiling of water should be promoted only in case of infants or an emergency.

Storing of water is one simple way of water treatment. Slow sand filtration is in principle a good treatment method but it faces problems of high turbidity during the rains. Water quality control in rural areas should be simple and should concentrate on sanitary inspections and simple field analyses.

Plastic materials have become very popular in water distribution. However, plastic pipes are easily destroyed by ultraviolet rays and therefore should not be exposed to direct sun-light. Plastic pipes are also often damaged during transportation and are not always properly installed and covered.

In many developing countries water is sold by water vendors. It has been suggested that vending could be institutionalized to guarantee fair pricing of water. Vending could probably be applied in sub-urban areas.

The term "appropriate" technology is often used synonymously with "simple" or "low-cost" technology. In the implementation of rural water supply this is often relevant. However, also advanced or "high" technology is needed, e.g. in deep ground water inventory.

The latest developments in appropriate hand-pumps present "low-high" technology. From the consumer's point of view they are simple to use but from the manufacturer's point of view they represent fairly high technology. The materials should be light and durable which means the best ones available. Another example of this "low-high"-technology are the plastic pipes. The most durable pipe is manufactured by quite advanced technology.

Economic appropriateness

Applied technology should be selected so that the beneficiaries and the suppliers will have enough resources to keep the schemes operative. At least the major responsibility of the operation and maintenance should lie on the consumers.

Since the central government, local government and also external resources will be limited, the only alternative is to get contributions from the consumers. Thus the common policy in developing countries of **"water for all free of charge" must be reconsidered.**

The options and limits of cost-recovery in rural water supplies particularly in Kenya, Sri Lanka and Tanzania were discussed in a workshop organized by the author in May 1987 (Katko 1987a). The conclusions of the workshop were as follows:

- If cost-recovery is not introduced in one form or another, the low level of operation will continue. Thus the need for cost-recovery is clear.
- Before starting to charge for water in rural areas, tariff structures in urban areas should be reconsidered. Quite often the urban tariffs are lower than those in rural areas.
- Ability to pay for drinking water is often fairly evident. Ways of estimating actual affordability should be developed in order to decide on affordable fees.

- Examples indicate that in spite of the obvious affordability consumers may lack the willingness to pay. A "felt need" must be created in the consumers and it can be developed, e.g. by promotional activities, community involvement and water committees.
- Direct payment is probably more appropriate than taxation and more fair to the consumers.
- Introducing water pricing to all consumers is a basic requirement. This can promote individual responsibility and thus avoid wastage of water.

Operation and maintenance problems are generally the most severe constraints in the sector as shown by Katko (1986, 1987b).

Until recently developing countries have concentrated on constructing new schemes partly because of international support. If most of the constructed schemes were maintained and kept operative, it would be impossible to have any funds for new investments in many developing countries. It is likely that the governments in developing countries have escaped bankruptcy in the sector development only because most of the water schemes are not operative. Thus there is an urgent need to develop methods for recovery by increasing local funding. Although donors have financed many investments, it is uncertain whether they would be willing to pay for operation and maintenance. On one hand they should take some responsibility of the operation and maintenance activities but on the other hand the recipient country and particularly the consumers should be responsible for operation and maintenance.

Social and cultural appropriateness

The role of community participation in water supply and sanitation has been discussed a lot during the last decade. It has often been presented as a "solution" for the sector's development. This approach can be accepted in principle. However, the author's view is that instead of participation we should rather speak of community involvement or contribution. In this context the social and cultural aspects become important. If we make a careful analysis of communities we could charge for water from those who can afford it. Thus there is a link between cost-recovery issues and social factors.

In rural areas women are the main users and drawers of water. Therefore their role in water supply and sanitation should be encouraged. However, in practice this seems to be quite difficult. Men are traditionally better represented in political and social communal decision-making. Nordic ideas of women's equality do not necessarily apply in the developing countries.

The author interviewed a number of professionals, mostly with engineering background. Their general view was that so-called socio-economic studies are often biased towards social aspects or rather that they lack economic consideration.

Cultural aspects are particularly important in sanitation and they are closely related to health education. There can be a great variety of taboos, beliefs and customs which can hinder proper

sanitation. In southern Tanzania there is a clear correlation between the religion of inhabitants and their sanitary behaviour. In Moslem coastal areas it is very difficult to introduce sanitation without water. In most of the Christian inland areas it is easier to introduce latrines. In Ethiopia some ethnic groups will not defecate on a spot where someone has done it earlier. Introduction of improved latrines in these circumstances will not be possible without long-term educational efforts.

Framework for appropriate technology

As a summary we can present a list of criteria to describe the nature of appropriate technology classified by technical, economical and socio-cultural aspects (Table 2.1). Additionally, the importance of each criteria in the categories is presented. Respectively, environmental aspects are included in the technical and financial aspects in the economic category.

Felt need for improved water supply is mainly a socio-cultural aspect. A number of technical aspects form the necessary, although by itself inadequate basis for improved services. Economic category serves as a link between technical and socio-cultural categories. For appropriate water supply, development of all these aspects is needed.

2.6 Human Resources Development

Human resources development contains planning, training and management aspects.

Well and pump caretakers can be trained on-the-job or in-service. Additionally refresher courses at different levels will be needed. Women or older men, who will stay in the village or community, should be selected. Foremen are typically trained on-the-job, too.

Training of technicians is commonly taken care of by national institutions. When externally supported projects train skilled workers, foremen or technicians it is important that the successful participants will be given degrees that are acceptable by national authorities.

The externally supported projects could also offer traineeships to national college and university students. The author's view is that the externally supported projects should establish better links with the national training institutions. On the other hand the national training institutions should have the main responsibility over the sector and the externally supported projects should be seen only as supporting units. Still training must be an integral component of any externally supported water project. This includes the training of trainers for community and consumer promotion and participation.

It is important to note that the externally supported **water projects should also train the human resources of the donor countries.** In some fields of water engineering the donor countries expertise can be quite limited. The author's view is that this fact should be openly and positively accepted.

Table 2.1 Primary, secondary and tertiary criteria for technical, economical and social appropriateness of rural water supply in developing countries suggested by the author.

Criteria	Category of appropriateness		
	Technical[1]	Economical[2]	Socio-Cultural
Felt need		xx	xxx
Quantity	xxx		
Quality	xxx		
Availability	xxx		
Accessibility	xxx		
Reliability	xxx		
Functioning	xxx	xx	x
Ease of operation and maintenance	xxx		xx
Affordability		xxx	
Consumers' willingness to pay			xxx
Fund collection and management	x	xxx	x
Motivation-building		xxx	x
Participation			xx
Sexual equality			xx
Behavioural change			xxx

1) including environmental aspects
2) including financial aspects

xxx primary
xx secondary
x tertiary

2.7 Institutional and Organizational Alternatives for External Support in the Water Sector

It is obvious that the use of individual experts and volunteers without the necessary supporting facilities and services is quite inefficient. It should preferably be linked in one way or another with other externally supported projects or programmes.

A team of experts fully integrated into the local administrative system can be utilized in planning and research activities.

Distinct project management units within the line ministries or departments have access to supporting services like imported equipment, spare parts, independent financial channels and possibilities to recruit national personnel. The more complex and large the units are the more these services are needed. There is a tendency for these units to become autonomous. If the technology used in a country is new such as ground water resources inventory, autonomous units can be justified. However, these units should be integrated into the national administrative and institutional framework as early as possible.

An organization which has succeeded in one country, or one field of industry like electricity supply, cannot necessarily be duplicated. In each case organizational alternatives must be critically examined.

Naturally, institutional and organizational alternatives are very closely linked with the resources available (human, material and water) and the technology used. The nature of the projects, i.e. the type and level of technology needed is, in the author's view, one of the most important matters in selecting an organization. Another point is the need for continuous organizational development and change. This is especially true with long-term projects and assistance in a large area.

The private sector can also greatly contribute to the field of water supply. This can mean local manufacturing of hand-pumps by joint ventures or manufacturing of simple water treatment units. It can also mean institutional support in operation and maintenance.

The integrated rural development approach, often including water resources development, seems to be becoming more prevalent. Water supply and sanitation can be included in these projects but directly productive uses of water like irrigation and hydropower are probably of more importance in integrated rural development.

When integration is limited to water supply, sanitation and health education, the first one seems to be the key technical function onto which the other two can be linked.

Development assistance funds have, to some extent, been used for buying the services of foreign consultants and exporters. It has been said that development assistance should not be used to support commercial export activities. This criticism is understandable. However, the author's opinion is that there are fields where foreign exports are the only alternative. These export activities can be supported if the technology offered is appropriate for the conditions of the developing country.

The importance of knowing local conditions is now recognized by foreign exporters, too. Joint ventures between a foreign exporter and the local partner have many advantages. For instance, local production of hand-pumps could be realized through joint ventures. On the whole, local participation in project export is deemed vital. There are probably numerous similarities between organizing development assistance and export activities. They should not be seen as contradictory but rather as supporting each other.

3 THE OBJECTIVE AND METHODOLOGY OF THE STUDY

3.1 Objective

The main objective of the study on four Nordic-supported rural water supply projects in Tanzania was to gather experiences on different organizational approaches of implementation.

The projects of the study according to their starting time were as follows:

(i) Mtwara-Lindi rural water supply project (FINNIDA),
(ii) Health, sanitation and water programme in Kagera, Mara and Mwanza regions (SIDA),
(iii) Water supply and sanitation development, Kigoma and Rukwa Regions (NORAD), and
(iv) Rural water supply project in Iringa, Mbeya and Ruvuma regions (DANIDA-supported).

Each of these projects was started by preparing a water master plan. However, the main interest of the study has been on the implementation phases.

3.2 Methodology

The study was based on a review of the project documents such as progress, phase, review and evaluation reports, seminar and conference papers as well as other consulting and occasional documents. Based on the documents and a few interviews simplified input-output tables on selected aspects were produced for each project. Most of these documents were attained from the Nordic support agencies. Sometimes it proved to be quite difficult to have access to the documents of the projects. In some cases particularly with the DANIDA-supported project "confidentiality" was used as an excuse for the unavailability of the reports.

As a second method a fairly compehensive questionnaire was developed including 49 questions, most of which were divided into sub-questions. Two different versions of the questionnaire were tested on a dozen of experts. The first version was mainly tested on TUT staff members with working experience in the case country. Respectively the second version was tested mainly on former Finnish project personnel. The latter version was also used for open-ended interviews of six persons in Finland and twelve persons in Tanzania.

The final version included background questions (2), questions on a particular project (41) and general experiences (6) (Appendix 1). Additionally, the questionnaire was divided into sub-groups according to the fifteen characteristics of interest in the study. The questionnaire included several questions on each characteristic. The level of each characteristic was either calculated from several questions or one summarizing question included. The results of the testing procedure were also utilized in the final analysis of results.

The author divided the projects into different stages according to their approaches which do not necessarily match with the

financial or administrative phases. The respondents were required to give their comments on the latest stage they were involved in or which they had observed. The questionnaire forms were filled between December 1986 and February 1987. The limited number of interviews were held during the same period. Thus the analysis in most cases covers the projects till the end of 1986.

Coverage, interest groups and professional background of respondents

The respondents were classified into four interest groups: project personnel, Tanzanian civil servants, donor representatives and other foreign experts knowledgeable about the project (Table 3.1).

Most of the consultants involved in the projects provided an address list of the persons requested. Additionally, the connections of TUT and the author were utilized.

Table 3.1 Respondents to the questionnaire classified according to their interest groups and the projects.

Interest group	Number of respondents Major donor of the project				
	DANIDA	FINNIDA	NORAD	SIDA	Total
Project staff (expatriate)	10	26	15	20	71
Project staff (Tanzanian)	1	1	0	1	3
Project staff & expatriate advisor	1	0	1	1	3
Project staff & expatriate advisor & donor representative	0	0	0	1	1
Tanzanian civil servant	2	4	0	1	7
Expatriate advisor	1	6	2	1	10
Expatriate advisor & donor representative	0	1	0	0	1
Donor representative	3	3	0	2	8
Other	0	3	0	2	5
Total	18	44	18	29	109

The questionnaire was sent to 380 persons. The total number of respondents including the test versions and interviews was 120. The questionnaire was sent to all persons with known or possible involvement in the projects in one form or another. Altogether 20 forms were sent back unfilled. These persons either regarded their experiences insufficient or irrelevant because of a long time since their involvement. About 50 persons of the total number have been working as bilateral experts or volunteers in Tanzania. Some of their addresses as well as a few others' were most probably out of date.

The total maximum number of potential respondents is estimated to be about 270 (Table 3.2). This means a total estimated coverage of about 40 per cent. Although the respondents did not always answer all the questions, the coverage can be regarded quite satisfactory. However, the amount of Tanzanian respondents

was quite low and thus it is not possible to thoroughly identify their particular views.

Table 3.2 Estimated response coverage of the questionnaire.

	Project				
	DANIDA-supported	FINNIDA-supported	NORAD-supported	SIDA-supported	Total
Number of respondents	18	44	18	29	109
Estimated potential no. of respondents	60	80	60	70	270
Estimated coverage (%)	30	55	30	40	40

The respondents were classified according to their professional background (Table 3.3). In this context a maximum of two professional fields of expertise for each respondent were taken into account. For each project the largest interest group was civil engineers specialized in water engineering.

Particularly in the analysis of open-ended questions the respondents were classified as persons directly involved and indirectly involved (outsiders) in the projects.

Table 3.3 Number of respondents classified according to their profession and secondary field of specialization.

Profession	Secondary field of specialization A	B	C	D	E	F	G	H	Total
DANIDA-supported project									
A Hydrologist	1		1						2
B Hydrogeologist & Geophysicist		1		1					2
C Civil Engineer			1	1		1			4
D Civil Engineer, specialist in water engineering				3	1		1		4
E Chemist/Limnologist/ Microbiologist					1				1
F Economist									-
G Socio-Economist							1	1	2
H Other								3	5
									18
FINNIDA-supported project									
A Hydrologist									-
B Hydrogeologist & Geophysicist	3								3
C Civil Engineer		4		5			2		11
D Civil Engineer, specialist in water engineering			20				2		22
E Chemist/Limnologist/ Microbiologist									-
F Economist									-
G Socio-Economist							1		1
H Other								8	8
									45
NORAD-supported project									
A Hydrologist	2								2
B Hydrogeologist & Geophysicist									-
C Civil Engineer			2	2					4
D Civil Engineer, specialist in water engineering				4			1		5
E Chemist/Limnologist/ Microbiologist					2				2
F Economist									-
G Socio-Economist							1		1
H Other								4	4
									18
SIDA-supported project									
A Hydrologist									-
B Hydrogeologist & Geophysicist	1							2	3
C Civil Engineer		1	2		3				6
D Civil Engineer, specialist in water engineering			6		1			1	8
E Chemist/Limnologist/ Microbiologist				1					1
F Economist							3		3
G Socio-Economist							1		1
H Other								7	7
									29

4 OUTLINE OF RURAL WATER SUPPLY DEVELOPMENT IN TANZANIA

4.1 Background of the Geographical Features, Population, Economy and Water Resources

Geographical features

The mainland of the United Republic of Tanzania is divided into 20 regions (Figure 4.1). Regions are further divided into districts, divisions, wards and villages. The figure shows the regions of the bilateral Nordic water projects of this study.

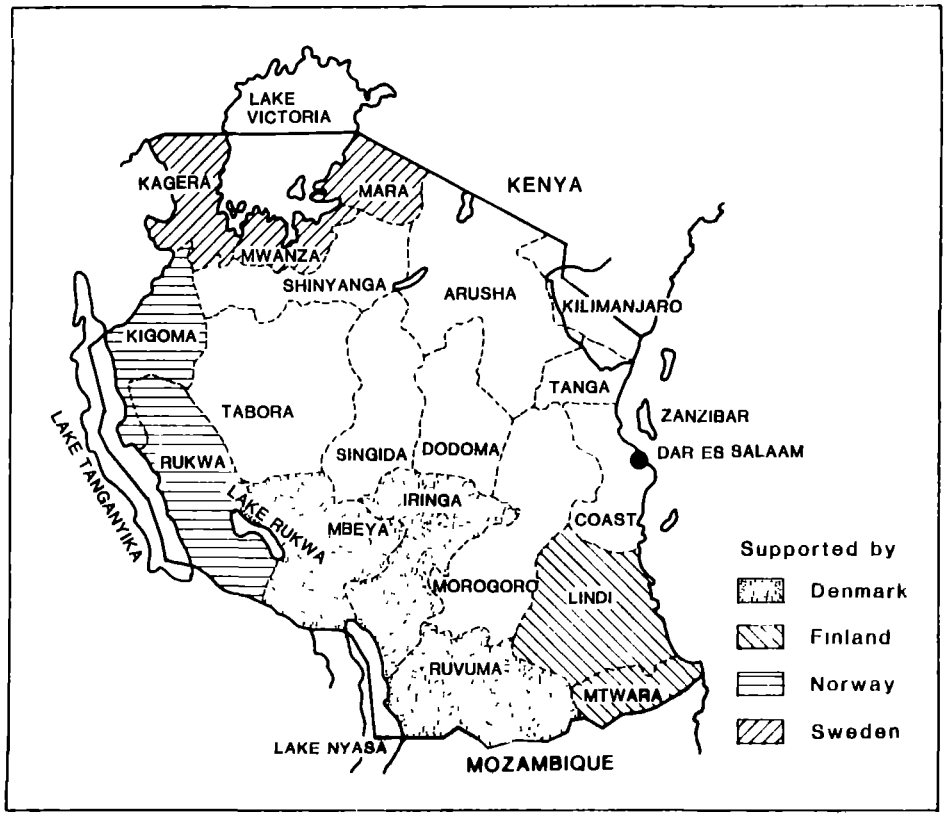


Figure 4.1 Regions of the mainland of the United Republic of Tanzania and the location of the Nordic-supported rural water supply projects.

The country's total area is about 947 000 km^2 including about 53 000 km^2 of inland waters. The land area is surrounded by three lakes namely Lake Nyasa (Malawi), Lake Tanganyika and Lake Victoria. On the western side of the humid and hot coastal plains, there are plateau areas at 300 - 1500 meters with higher summits up to 5000 meters (Figure 4.2).

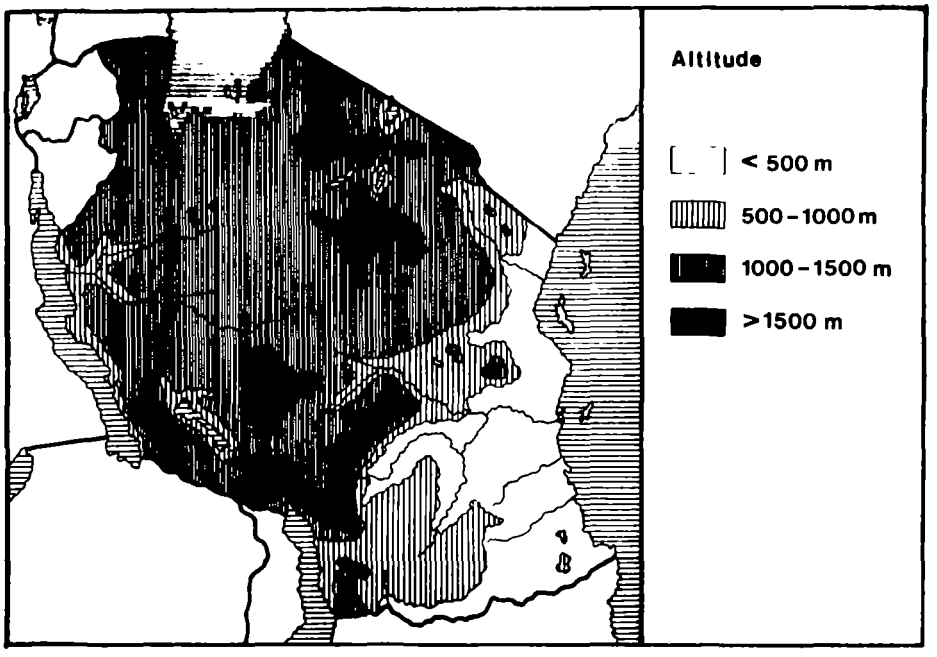


Figure 4.2 Average altitudes in Tanzania (FINNIDA 1984b).

Population

In 1982 the total population of the country was estimated to be about 20 million of which around 90 per cent lived in rural areas. The annual population growth rate is 3,2 per cent (Msimbira 1986). Figure 4.3 shows the zones of high population density. Among them are particularly the south-eastern parts of the Mwanza and Mtwara regions.

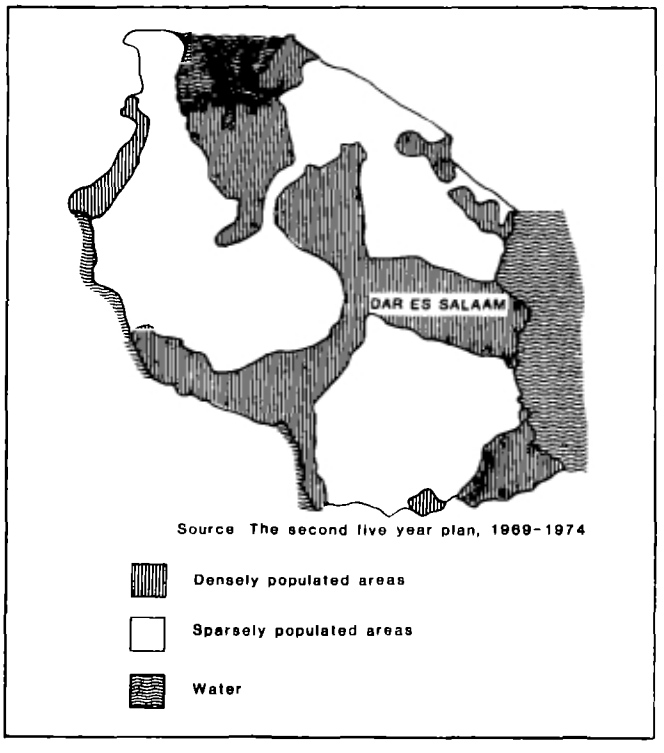


Figure 4.3 Zones of high population density in Tanzania (Rimer and Associates 1970, vol. II).

Economy

The average per capita Gross National Product (GNP) in 1981 was estimated at USD 280 (International Monetary Fund 1983). Agriculture dominates the national economy and accounts for about 50 per cent of GDP and over 80 per cent of export earnings. Agricultural production has, however, not increased with the population growth and in the 1980s the country has had a bad economic crisis.

In spite of declined imports, Tanzania has spent about twice as much on imports as she has earned from exports. This crisis has created other economic problems like a government deficit, inflation, industry working at 20 to 40 per cent capacity and a growing parallel market. Since 1978 the International Monetary Fund (IMF) and the Government have had negotiations and in 1986 they finally reached an agreement. As a result the Tanzanian shilling has been devaluated more or less continuously. Other steps have also been taken to liberalize the economy (Kleemeier 1987).

Water resources

The average annual precipitation in different parts of the country is shown in Figure 4.4. The highest annual values are over 1600 mm and the lowest values about 600 mm. More than one half of the total area of the mainland receives less than 750 mm per annum. In most parts of southern and central Tanzania the rainy season lasts from November to April. In the northern and north-eastern parts there are normally two shorter rainy periods.

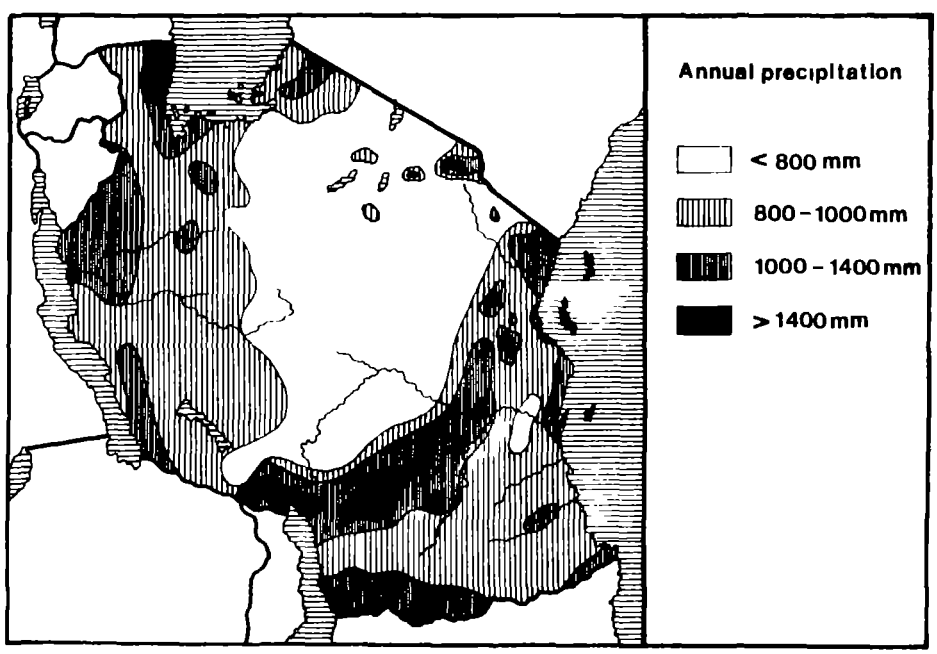


Figure 4.4 Annual average precipitation in Tanzania (FINNIDA 1984b).

Evapotranspiration is under 600 mm per annum on the inland plateau areas. The highest values are close to 1000 mm per annum (Figure 4.5). In all parts of the country the potential evapotranspiration exceeds the average precipitation (Vänskä 1987).

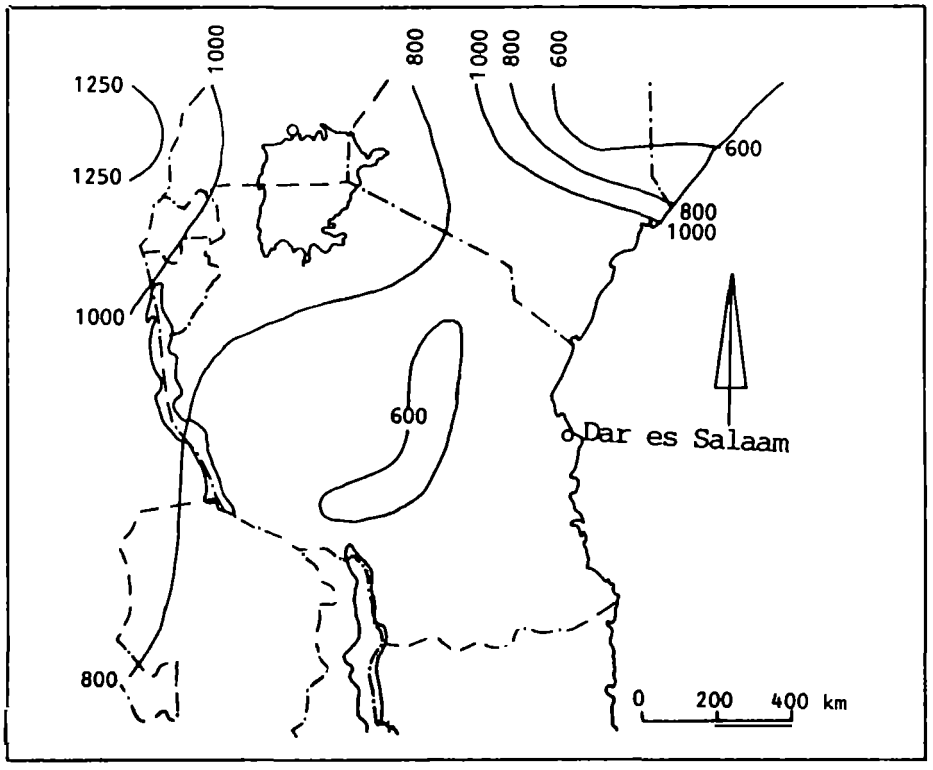


Figure 4.5 Annual average evapotranspiration in Tanzania (Atlas of World Water Balance 1977 cited by Vänskä 1987).

Vänskä (1987) has divided the country into four main hydrogeological zones (Figure 4.6.). The precambrian basement covers nearly two thirds of the mainland area. For ground water occurrence the weathered mantle is of primary importance. The other major aquifers are in faults and fracture zones, the older sedimentary formations, the volcanites and the tertiary-quarternary sedimentary formations. Aquifers in the last group are mainly alluvial deposits and marine deposits, for instance karstic rocks.

As for water quality high concentrations of fluoride, salts and iron can limit particularly the use of ground water. The highest values of fluoride occur in the Arusha region where over 20 per cent of samples evaluated by Brokonsult AB (1979) were above the high value of the Tanzanian water quality standards (8,0 mgl^{-1}).

High salt concentrations can be caused by sea water or evaporation. The first cause is typical in the coastal areas and the second one, for instance, in the Dodoma region. High iron contents can limit the use of ground water. High iron contents were found particularly in the Dodoma and Ruvuma regions (Brokonsult AB 1979).

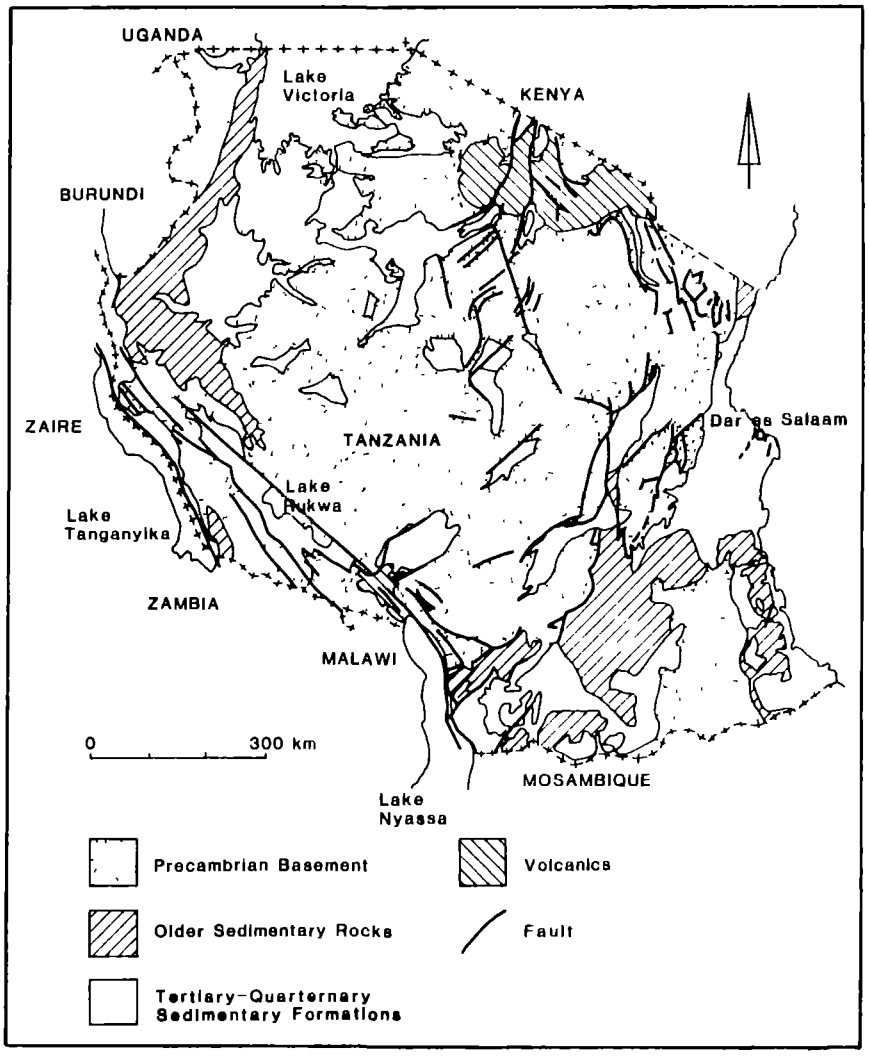


Figure 4.6 Hydrogeological zones of Tanzania (Vänskä 1987; modified by the author).

4.2 Objectives and Basic Policies of Water Supply

The first public investments in water supply were made around the year 1930. The Public Works Department was responsible for these supplies mainly for townships, trading centres, missions and large estates. In 1946 the Water Development Department was formed. Rural water supply construction started in the late 1950s financed by the Government and local authorities. The operation and maintenance costs were paid by local authorities based on water rates or taxes. In 1961 Tanzania became independent. In 1965 the Government started to finance all investments and in 1970 even the operation and maintenance costs. By 1970 all water of rural supplies was served free of charge (Rimer and Associates 1970, vol. II).

During the 1970s the ujamaa villagisation was introduced in Tanzania. Water supply for these rural areas was one of the services which was regarded very important. The first five year plan presented the objective to supply water to everyone in 40

years. In the middle of 1970s the Government declared the following water policy objectives:

i) to provide a source of clean and potable water within a reasonable distance of every village by 1981 as a free basic service, and

ii) to provide a piped water supply to the rural areas by 1991 so that all people will have easy access (i.e. a distance of 400 m or less) to a public domestic water point.

In 1977 in Mar del Plata, Argentina the objective of the International Drinking Water Supply and Sanitation Decade 1981 - 1990 was to provide all mankind with safe water supply and proper sanitation by 1990.

In 1987, more than halfway through the Decade it is obvious that very few countries in the developing world have possibilities to reach this goal.

According to Msimbira (1986), the Ministry in charge of the sector is revising the 1990/1991 target. Already in 1982 Nyerere (1982) stated in the Second Ordinary Party Conference

> "Whatever the technique used (for building water supplies) it must be adopted in consultation with the local people, and from the beginning the responsibility for looking after the facilities must clearly be theirs. Government cannot finance the maintenance and repair work of basic village equipment if new developments are to go ahead."

4.3 Governmental Organizations in Water Development

After independence the water supply sector was under the responsibility of the Water Development and Irrigation Division (WDID) in the Ministry of Lands, Settlement and Water Development.

In 1969 the WDID was transferred to the Ministry of Agriculture, Food and Co-Operatives. Soon thereafter the WDID was moved to the Ministry of Water Development and Power (Rimer and Associates 1970, vol. II). The latter was enlarged by the Mineral sector in the mid 1970s thus called the Ministry of Water, Energy and Minerals. Later there were a few similar changes with the Mineral sector. In 1983 it was called the Ministry of Water and Energy.

Since the end of 1985 the Water Department, commonly called MAJI by its Swahili name, was under the Ministry of Lands, Water, Housing and Urban Development. Urban water supply, rural water supply and urban sanitation were thus placed under the same ministry. In March 1987 the Water Department became an independent ministry. Rural sanitation is the responsibility of the Ministry of Health and Social Welfare. The Ministry of Community Development, Culture, Youth and Sports is dealing with mobilization aspects. Most of the externally supported rural water projects try to cooperate also with the health (AFYA) and community development (MAENDELEO) sectors (Msimbira 1986).

MAJI and RWEs

The organization of MAJI regions under the Regional Water Engineer (RWE) is shown in Figure 4.7. Since the decentralization by the government in 1972 the joint collaboration between MAJI and the RWE in the sector has gradually declined. Before 1972 the RWE was directly responsible to MAJI in both technical and administrative matters. Thereafter the RWE has been responsible to the Regional Development Director (RDD) and hence to the Prime Minister's Office (PMO). The RWE can consult MAJI on technical matters but is not obliged to do so.

MAJIs role depends on the scope of the project. A regional project is, in principle, within the managerial capacity of the RWE. There is no defined financial ceiling, but in 1984 a general outline of Tanzanian Shilling (TAS) 500 000 (1 US $ = 11.0 TAS) was reported by Kusare (1984). In case of a complex and large project the ranking for a national project can be gained through the RDD, PMO, Treasury and MAJI. Most of the externally supported water projects have been classified under the national category.

Decentralization and local government

The decentralization reform commenced in 1971 and was implemented via villagisation in 1972 - 1975. The idea was to gather rural people to live in villages to make it easier to supply them with services. Unfortunately this took place without real data on the available resources, such as water. For instance, in Mwanza region most villages were located on the crests where there were no suitable sites for shallow wells (PMO 1984). The villagisation was, in principle, based on the idea of self-sufficiency of the people and villages. However, services like water supply were seen as the responsibility of the government. Thus water was to be supplied free of charge. Already in the early part of the 1970s, e.g. Cunningham (1970) noted that with this approach the villages lost the first possibility of utilizing self-help.

Connected with the decentralization the Community Development Department and its district councils were abolished in 1972 and the farmers' cooperatives in 1976, respectively (Kleemeier 1987). According to Hannan-Andersson and Andersson (1985b) and Kleemeier (1987) in practice the decentralization had a negative effect on mobilization at the local level. Kleemeier (1984) wrote that the decentralization actually led to increased centralization of power. She added that the councils and cooperatives were accountable to local communities through direct elections. These institutions were replaced by parastatal crop authorities and district government administration.

In the 1980s the cooperatives were refounded. By the laws of 1982 the Local Government became responsible again for planning, construction as well as operation and maintenance of water projects. Among other activities the Local Government is also responsible for sanitation and health (Msimbira 1986). It has a

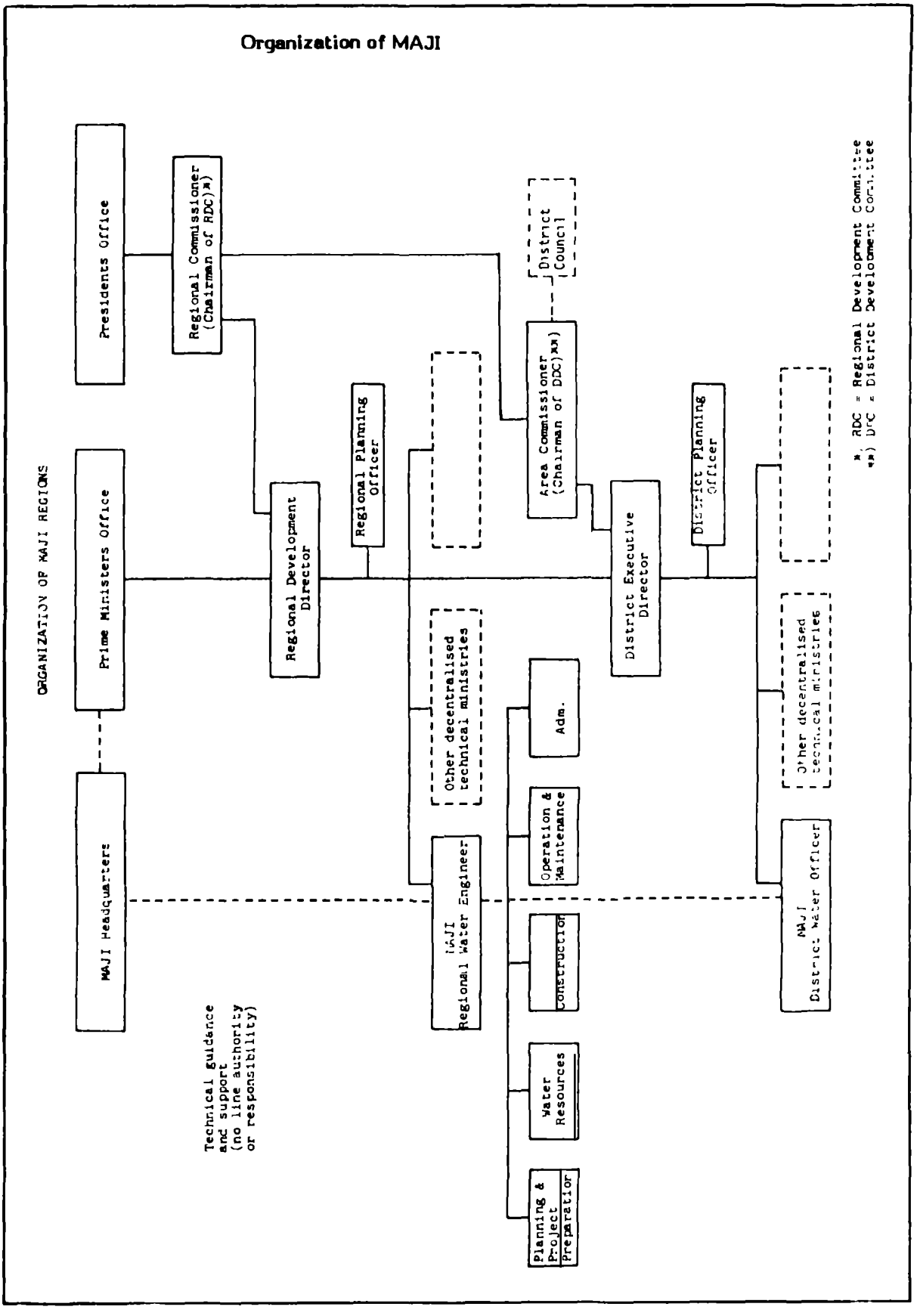


Figure 4.7 Maji regional organization in relation to the Maji headquarters and regional authorities (Finnwater... 1986a).

decentralized structure down to the village level. Perhaps the major focus is on the district level administered through the district councils (Mawhood 1983).

The Local Government is not, however, able to implement large projects. Therefore such projects are implemented by the RWE of MAJI. In 1987 the role of the Local Government in the rural water supply sector has been under debate. The externally supported projects have different approaches to the issue.

4.4 Official and Operational Water Supply Service Coverage

Since independence water supply in East Africa has been based on several approaches. In Tanzania the emphasis was put on piped supplies in rural areas (Warner 1973).

Table 4.1 shows the development of rural water supplies in 1960 - 1968. By the year 1969, officially about 11 per cent of the rural population was served by proper water supplies (United Republic of Tanzania 1972).

Table 4.1 Development of rural water supplies in Tanzania in 1960 -1968 (United Republic of Tanzania 1972).

DEVELOPMENT OF RURAL WATER SUPPLIES(1)

Year	Surface Storage Schemes (2)		Gravity and pumped Supply Schemes		Borehole and Well Supply Scheme (3)			Total Cost (estimated) in shillings million
	Number Completed	Storage Capacity in acre feet	Number Completed	Output in '000 gallons per day	Number Completed	Footage	Output in '000 gallons per hour	
1960	33	24,500	29	906	23	4,784	39	6·2
1961	13	4,400	44	666	26	5,925	61	7·8
1962	9	1,011	21	1,070	17	3,654	29	4·2
1963	8	2,212	21	473	13	2,589	18	8·0
1964	18	400	10	350	19	2,964	30	3·4
1965	9	1,230	20	482	35	6,658	189	3·8
1966	5	438	18	390	18	4,338	78	5·2
1967	6	240	61	1,870	48	12,496	49	12·9
1968	13	185	90	4,400	59	22,894	103	14·3

Source.—Water Development and Irrigation Division, Ministry of Water Development and Power. 1 acre foot=274,000 gallons imperial.

(1) For all purposes other than irrigation and power generation. Figures relate to work undertaken by Government only.

(2) Includes dams and hafirs, charcos, and catchment tanks.

(3) Output under this heading related to tested yield of the boreholes. The number drilled includes failures.

The distribution of different types of existing MAJI water supplies in 1976 is shown in Table 4.2. The idea of low-cost or simple technology had not yet been accepted by that time. The share of wells was very low and the pumped schemes were dominating.

Table 4.2. Existing MAJI water supplies in 1976 (WHO and IBRD 1976, Vol. 2, cited by Allmänna Ingenjörsbyrån AB 1980).

Type of supply	Number of supplies	Design Population		Share
		Assumed average per supply	Total	%
Surface gravity	341	4000	1 360 000	33
Surface pumped	445	4000	1 780 000	42
Boreholes	400	2000	800 000	19
Wells	837	300	250 000	6
TOTAL	2023		4 190 000	100

Figure 4.8 illustrates the achievements of rural water supply in 1970 - 1980 (Allmänna Ingenjörsbyrån Ab 1980). During the decade almost all investments have supported constructing new schemes. The design capacity (Point A) has grown faster than the rural population. However, in 1980 the number of people served was estimated to be only 5 million (point B). Although the funds for operation and maintenance have increased since 1977, many water supply systems have come to a standstill. The other graphs in the Figure show the target:

- to keep the design capacity for existing schemes (B - C),
- to keep the design capacity for rehabilitated schemes (B - D), and
- to keep the design capacity for new implemented schemes (A - E).

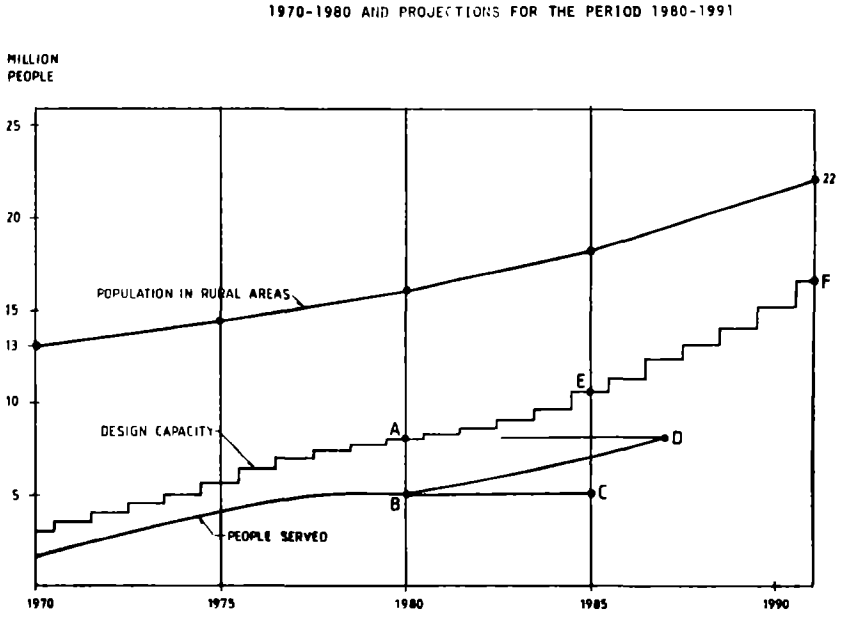


Figure 4.8 Rural water supply process 1970 - 1980 and projections for 1980 - 1991 (Allmänna Ingenjörsbyrå AB 1980).

According to the study missing operation and maintenance will result in heavy reductions in the number of people served by existing schemes by 1991. The conclusion was that the basic reason for the situation is the limited implementation capacity. In 1980 MAJI and the regional and district authorities were absording as much funds as they were institutionally capable of using (Allmänna Ingenjörsbyrå AB 1980).

The official government figures on people served have been based on the assumption of operative systems. Since the 1969 value of 11 per cent the service coverage has reached 42 per cent in 1986 (Msimbira 1986).

Findings of different studies show, however, that the operative level is far from 100 per cent. In a study made by Mujwahuzi (1978), in the Dodoma district, about 30 per cent of the 33 water supply schemes were not operational. In 1984 it was estimated that at least 85 per cent of the rural households are in need of improved water supply and sanitation. In other words the real service coverage would be around 15 per cent (FINNIDA 1984a). Perhaps the most critical estimate has been presented by Hannan-Andersson and Andersson (1985b). They estimated that only 5 per cent of rural population in most regions have access to improved water supply. This figure would equal the official coverage in 1961. Rukiko (1986) reported that the actual production capacity of the water supply schemes in Tabora region is about 25 per cent.

4.5 Trends of Financial Allocations

The trends in financial allocations to rural water supply both from national and donor sources are shown in Table 4.3. The data in the table is based on the annual budgets. The national capital expenditure and the donor allocations have declined. The recurrent expenditure has been quite constant at current prices. However, the values exclude the recurrent funds to rural water supplies from the Central Government.

The national share has been 28 per cent on an average. Sweden has allocated about 30 per cent of the total funds during the period. The current ratio of external and internal funding is about 80:20.

According to Makundi (1986) the annual allocations including the external support are only about 40 per cent of the required. Respectively the operation and maintenance costs cover less than 30 per cent of the demand.

The financial allocations, particularly the recurrent costs have been declining although new schemes have been constructed. At the same time the real service level of the schemes has decreased as shown in chapter 4.4. If most of the constructed schemes had been maintained and kept operative, it would have been very difficult to have any funds at all for new investments.

Table 4.3 Resource Allocations to Rural Water Supplies in Tanzania, 1964 - 1984 (Therkildsen 1986).

	64/65–68/69	69/70–73/74	74/75–78/79	79/80–83/84
Capital expenditure				
Donor funds (Tsh m)	26	141	471[a]	649
Total funds (Tsh m)	39	193	617	1032
Total funds in 1974/75 prices (Tsh m)[b]	n a	n a	496	428
Donor funds/total funds (%)	67	73	76	63
Total funds/total central & regional government capital budget (%)	n a	n a	2 6	2 2[c]
Recurrent expenditure[d]				
Total regional funds (Tsh m)	n a	n a	286	763
Total regional funds in 1974/75 prices (Tsh m)[e]	n a	n a	222	238
Total regional funds/total reg gov recurrent budget (%)	n a	n a	4 4[f]	5 7

[a] Estimated for 1975/76

[b] Assuming that 60% of donor funds are spent outside Tanzania (see Hordijk A E M Munuo, D Ricardo, M Schroder, 'The Netherlands Sponsored Water Projects in Morogoro Region – Tanzania', Unpublished Report, May 1982, Ministry of Foreign Affairs, Holland, p 72, and Ministry of Water and Energy and Australian Development Assistance Bureau, *Evaluation of the Tanzania Village Water Development Project*, Final Report, 1984, p 4 23 These funds are subject to inflation in the international price index for dollars Remaining funds are subject to local inflation after the retail price index Indexes in Schluter, "An Analysis of Budgetary Allocations", Unpublished, World Bank, September 1982

[c] 1979/80 - 1982/83

[d] Rural water supply recurrent expenditure from central government budget cannot be separately identified Figures indicate regional funds only See text

[e] Deflated by retail price index

[f] 1975/76–1978/79

4.6 Background Indicators for the Regions of the Study

Table 4.4 shows a summary of different indicators in the ten regions of the study supported by Nordic countries. The Mwanza region has the highest number of population and together with Iringa, Mbeya and Mtwara regions it has also high population density (Figure 4.3). In Iringa and Mbeya precipitation varies to a larger extent because of higher elevation differences. The Mtwara and Lindi regions have the highest relative amount of people served assuming full operative systems.

Table 4.4 Some Indicators on the Regions of the Study (Boesen et al 1986, FINNIDA 1984a, Msimbira 1986).

Region	Donor	Rural Population in 1985	Precipitation ma^{-1}	People served [1] %
Iringa	Denmark	1 010 000	0.5-1.6	43
Mbeya	Denmark	1 250 000	0.7-1.6	31
Ruvuma	Denmark	640 000	0.8-1.6	35
Mtwara	Finland	780 000	0.8-1.2	70
Lindi	Finland	600 000	0.8-1.2	71
Kigoma	Norway	710 000	0.8-1.4	30
Rukwa	Norway	540 000	0-8-1.4	36
Kagera	Sweden	1 280 000	0-8-1.6	19
Mara	Sweden	800 000	0.8-1.4	19
Mwanza	Sweden	1 570 000	0.7-1.4	29

1) assuming full operation

5 EXTERNAL SUPPORT TO THE SECTOR

5.1 From Programmes to Project Type Assistance

It was in 1965 that the first donor SIDA started to give assistance via a comprehensive programme to the rural water supply sector. For about a decade it was the dominating external supporter in the sector (Hannan-Andersson and Andersson 1985a). The programme included substantial technical assistance through exports and volunteers in different parts of the country. Up to 1976 this support amounted to about 45 million US $ (UNDP cited by Dworkin 1980).

The total number of SIDA-supported volunteers having served in Tanzania was as high as 133 persons by the year 1983 (SIDA 1986). During the first decade more than one half of the total MAJI budget was financed by SIDA. For instance in 1971 SIDA's share was 80 per cent of all the sector investments. The construction of water supply schemes was supported in all the 20 regions. Additionally SIDA assisted supporting services like the Water Resources Institute (WRI) (Makundi 1986).

Hyden et al (1974) reported on the expatriate effectiveness in development management and mentioned the following organizational problems in the Ministry of Water and Power:

- Most of the Tanzanian personnel represent the first generation serving in a formal organization. Because of the previous authoritarian administration the attitudes of Tanzanian professionals towards work is different from those of expatriates.
- The short experience of domestic technology does not support experimental and innovative management.
- Willingness to take responsibility varies because of historical reasons and because of not understanding the relationship between one's duties and larger aspects.
- A well-paid expatriate is satisfied with a feeling of successful work whereas a Tanzanian person is more worried about his earnings.

The experiences of the programme-type support were not all positive. Because of that and the increased interest of other external supporters the project-type aid with specified targets and budgets became more important in the 1970s. With the project approach it is easier to have control of the funds used. The change in SIDA's policy was influenced by public discussion on the failures of programme-type support in the sector in the late 1970s (Kleemeier 1987).

In the 1970s Tanzania attracted a massive amount of assistance to rural development including water supply. The western donors stressed employment and basic need strategies. Both of these strategies assumed four major approaches for domestic policy, namely:

- the provision of price incentives and appropriate technology,
- encouragement of popular participation,
- decentralization, and
- substantial investments in social services in rural areas.

According to Kleemeier (1984) the actual Tanzanian policies did not contain these approaches. The author's view is that particularly the first aspect has been missing.

Table 5.1 shows a summary of bilateral external support for the rural water supplies from 1965 to 1976. It is not comprehensive but it shows the most important forms of assistance.

By 1976 water master planning had been started in nine regions by the support of five donors as consultancy services. Norway supported hydrological network development by expert support. Australia, the Federal Republic of Germany and the Netherlands assisted large rural water supply projects. SIDA provided a 4-year university course for 130 Tanzanian water technicians in India starting in 1976. China supported rural water supply construction mainly in the 1960s.

5.2 Water Master Planning

The concept of regional water master plans was formed in the 1970s when external support to the country was increasing. For some reasons the concept of water master plan instead of master water plan has been generally used. Since 1975 there have been discussions on a National Water Master Plan, standardization of the regional water master plans and monitoring of the implementation of these plans (Arthanari et al 1983). The concept of a National Water Master Plan still seems to be quite debatable and particularly some foreign experts regard it questionable. The water master plans were mainly funded by nine external support agencies and in most cases carried out by consultancy services. By the year 1982 there were altogether 17 regions with these master plans. Table 5.2 presents a summary of the water master plans with the time schedule and the total funds used. The Netherlands was the first supporter of water master planning and Denmark the newest one so far. The costs are in current prices.

The total costs of the Water Master Plans in the 17 regions in 1971 - 1983 amounted to 27 million US $. This figure can be compared to Rural Integrated Development Plans (RIDEPs) which were financed by 14 donors in 18 regions from 1972 to 1984. The total costs of the RIDEPs were 14 million US $ (Kleemeier 1982).

In 1980 the Project Preparation Division of MAJI suggested the establishment of a Water Master Planning Coordination Unit (WMPCU). The Unit started to operate in 1981 with six Nordic expatriates and national counterparts receiving financial support from the Nordic countries. The following year the number of expatriates increased to seven.

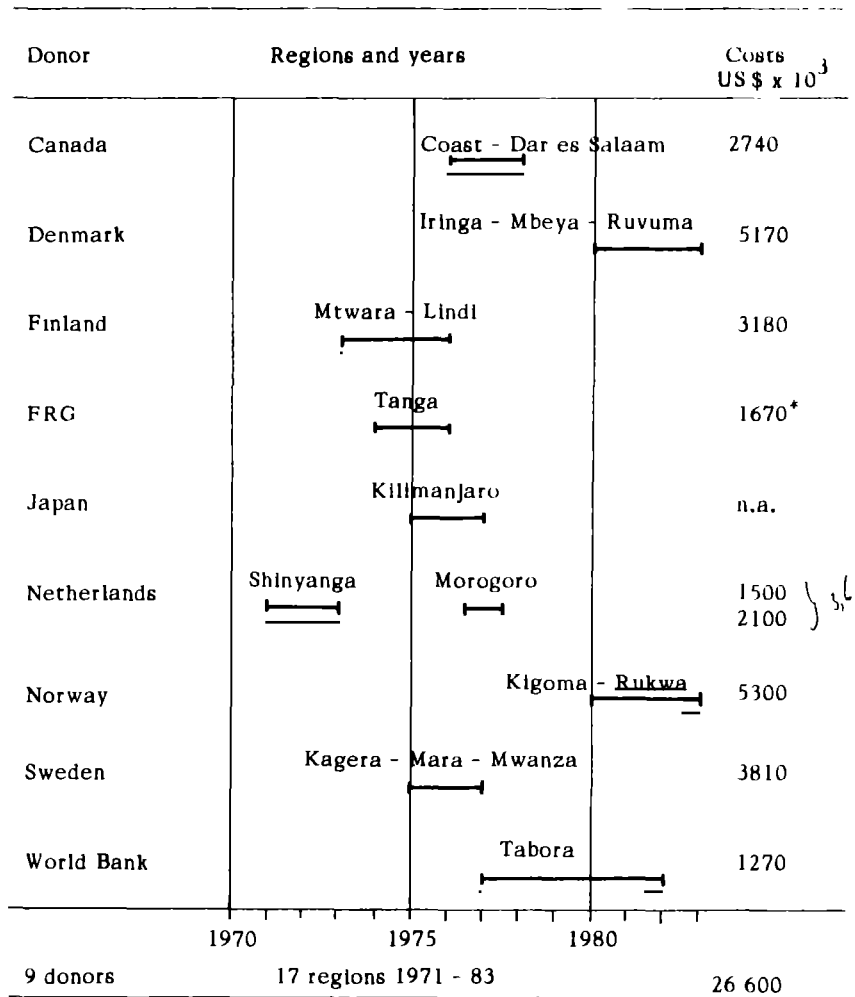
Table 5.1 Bilateral assistance to the rural water supply sector in Tanzania (UNDP cited by Dworkin 1980).

TANZANIA
RURAL WATER SUPPLY SECTOR STUDY
BILATERAL ASSISTANCE TO THE RURAL WATER SUPPLY SECTOR

(Source UNDP)

PROJECT/ACTIVITY (Title)	SOURCE	ASSISTANCE COMMITTED US$ EQUIVALENT	DURATION	NATURE OF ASSISTANCE
1. Rural Water Development	Sweden	45 302 670	1965-1976	Comprehensive program including substantial technical assistance through experts and volunteers
2. Master Water Plans for Mwanza Region, Mara Region, West Lake Region	Sweden	2 733 500	1975-1978	Consultancy services
3. Master Water Plans for Mtwara Region, Lindi Region	Finland	4 600 000	1972-1977	Consultancy services
4. Water Engineering	Finland	100 000	1973-1975	Two water engineers at MAJI
5. Water Engineering	Finland	90 000	1975-1977	One water chemist and one senior water technician in MAJI
6. Master Water Plans for Coast Region, Dar es Salaam Region	Canada	2 700 000	1975-1979	Consultancy services
7. Master Water Plan for Tanga Region	F.R.Germany	2 115 300	1974-1976	Consultancy services
8. Water Development	F.R.Germany	1 233 500	1972-1976	Two drilling rigs and drilling experts in Tanga and Coast Regions
9. Rural Water Development	F.R.Germany	6 938 000	1974-1978	Construction of Handeni trunk main
10. Extension of Hydrological network in Kigoma Region, Tabora Region, Mbeya Region, Rukwa Region, Rubuma	Norway	1 600 000	1973-1978	Construction and equipping of hydrological stations
11 Extension of Hydrological network	Norway	296 000	1973-1978	Eight experts to assist in the implementation of item 10
12 Rural Water Resources Project in the Singida Region	Australia	1 500 000	1974-1976	Provision of two drilling rigs with accessories and support vehicles together with a team of Australian experts
13 Water Supply Development Shinyanga Region	Netherlands	900 000	1974-1977	Sinking of 700 shallow wells, equipment, fellowship and 10 experts
14 Water Master Plan for Morogoro Region	Netherlands	19 000	1975	Assisting in formulation of terms of reference
15 Assistance to MAJI	Netherlands	55 000	1973-1975	One expert as Director of Construction Division, MAJI
16. Water Supply	Hungary	Not available	1975-1977	Seven water engineers to MAJI
17 Water Supply	Hungary		1973-1975	Five 3-year scholarships in water engineering in Hungary
18. Water Engineering Education	Hungary		1974-1975	Five scholarships in water engineering in Hungary
19 Assistance to Water	Pakistan		1975	A number of civil engineers to MAJI
20 Water Development	China			Provision of rural water supplies (number not available)
21 Training	India			Provision of 4-year university course for water engineers 129 students started 1975, 30 students started 1976
22 Water Engineering	India			Technical assistance/87 engineers and senior technicians are currently working in MAJI

Table 5.2 External support for water master plan preparation in current prices (Kleemeier 1982, Laugerud 1987; scheduled by the author).



* assistance agency staff estimate

n.a. not available

The objectives of the Coordination Unit were

(i) to establish uniformity and relevance in the preparation of remaining water master plans,
(ii) to adjust, complement and modify existing water master plans to accord with those under development,
(iii) to establish an appropriate monitoring system for operations and maintenance,
(iv) to establish, in liaison with the Director of Planning, a data bank and to update and review these data,
(v) to establish an appropriate monitoring system for the water master plans on a national basis,
(vi) to ensure that water master plans are developed with due consideration to socio-economic, cultural and health prerequisites,
(vii) to compile the National Water Master Plan (Arthanari et al 1983).

The Unit participated in the final review of the Water Master Plans in Kigoma and Rukwa (NORAD-supported) as well as in Iringa, Mbeya and Ruvuma (DANIDA-supported).

The Unit's activities and role were reviewed by Arthanari et al (1983) with quite a lot of critique. The objectives of the Unit covered quite a broad area of activities. For instance the review mission criticized the Unit for not having concentrated on its major tasks. Comments on the review mission (Water Master Plan Coordination Unit 1983) by the Unit as well as interviews indicate that using external experts only in evaluation does not necessarily bring objective results. In any evaluation team there should be one or a few experts who are adequately familiar with the background of the project but still not directly involved in it. In this case the constraints could have been more of a personal than a technical nature. Arranging proper supervision seems very necessary in this type of a project.

Soon after the review mission external support was decreased and the national counterparts took over the activities. One expatriate assisted the unit until 1986.

To share the experiences and lessons learned, a seminar on Water Master Planning in Developing Countries and particularly in Tanzania was held in Bolkesjø, Norway 17 - 21 January 1983 (Lium and Skofteland 1983). To some extent the role of water master plans was discussed already in the Nordic meeting in Nord-Torpa, Norway 21-23 Nov 1978 (Riise and Skofteland 1979).

The role and contents of water master plans

Helland-Hansen (1986) has divided the contents of a regional water master plan into four main components:

(i) implementation plan or approaches,
(ii) water supply plans,
(iii) socio-economic data and recommendations, and
(iv) water resources data and analyses.

His view was that the regional water master plans are not as such suitable for guiding implementation, but a separate implementation plan should be formed. Further he suggested that the first (i) and partially the fourth (iv) component should be updated. The water resources data and overall water resources assessment should be taken care of by MAJI. According to him the local water resources data and monitoring of ungauged streams, springs and boreholes are very important for village water supply and, therefore, should be continuously updated.

Instead of continuous updating a separate revision can be made as was done by Finnwater... (1986c) for Mtwara and Lindi regions. To the author's knowledge the water resources data has been continuously updated. The revision concentrated on population and water demand as well as gathering the data of those schemes implemented by MAJI itself.

The Water Master Plan Coordination Unit (1983) suggested that a regional water master plan should be considered in sequences as shown in Table 5.3.

Table 5.3 Sequences in preparing a regional water master plan (Water Master Plan Coordination Unit 1983).

Phase	Contents
Preparatory Phase	Water Resources Inventory (Quantity, Quality), Policies and Economics, Regulations and Standards, Present Development Plans, Legislation
	↓
Assessment Phase	Hydropower, Industry, Irrigation, Cattle, Domestic, Community Participation ← {Demand of Quantity and Quality}
	↓
Recommendations	Water Development Recommendation
	↓
WMPs	Implementation Plans
	↓
	Implementation Projects

Most of the regional water master plans in Tanzania have been prepared with fairly little or no simultaneous implementation. When implementation has started some of the basic data has already become out-of-date. It could also be that experiences on appropriate construction methods and technology have not been sufficient.

In Western Kenya FINNIDA (1985a) has supported a rural water supply project which started with a relatively short investigation phase followed immediately by implementation.

Therkildsen (1986) was quite sceptical about the benefits of water master plans based on comprehensive pre-implementation planning. Instead he favoured a participatory learning-based approach in which mistakes are corrected.

5.3 Implementation of Water Master Plans and Other Donor-Supported Projects

5.3.1 Introduction of Hand-Pump Wells

The technology used in rural water supply by MAJI was in the 1960s and 1970s mainly based on piped schemes often with diesel pumping. With the increasing price of oil it became clear that cheaper and lower-cost alternatives must be considered.

Wells have been used as communal water supply sources only to a minor extent. For instance, in southern Tanzania there are signs of wells constructed many decades ago. However, the first large

scale donor-supported project was started in Shinyanga with Dutch assistance in 1974. Altogether 750 shallow wells equipped with hand-pumps were constructed by 1978. The project was implemented by massive external support under an independent and parallel organization to MAJI.

The responsibility of the project was transferred to the local Regional Water Engineer's (RWE's) office within a period of two months. Although the period contained some training activities the rapid transfer of responsibility proved to be a failure. In 1979 the Dutch who had started a similar project in Morogoro had to come back (lead by a Dutch consultant) to assist. This lesson is perhaps one of the most dramatic ones of what happens when the responsibility is transferred without sufficient building of institutional capacity.

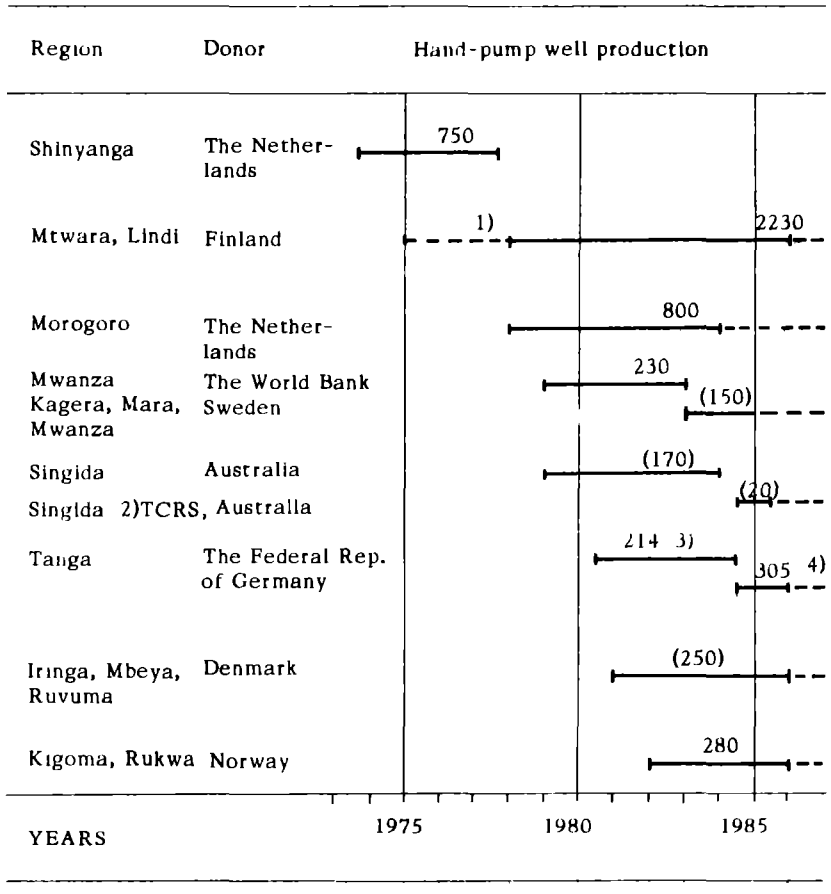
Anyway, the Shinyanga Shallow Well Project was a very pioneering one in technology selection for rural water supply. However, mainly locally manufactured Shinyanga hand-pumps originally developed by UNICEF support in Uganda proved to be less reliable. At about the same time the hand-pump well technology was tested by a FINNIDA-supported project in Mtwara and Lindi regions during the Water Master Plan Phase. Among others the NIRA hand-pump model used typically in privately owned wells in rural areas of Finland was tested. These pumps broke in a few days or weeks. This was the start of a specially applicable hand-pump development in Finland for the conditions in developing countries.

Table 5.4 shows a summary of hand-pump well technology in externally supported projects according to their scheduling. In timing and production the Dutch and Finnish support were of pioneering nature. Both of these projects were initially implemented with efficient management teams with few links to regional water authorities.

5.3.2 Hand-Pump Development

Cotter (1969) reported on one of the earliest developments of hand-pumps for communal wells in Tanzania. The hand-pump well technology was discussed at the national level at the Morogoro Conference on Wells in 1980, supported financially and organizationally by the Dutch project in Morogoro (Bonnier et al 1980). The conference agreed that shallow wells representing low-cost technology should be given priority. Village governments were urged to own and maintain their own water supplies. Issues of coordination, standardization and participation were pointed out. To promote shallow wells a National Shallow Well Programme was established by the support of the Government of the Netherlands.

Table 5.4 Introduction of hand-pump well technology by externally supported projects in Tanzania 1974-1986. Numbers indicate the total amount of wells constructed (Armstrong 1987, DANIDA 1986, DHV... 1979 and 1983, Finnwater... 1986b, GTZ 1986, NORAD 1985, PMO 1984, SIDA 1985, Snowy Mountains... 1985; compiled and scheduled by the author).



( ) rough estimate

1) experiments

2) Tanzanian Christian Refugee Service

3) Shallow well project in cooperation with RWE

4) Village water supply project under Tanga Integrated Rural Development Programme (TIRDEP)

After the failure of the Shinyanga hand-pump, the Dutch project developed the Kangaroo foot-pump and later the SWN-80 hand-pumps. Local production was attempted in Morogoro but practically all the materials had to be imported (Katko and Korpela 1982). Later on this production has expanded and includes among others production of well drilling equipment.

In 1982 after the laboratory tests in England the World Bank started its field tests on hand-pumps. The Mtwara and Lindi regions were selected as testing areas in Tanzania (Katko and Korpela 1982).

The development of the NIRA AF-76 hand-pump of Finnish make and design continued based on the experiences from the Mtwara-Lindi project. The similar pump was also used in projects in Kenya and Sri Lanka. The major breakthrough came in 1985 with the so-called direct-action pump. Because of using direct action instead of the conventional level and fulcrum it is more durable and easier to maintain. However, the present model cannot lift water more than 12...15 metres. Development work is continuing on similar models for deeper wells (Viiala 1987). At the time of reporting plans are under way for starting local production in Tanzania.

Shallow wells and hand-pump technology is naturally not applicable in all areas of Tanzania. It has been estimated that about 50 per cent of the rural population could be supplied with hand-pump wells. The geological conditions are the main defining factors. One could even argue that the Shinyanga region, (the area of the first large-scale shallow well project), is geologically not very appropriate for shallow wells. However, history shows that even such a simple device as a hand-pump needs technical development. We have to remember that hand-pump technology is problematic and needs particularly preventive maintenance. A maintenance-free pump often mentioned by the Dutch in their progress reports simply is impossible.

5.3.3 Other water sources

Hofkes (1983) suggested that in Tanzania open wells with buckets and winches should be considered in such conditions where proper operation and maintenance cannot be guaranteed.

SIDA's approach to technology selection has changed dramatically during the last decade. In the Water Master Plan by Broconsult AB (1978) shallow wells were regarded less feasible and even less expensive than diesel pumped piped schemes. Still in the 1980s SIDA supported the construction of piped schemes with diesel pumps. The health, sanitation and water (Hesawa) project started in 1983 and accepted the hand-pump well as the main technology. Sources like springs, improved rainwater harvesting and open improved wells came into the picture (Hannan-Andersson and Andersson 1985 b). In most cases shallow wells are sited close to the traditional water sources like pits dug on river-valleys or banks. Therefore, this approach is not totally new.

Instead of proper protection of springs it has been quite common to let the water run free and install a surface water intake downstream. This concerns particularly the schemes constructed by MAJI. As for donor-supported projects spring protection has become important in the 1980s.

Kleemeier (1987) stated that donors have still relied too much on hand-pump wells. According to her neither villages nor district councils can afford this technology. The district level administration is still too weak to manage the operation and maintenance required. Kleemeier pointed out that participation will not solve these problems. Finally she stated that

> "If donors do not want these projects to go the way of their predecessors, the donors will essentially have to start over in the rural water supply sector, with research and development of the very simplest technologies - buckets not pumps - and of means to disseminate this technology outside government departments".

On the whole technology has become simpler and less costly since the beginning of water master planning. But are even developed hand-pump wells too advanced for some rural areas of Tanzania?

5.3.4 Organizational Approaches

The construction- oriented and efficient projects in Shinyanga, Morogoro and Mtwara-Lindi proved not to be successful in building local capacity and particularly the responsibility of the consumers. Kauzeni and Konter (1981) studied the institutional aspects of shallow well programmes in Shinyanga and Morogoro regions. They pointed out that the local organization in Shinyanga should rather have been developed during the project and not after the departure of the major Dutch project support. In Morogoro the project was also implemented quite independently. Counterparts were not appointed or available to take gradually the responsibility.

In 1981 a National Workshop on Village Water Supply and Community Participation was held. As a result the PMO and the International Reference Centre (IRC) with financial support from the Netherlands Government started a project on people's participation in rural water supplies. The study was carried out in the field in 1982 and 1983 and the main recommendations included among others (PMO and IRC 1984):

- village ownership,
- priority on villages in greatest need,
- consumer participation at all stages of the project,
- single monitoring and evaluation methods,
- productive use of water,
- integration to existing manpower structure (MAJI, AFYA, PMO/CDD),
- spare parts supply,
- appropriate technology (piped gravity schemes, hand-pumps), and
- cooperation and coordination.

After the evaluation of the Morogoro project by Hordijk et al (1982) the objectives of the project were reconsidered. Emphasis from high production shifted more to consumer involvement. In 1985 a reoriented programme costing about 40 million TAS started. The intention was to give assistance both to Morogoro and Shinyanga regions over a five year period. An agreement was made with MAJI (Sedin and Lium 1986).

The latest water master plan financed by DANIDA in 1980-1982 included a paralled socio-economic survey, the first of its kind in Tanzania. It also included institutional and organizational aspects (Chapter 9).

The World Bank financed Mwanza Rural Integrated Development Programme (MRIDEP) including a water supply component since 1979. About one third of the villages paid for their wells according to the PMO's (1984) evaluation. The responsibility of maintenance was not clearly understood. Means of making villages aware of this responsibility were suggested. In 1983 SIDA started the implementation of its water development project in the lake zone and it took over the responsibility for the incremental funding of the MRIDEP component. This health, sanitation and water (Hesawa) project is explained in detail in Chapter 7.

In 1984 the FINNIDA-supported project in Mtwara and Lindi regions was evaluated (FINNIDA 1984a). The approach of the crash-programme with high construction goals was abolished and the transfer of responsibility to local authorities and villages together with institutional capacity building was started (Chapter 6).

In 1975 Australia started to support MAJI in Singida region. However, there was no water master plan made for the region. In 1976 the project was extended and in 1978 a water resources survey was completed. Windmills connected to deep wells were introduced which later proved to be less successful. In the early 1980s a change of emphasis from deep to shallow ground water utilization took place. Attempts to involve the consumers were also made (Snowy Mountains... 1985). The following observations were made:

- the need for consultation with villages and their involvement in all phases of the project,
- the need for sanitary improvements and hygiene education, and
- the preference of shallow wells to boreholes because of more simple construction and maintenance (Snowy Mountains... 1986).

In the middle of 1984 the Australian Government decided dramatically to withdraw from the project. The facilities were handed over to the Tanzanian Christian Refugee Service (TCRS) which started an integrated development project. The target of the project is to produce 50 shallow wells per annum (Armstrong 1987). Integration includes sanitation, health education and even agricultural and forestry development.

5.3.5 Arusha Seminar on Water Master Plan Implementation

A seminar on the "Implementation of Rural Water Supply and Sanitation in Tanzania" was held in Arusha 3 - 7 March 1986. The objectives were to review experiences since the Bolkesjø Seminar and make suggestions for future action. Table 5.5 presents a summary of the action plan suggested by the seminar. There were altogether 26 issues discussed. In this context the most interesting ones were the recommendations on

- community participation (no. 1),
- choice of technology (no. 3),
- decentralization of responsibility to local authorities (no. 8)
- village level operation and maintenance (no. 13), and
- cost-recovery options for operation and maintenance (no. 15).

Table 5.5 Action plan summary of the Arusha seminar on Implementation of Rural Water Supply and Sanitation in Tanzania (Andersson et al 1986).

Action Plan Summary

No	Title of Recommendation	Responsible	Progress Milestones
1	COMMUNITY PARTICIPATION IN RURAL WATER SUPPLY AND SANITATION	Principal Secretary, Ministry of ARDHI/MAJI	October 1986 May 1987
2	SANITATION AS PART OF THE RURAL WATER PROGRAMME	Principal Secretary, Ministry of AFYA	October 1986 May 1987
3	CHOICE OF TECHNOLOGY	Director of Design, Construction and Maintenance (ARDHI/MAJI)	October 1986 May 1987
4	WATER QUALITY STANDARDS	Head of Water Laboratory (ARDHI/MAJI)	December 1 86 July 1987
5	DISSEMINATION OF INFORMATION	Coordinator WMPCU (ARDHI/MAJI)	March 1987
6	STANDARDIZATION OF EQUIPMENT AND MATERIALS	Director of Design, Construction and Maintenance (ARDHI/MAJI)	May 1987 June 1987
7	REVISION OF THE 1991 TARGET	Principal Secretary, Ministry of ARDHI/MAJI	December 1986 June 1987 July 1987
8	DECENTRALIZATION OF RESPONSIBILITY TO LOCAL AUTHORITIES	Principal Secretary, Ministry of SM	December 1986 March 1987 June 1987
9	ORGANIZATIONAL MODEL FOR INTEGRATION OF SECTOR ACTIVITIES	Principal Secretary, Ministry of SM	October 1986 May 1987 June 1987
10	SURFACE WATER HYDROLOGY	Head of Hydrology Section (ARDHI/MAJI)	November 1986 January 1987 March 1987
11	PROMOTION OF WOMEN'S ROLE IN SECTOR DEVELOPMENT	Director of Planning Division (MAENDELEO)	September 1986 December 1986
12	WATER RESEARCH	Director of Project Preparation Division (ARDHI/MAJI)	October 1986 June 1987
13	VILLAGE LEVEL OPERATION AND MAINTENANCE	Director of Design, Construction and Maintenance (ARDHI/MAJI)	September 1986 March 1987
14	SUPPORT SYSTEM FOR COMPLEMENTARY ACTIONS AT VILLAGE LEVEL	Director of Design, Construction and Maintenance (ARDHI/MAJI)	September 1986 June 1987
15	COST RECOVERY OPTIONS FOR OPERATION AND MAINTENANCE	Principal Secretary, Ministry of SM	November 1986 June 1987
16	CENTRAL MONITORING SYSTEM	Coordinator WMPCU (ARDHI/MAJI)	October 1986 May 1987
17	LOCAL MANUFACTURE OF HANDPUMPS	NAC	February 1987
18	SELECTION CRITERIA FOR REHABILITATION OF SCHEMES	Respective RWEs Director of Design, Construction and Maintenance (ARDHI/MAJI)	September 1986 June 1987
20	UTILIZATION OF HUMAN RESOURCES	Director of Manpower Development and Administration (ARDHI/MAJI)	October 1986 January 1987
21	IRRELEVANCE OF CURRICULA TO THE REAL SECTOR NEEDS	Principal, Water Resources Institute	June 1987
22	HUMAN RESOURCES DEVELOPMENT PLANNING IN ARDHI/MAJI	Director of Manpower Development and Administration (ARDHI/MAJI)	June 1987
23	TASK-ORIENTED DESCRIPTIONS OF RESPONSIBILITIES	Director of Manpower Development and Administration (ARDHI/MAJI)	December 1986 March 1987 December 1987
24	COMMUNITY EDUCATION RELEVANT TO THE SECTOR ACTIVITIES	Commissioner (MAENDELEO)	September 1986 March 1987 December 1987
25	INFORMATION ABOUT EXISTING CAREER PATHS	Coordinator WMPCU (ARDHI/MAJI)	November 1986
26	PREFERENCE FOR NATIONALLY BASED TRAINING	Principal Secretary, Ministry of Education	December 1987

Community participation was seen as a vital and necessary aspect of water supply and programmes in their different stages. However, community participation was considered as an aim instead of a strategy. The author's view is that the seminar agreed that community participation alone is not a solution for the difficulties in water projects. Other means are also needed. These can include the recommended steps mentioned above. The constraints seem again to involve cost-recovery issues.

The seminar also discussed the role of district councils in the water supply sector and the ways of coordination and cooperation between the institutions of the sector.

As a Tanzanian view Msuya (1986) stated

> "From the WMPCU's experience, unless a joint policy between the Donors and the Recipients is clearly stated/compromised, the turn-over of the Decade will result to a precarious state whereby direct "Donor dependency dilemma" shall prevail... As one writer puts it: the real issue is the quality of aid rather than the amount."

6 MTWARA-LINDI RURAL WATER SUPPLY PROJECT (FINNIDA-SUPPORTED)

6.1 Project History

The aspects of geographical features, population, economy and water resources are discussed in Chapter 4.1. Figure 6.1 shows the administrative boundaries and the areas of well construction in the two south-eastern regions.

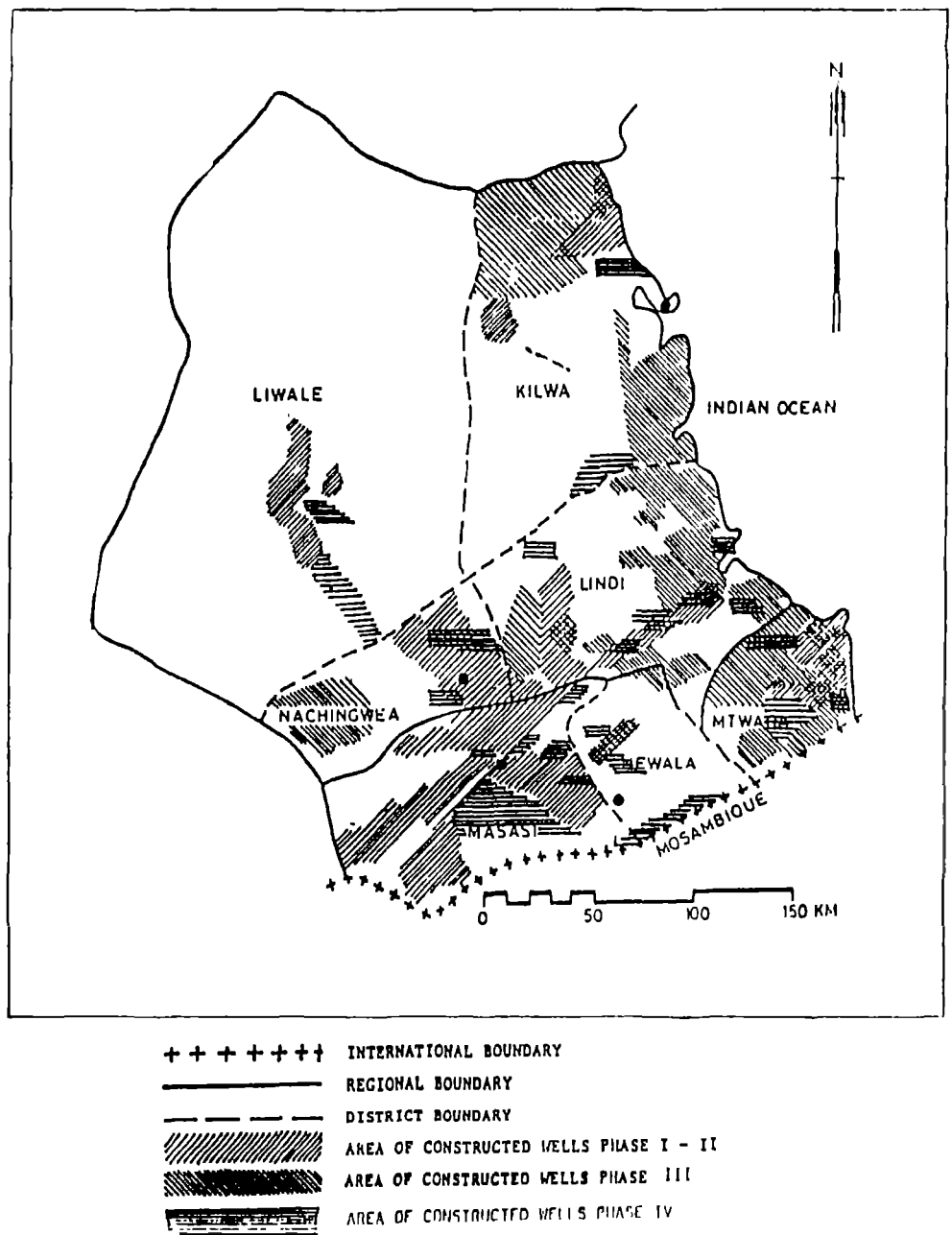


Figure 6.1 Administrative boundaries and areas of constructed wells in Mtwara and Lindi regions (Finnwater... 1986b).

Bilateral development cooperation between Finland and Tanzania started in 1968 in the form of personnel assistance mainly to the forestry and water sectors. In 1972 the Governments of Finland and Tanzania signed the Agreement on Technical Cooperation. According to the administration and finance the project contains the following phases:

• Project Indentification	1970 - 1971
• Feasibility Study	1972 - 1973
• Housing Project	1973 - 1974
• Water Master Plan	1974 - 1977
• Implementation Phase I	1978 - March 1980
• Implementation Phase II	April 1980 - 1981
• Implementation Phase III	1982 - 1984
• Implementation Phase IV	1985 - 1987
• Follow-up Phase	1988 -

The project was one of the first bilateral projects supported by FINNIDA. So far it is the most enduring one of all the FINNIDA-supported bilateral projects in any field.

Considering particularly the parts responsibility transfer and institution building the author divided the project into five different stages (Figure 6.2).

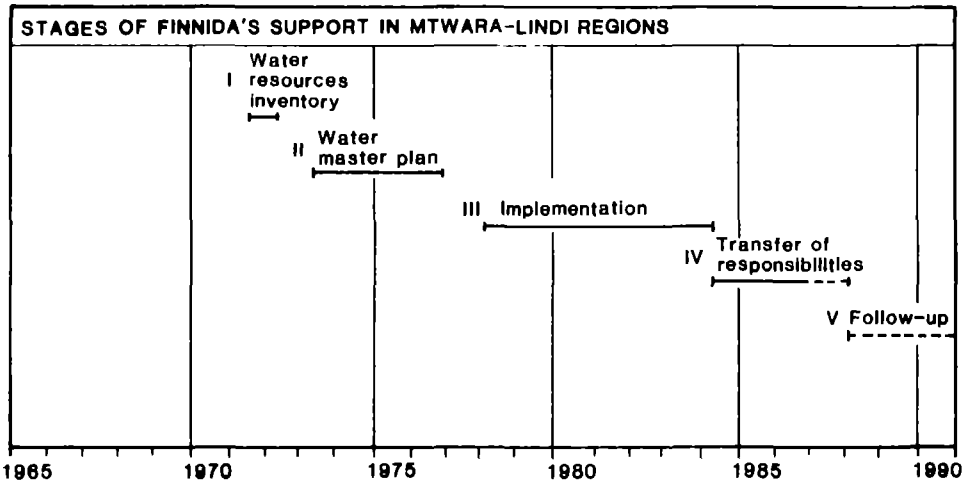


Figure 6.2 Stages of FINNIDA's Support to Water Supply Sector in Mtwara and Lindi Regions; compiled from various sources by the author.

The first phase and stage was officially called Mtwara-Lindi Water Resources Inventory and Development Plan. It was signed by FINNIDA as the client and Finnwater Partnership (later called Finnwater Consulting Engineers) as the consultant. As an interesting detail Forbes (1971) wrote in his comments on the project identification report of the inventory and development of water resources as follows:

> "The principles laid down in this section are admirable but an important aspect has been neglected, namely the **payment of water.** In the Mtwara Region there are

prosperous areas and poor ones. Again within a specific area the payment capacity of the peasant for water varies greatly. Those who grow cashew, simsim and coconuts can afford to pay whereas the poor subsistence farmer selling only his surplusses to maintenance, such as maize beans cassava, etc, cannot. I would strongly recommend that the Mission in drawing up its works programme should give special emphasis to studies affecting payment capacity and the elasticity of the market for water related to price."

It is very obvious that at that time for policy reasons the decision-makers were not able to consider this suggestion.

In August 1975 the project was extended to include hydrological, hydrogeological and water supply investigations. The field work was completed in September 1976. The draft final report, Mtwara Lindi Water Master Plan was printed in March 1977. It comprised the main report and annexes from A to L (Finnwater... 1977b). On the whole the plan promoted the use of ground water: pumped and piped schemes with boreholes or hand-pump wells utilizing shallow aquifers.

Implementation

The implementation of the water master plan started in 1978 after a one year break in activities. The selection of appropriate organization was discussed widely. The suggested alternatives were autonomous implementation units, distinct management units and teams of individual advisors. A relatively autonomous unit was finally selected to implement the so-called "crash programme" (FINNIDA 1977). However, in the request for the water master plan implementation the Tanzanian Government emphasized the need for establishing a capacity in the regions to maintain and run the schemes effectively (FINNIDA 1976).

The first phase of implementation project January 1978 -March 1980 included (Finnwater... 1980)

- complementary geophysical and hydrogeological investigations for locating the most favourable well sites,
- engineering design of wells and water supply systems,
- implementation of the construction work including acquisition of materials and supervision,
- carrying out deep borehole well drilling, and
- implementation of the training programme.

As an indicator one objective of the phase was to construct 550 wells.

The second phase of the implementation project April 1980 - December 1981 included (Finnwater... 1982)

- complementary geophysical investigations for locating the most favourable well sites for water schemes to be implemented in connection with the programme as well as for certain well sites, which are included in the separate construction programme of the Ministry of Water,
- complementary hydrogeological investigations in order to determine in detail the locations of wells included in the works,

- engineering design of wells and water supply systems,
- implementation of the construction work including acquisition of materials and supervision,
- carrying out the well drilling with a Cyclone model 300 Rotary Rig owned by the Consultant and Schramm Rig no. 41 owned by the Ministry of Water and Energy,
- implementation of the training programme, and
- service and maintenance of shallow wells and water works constructed during Phase I.

The shallow well programme comprised the construction of about 600 wells.

The third implementation phase January 1982 - December 1984 included (Finnwater... 1985a)

- hand-pump well programme (earlier called shallow well),
- waterworks,
- rehabilitation of old piped schemes,
- deep borehole drilling,
- hand pump maintenance,
- waterworks maintenance,
- sanitation and health campaign, and
- revision of water master plan (data collection).

The implementation was heavily construction oriented and it was called the crash programme. During the third phase of implementation the approach started to change. In March 1984 the project was evaluated by an international team. Thereafter the approach changed towards transferring responsibility and later to institution building. In this study that approach is the fourth stage as shown in Table 6.1.

The activities of the fourth stage can be described by those of the fourth implementation phase January 1985 - December 1987 (Finnwater... 1986a):

- construction of new hand-pump wells and deepening and rehabilitating existing wells,
- extension and rehabilitation of the Makonde Water Scheme and completion of piped water supply projects started earlier by the Project,
- starting of a sanitation and health education programme,
- training of personnel,
- updating the Mtwara-Lindi Water Master Plan of 1977, and
- Institutional Study to form a step-by-step programme for transferring the Project activities and facilities constructed to MAJI.

During the fourth stage the project organization has operated more or less independently, as a section of the Regional Water Development Division (Figure 6.3).

In 1988 the project will start a follow-up phase under the sole responsibility of the RWEs in the two regions assisted by a team of 10 to 11 Finnish advisors.

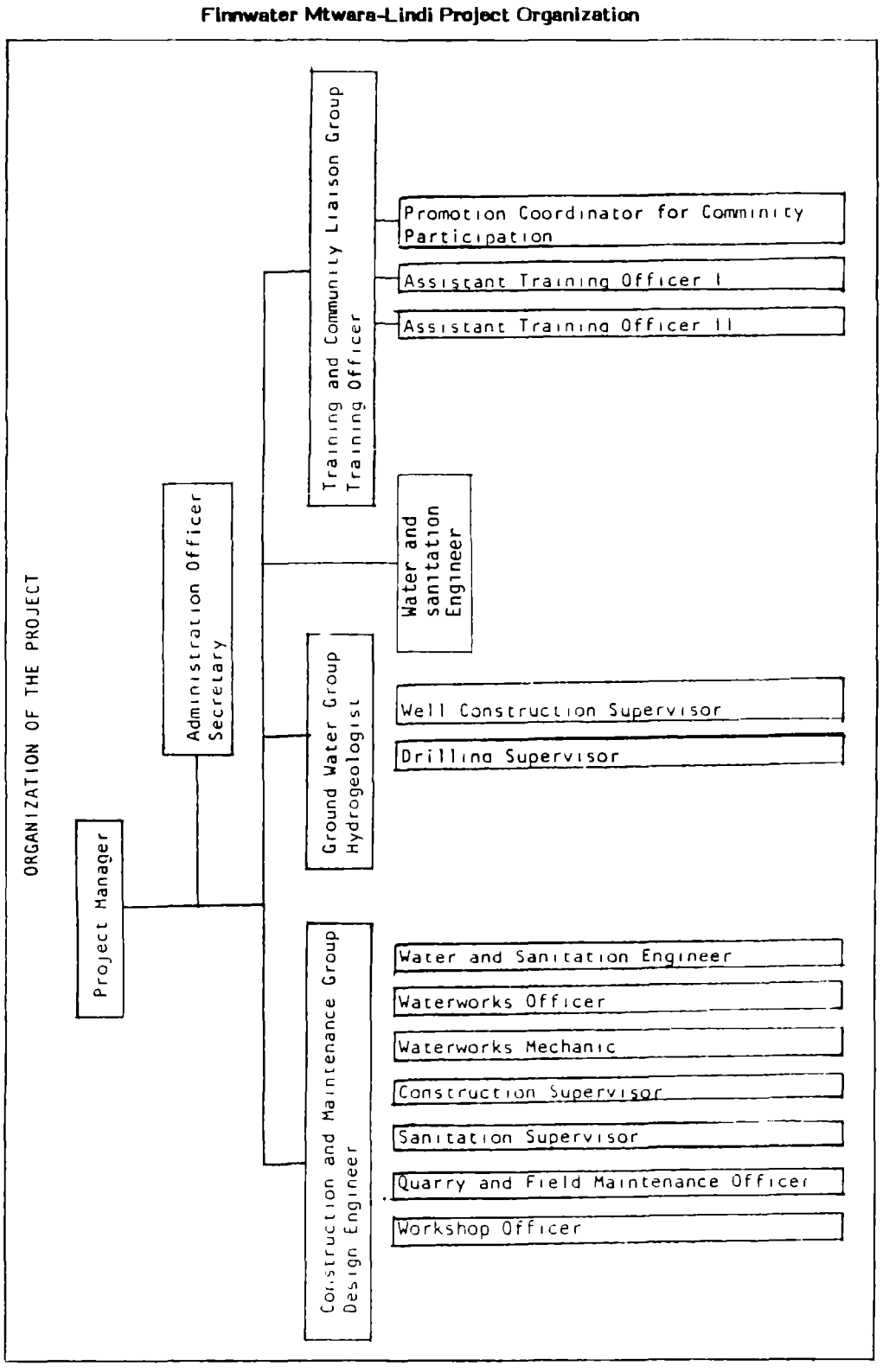


Figure 6.3 The Organization of the Mtwara-Lindi Rural Water Supply Project (Finnwater... 1986a).

Sitari (1986) wrote that Mtwara region has only one rainy season annually and therefore it is possible to get just one harvest per year, unless irrigation is introduced. Forbes (1984) estimated that irrigation has no role to play in general agricultural development in the foreseeable future.

6.2 Primary Inputs and Outputs

Time-correlated selected input data was prepared by the author (Figure 6.4). The data is not comprehensive but it shows the most important factors and their trends.

Costs

The total costs of the water master plan were around 6 million Finnish marks (FIM) per annum as current prices (in 1976 1 US $ = 3,9 FIM). During the implementation phases the total annual costs have been around 16 million FIM (in 1986 1 US $ = 5,1 FIM). Since the Tanzanian Shilling has recently been strongly devaluated, the use of FIM current prices was more practical.

Over 95 per cent of the costs of the water master plan were covered by FINNIDA. In the implementation the Tanzanian share has increased to 9 - 17 per cent. The project has also attracted other external funding from UNICEF and ODA (United Kingdom). This external assistance has been material supply for the large Makonde Plateau piped water supply system. In the stage of responsibility transfer in 1987 FINNIDA's share was about 85 per cent (Purhonen 1987).

Personnel

The volume of expatriate assistance is given in personmonths per annum. During the water master plan the expatriate team had a maximum of 25 persons. During the implementation the personnel has included 15 to 18 expatriates. The expatriates have been in charge of the workshop activities, planning, supervision, training, drilling, geological and geophysical investigations, and project management. During 1982 and 1984 the team had no permanent geologist or geophysicist. This was obviously a severe constraint considering the overall strategy of the project which is the use of ground water. In 1984 the evaluation team recommended the recruitment of a hydrogeologist (FINNIDA 1984a).

During the water master plan there were about 70 permanent Tanzanian staff members including a few engineers, technicians, foremen and craftsmen. Additionally 30 to 120 casual labourers were employed. During the implementation the number of permanent staff varied from 60 to 160. The number of casual labourers varied from 70 to 200 persons.

During the water master plan the project had a few Tanzanian counterparts. For the implementation counterparts were not recruited until 1985. According to the author's knowledge the counterparts have been requested by the project at least since 1978.

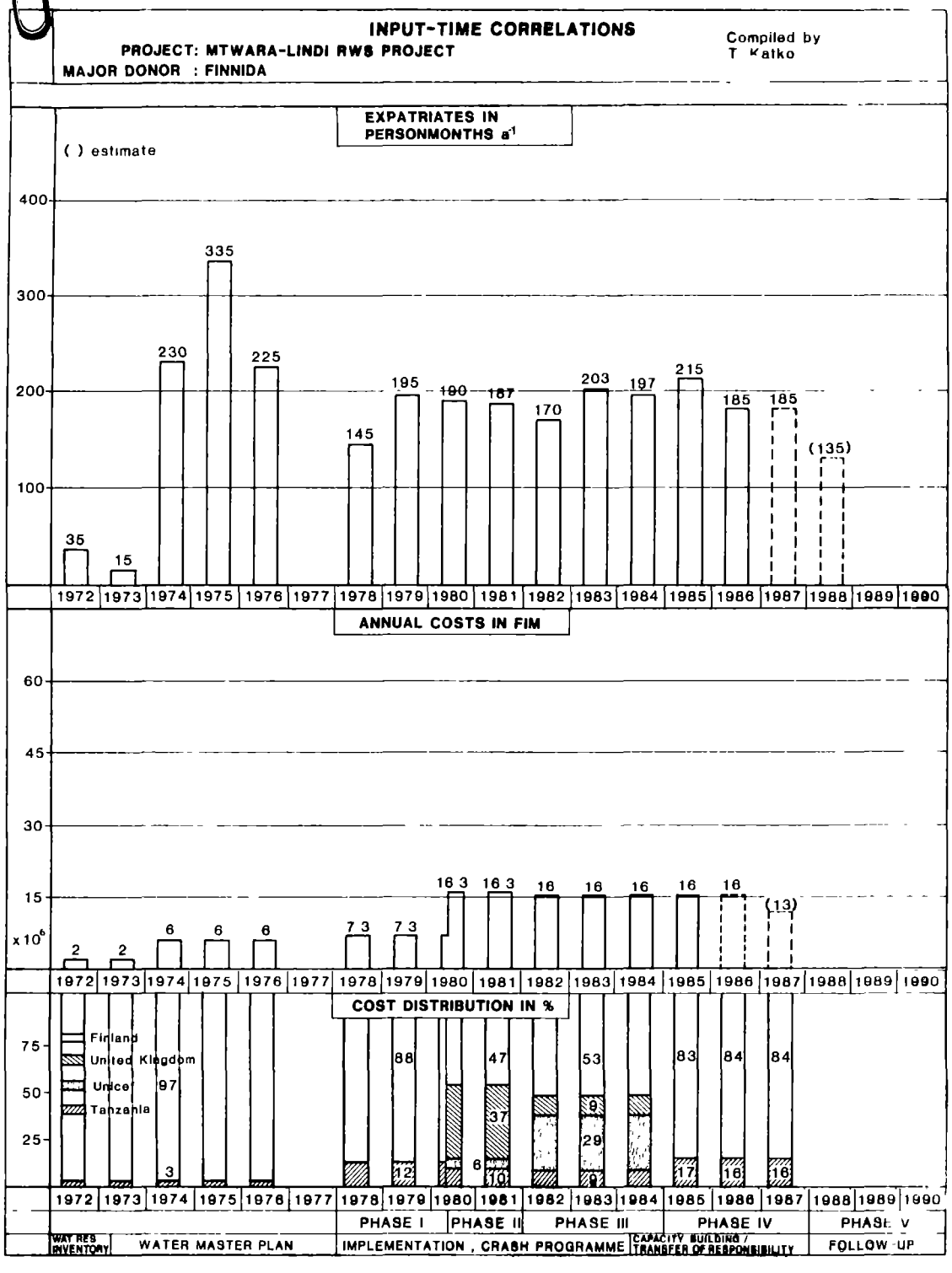


Figure 6.4 Selected input-time correlations of Mtwara-Lindi Rural Water Supply Project (Finnwater... 1977b, 1980, 1982, 1985a, 1986b; compiled and scheduled by the author).

Production and number of people served

The water supply in the project is entirely based on the use of ground water. The project has been one of the pioneers in hand-pump technology (Chapter 5). In the beginning wells were dug by an excavator and drilled by an auger drilling machine. Soon the manual methods of hand digging and hand drilling were

introduced. During the first years the annual production of hand-pump wells was as high as 350 to 370. Since 1982 the production has been around two hundred wells per annum (Figure 6.5). By the end of 1986 the total number of hand-pump wells was 2230 (Finnwater... 1986b).

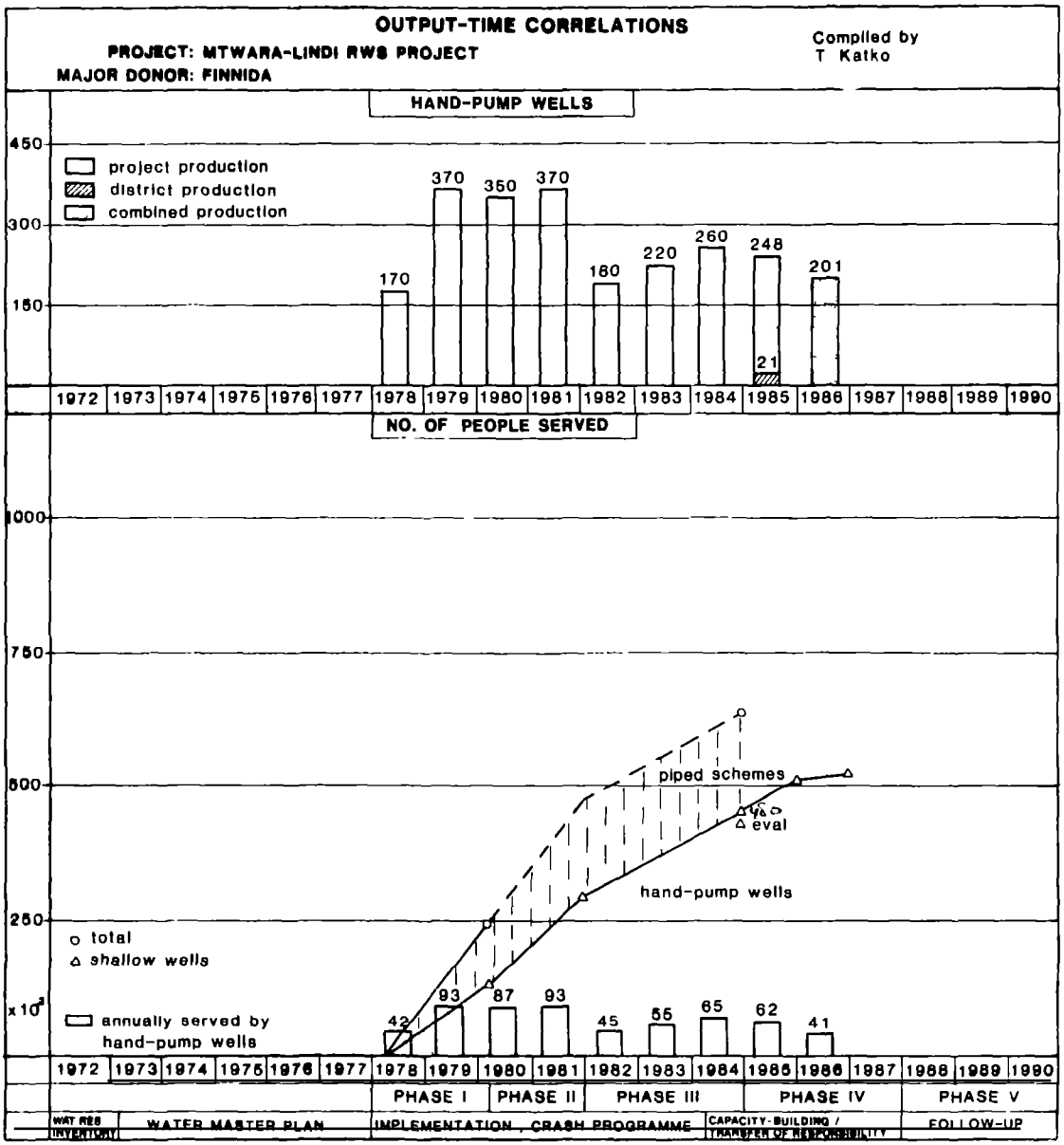


Figure 6.5 Selected output-time correlations of Mtwara-Lindi Rural Water Supply Project (FINNIDA 1984a; Finnwater... 1977b, 1980, 1982, 1985a, 1986b; compiled and scheduled by the author).

In 1985 the hand-pump well category comprised hand auger wells, hand dug wells, down the whole hammer wells and cable tool drilled wells (Finnwater... 1985b). In the same year district water offices started to construct hand dug wells. Since 1986 this activity has not been separated any more due to responsibility transfer.

The project has implemented (rehabilitated and constructed) one large piped, pumped scheme for the Makonde Plateau. The deep ground water deposit was identified during the master plan by geophysical and geological investigations (Finnwater... 1977a). The scheme served about 150 000 people at the end of 1986.

The project has also constructed altogether 12 other, smaller piped, pumped schemes (Finnwater... 1986a). The pumped schemes have had problems with fuel supply and therefore the actual service has been disappointing.

At the end of 1986 hand-pump wells served just over 500 000 people. However, some of the wells can become seasonally dry and some of them suffer from hand-pump breakdowns.

Since 1983 the maintenance of shallow wells has been handed over to villages. By the end of December 1986 this handing over has taken place in 86 villages during the phase four (Finnwater... 1986b).

In 1984 the overall distribution of the population according to their principal water supplies in the two regions were as follows (Finnwater... 1986c):

• Piped water supply	38 %
• Hand pump well	26 %
• Open well or pit	25 %
• Stream	5 %
• Spring	5 %
• Dam	1 %
• Rainwater collection	< 1 %

There were altogether 143 piped schemes in the regions out of which 130 were constructed by MAJI. However, the piped schemes often operate poorly. Finnwater... (1986c) estimated that about 50 per cent of these schemes supply water regularly. The author has noticed even some lower values.

On the whole the Mtwara and Lindi are among the best regions considering the coverage of water supply in Tanzania (Chapter 4.3).

6.3 Strengths and Weaknesses

On the basis of the questionnaire a profile consisting of 15 selected characteristics was prepared separately for stage III (implementation 1978- mid 1984, Figure 6.6) and stage IV (since mid 1984, Figure 6.7). The number of respondents to stage II (master water plan) was so low that no profile could be produced.

Some of the characteristics were presented as such in the questionnaire but some of them were calculated by using data from several questions and/or sub-questions. Additionally the questionnaires offered some space for comments on the characteristics.

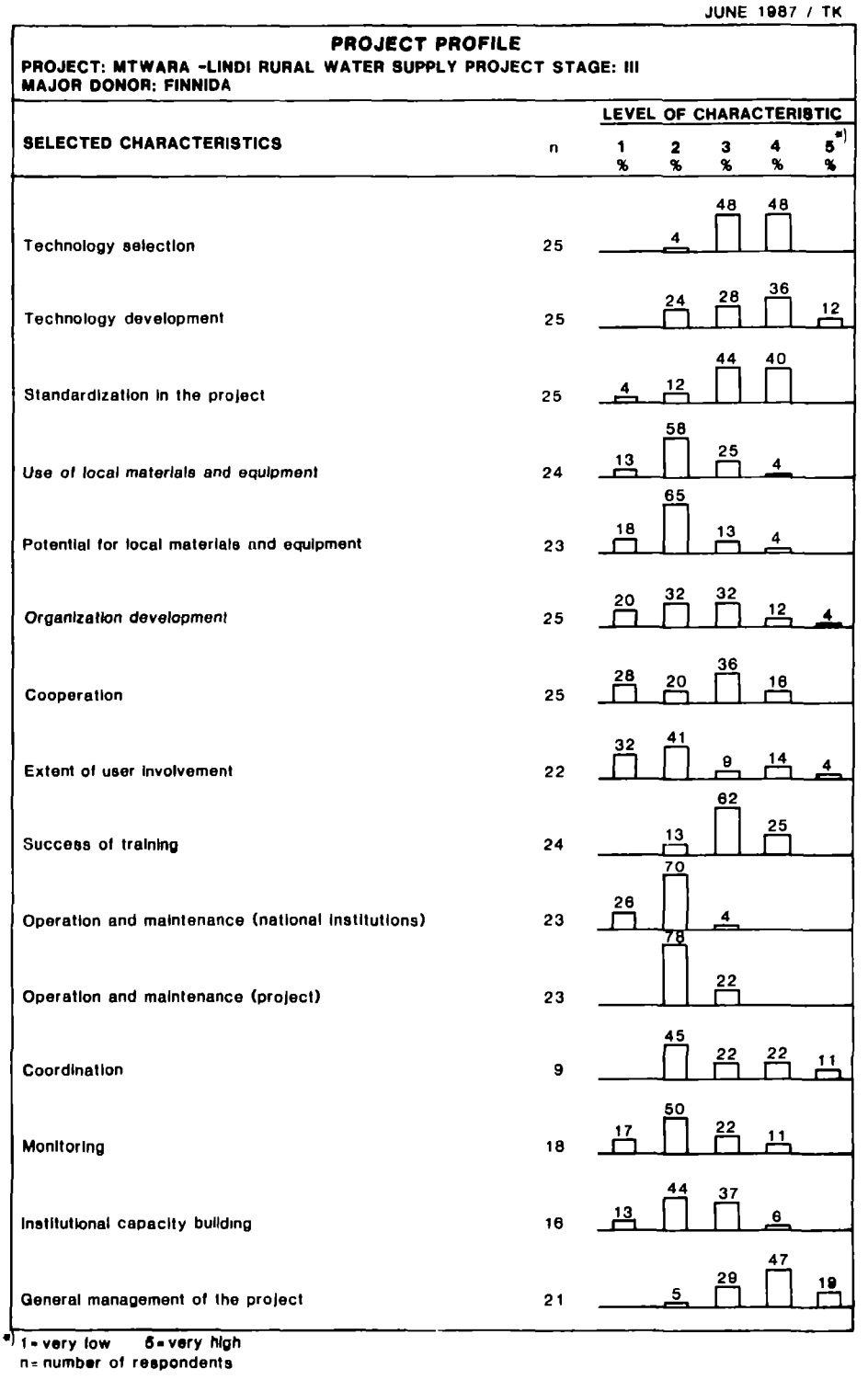
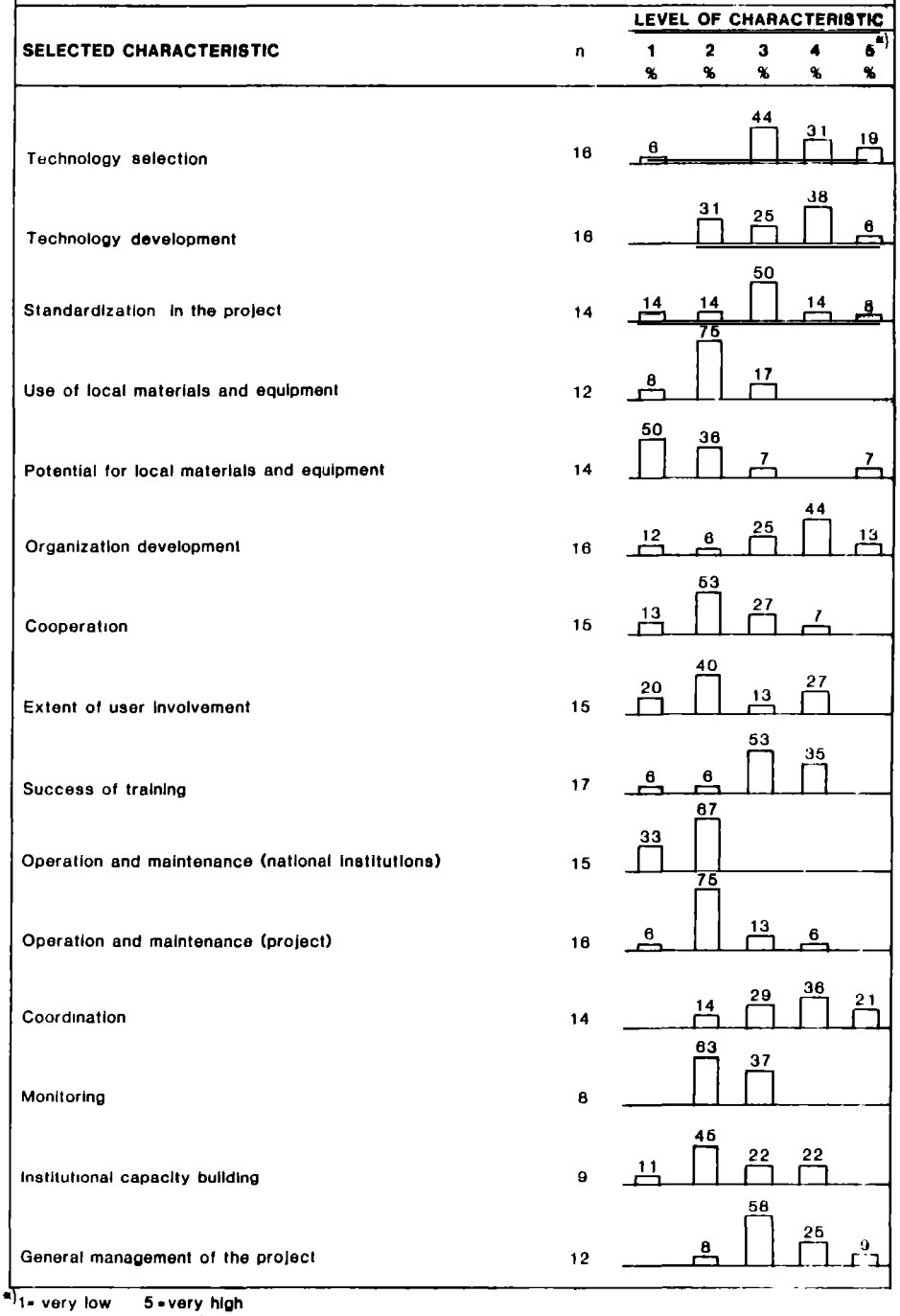


Figure 6.6 Project profile of selected characteristics in Mtwara-Lindi Rural Water Supply Construction Project, stage III based on the questionnaire.

JUNE 1987 / TK

PROJECT PROFILE

PROJECT: MTWARA-LINDI RURAL WATER SUPPLY PROJECT STAGE· IV
MAJOR DONOR: FINNIDA



a) 1= very low 5 = very high
n= number of respondents

Figure 6.7 Project profile of selected characteristics in Mtwara-Lindi Rural Water Supply Construction Project, stage IV based on the questionnaire.

In the questionnaire the respondents were asked to give their views on the most positive and the most negative aspects in an unstructured, open-ended form. A summary of these views is shown in Table 6.1.

Table 6.1 Positive and negative aspects of stages III and IV (combined) in Mtwara-Lindi Rural Water Supply Project based on open-ended questions.

Positive and negative aspects
Project: Mtwara-Lindi Rural Water Supply Project
Major donor: FINNIDA

Positive (+)	Negative (-)
Persons involved (39[1] + 4)[2]	**Persons involved (41 + 5)**
+ efficient implementation (10[3] + 0[4])	- inadequate integration to national organizations (15 + 4)
+ fairly simple well technology (8 + 1)	- low consumer involvement (9 + 2)
+ training (6 + 1)*	- low volume of training, not as a part of institution building (9 + 0)
+ support to the most needy areas (5 + 0)	- lack of felt ownership (5)
+ ability to adjust approach (5 + 0)*	- unrealistic objectives (5 + 0)
+ reporting (2 + 1)	- underdevelopment of O & M systems (4 + 1)
+ continuity (3)	- quantity instead of quality (4 + 0)
+ interest of Tanzanian personnel (2 + 0)	- too high technics in construction (3+0))
+ working routines achieved (2 + 0)	- well siting (3 + 0)
+ new technology transferred to Maji (0 + 2)	- lack of financial consumer contributions (1 + 1)
+ logistic support to RWE (0 + 2)	- short contracts of expatriates (2 + 0)
	- too large area (2 + 0)
	- 86 - 87 worn-out vehicles (2 + 0)
Outsiders (12 + 1)	**Outsiders (13 + 1)**
+ efficient implementation (5 + 0)	- inadequate integration to national organizations (6 + 1)
+ change of approach (5 + 0)*	- expatriate dominance (3 + 0)
+ introduction of hand-pump wells (4)	

1) total number of responding expatriates
2) total number of responding Tanzanians
3) frequency of expatriate responses
4) frequency of Tanzanian responses

* refers particularly to stage IV

The "persons involved" are those who replied to the detailed questions. In practice this means project staff, counterparts and also, to some extent, evaluators and other short term experts. The "outsiders" were those who gave their general views on the positive and negative aspects but who did not answer any of the detailed questions. The analysis showed that the views did not concern just one stage of the project; instead they were overlapping and therefore the results were combined.

The project manager Ovaskainen (1986) reported the views on dissolution of the project organization. He listed the advantages and disadvantages of the implementation organization from 1978 to the end of 1987 (Table 6.2).

Table 6.2 Advantages and disadvantages of the dissolution of the Mtwara-Lindi Rural Water Supply Project (Ovaskainen 1986).

Advantages

1. Flexible financing can be arranged if the Project receives funds directly from the donors.
2. The Project can procure non-local materials and spare parts independently. Programmes are often delayed if contacts with a foreign procurement office are not well arranged.
3. Well organized financing and procurement systems would allow smooth progress and effective use of expatriate staff.
4. The zonal organization can operate in two Regions to maximise the output with a minimum number of experts.
5. Project organization is not bureaucratic.
6. It can freely use contractor and consultant services.
7. It can freely recruit personnel needed and has an independent personnel policy.
8. It has the consultant staff and recruitment channels available.
9. It is easy to control administratively and financially.
10. The equipment is used only by the Project and is always available.

Disadvantages

1. An independent organization tends to become isolated from the Ministry organization.
2. The majority of the staff trained by the Project do not have permanent positions in the Ministry's organization.
3. Coordination with other similar project organizations is difficult. This leads to different approaches in different areas and to problems in for example, standardization.
4. The Project organization may be pushed into the difficult tasks whilst the local organization did not make the effort to solve problems using the local facilities.
5. Because certain tasks are implemented by the Project organization the corresponding sectors within Maji fail to develop.
6. The effective administration of a small unit tends to neglect adequate involvement of the Ministry organization in decision making and planning. Economical and productive effectiveness of a small unit can create a different level of development in the Project and in the Ministry organizations.

Technology selection

The project is one of the pioneers in ground water utilization and hand-pump wells. Technology selection was generally regarded among the most positive aspects of the project (Table 6.2). Of the alternative water sources the respondents would have preferred to use more protected springs and rainwater collectors. Some favoured improved open wells and infiltration galleries for river bed deposits. In fact, spring protection was started in 1985. In spite of their relatively low potential, springs should be among the first sources to be utilized. On the slopes of the Makonde Plateau the RWE has constructed a number of gravity and pumped schemes. The Makonde Plateau Water Supply Scheme was constructed already in the mid-1950s. The water was taken from the springs on the slopes (Hakulinen 1982). Sitari (1986) noted that in worst cases water drawers had to spend the night camping near the water source and to return home in the morning.

In the earlier implementation phases some seasonal wells were constructed in places where the ground water table was known to sink considerably. In principle wells should be constructed at the end of the dry season when the ground water table is the lowest. For employment and other practical management reasons this is not, however, possible in a project with defined targets. Therefore, ring wells have later been deepened by digging and installing telescopic rings. This has been the case particularly in the basement area in the Masasi district where aquifers are relatively small. There was also some criticism on well siting. This might be due to insufficient consideration of the user's wishes.

There was also some criticism on the use of too advanced technology in construction. In the first phase of implementation shallow wells were dug and drilled with machinery methods but later hand digging and hand auger drilling were taken into use. It is also evident that in the beginning of the crash programme quantity was the major goal instead of quality.

The Makonde water supply scheme is the largest piped water supply system in the project area. Wilander-Prajogo (1986) made a desk survey on the economic analysis of the project. In the conclusions she stressed that an improved water supply system should not exceed the absorptive capacity of the receiving area on village, regional and national level. Otherwise it can have a negative impact on the general development of the area. In principle this is a feasible approach. However, in areas like the Makonde Plateau the alternatives are very few. If piped water is not supplied, people can partially rely on rainwater harvesting. This has been used to some extent (von Troil 1986). Anyway, in this case they have to walk as long as ten kilometers to fetch water. Thus, the criteria of absorptive capacity is better applied to conditions where several alternatives exist.

Technology development

Technology development in the project concerns primarily hand-pumps. During the water master plan some hand-pumps commonly used for private wells in Finland were tested in the region. They proved to be far too weak for communal wells. This experience

started the development of an appropriate hand-pump for the conditions of developing countries. The first model was the so-called NIRA AF-76. The model was continuously developed in cooperation with the project and the manufacturer. The basic working principle and the structure with the fulcrum area and lever arm was kept the same. A study on the model was made by Korpela (1982).

In 1982 the project area was selected as one of the field test areas of the World Bank executed worldwide hand-pump development project. In 1985 the direct action pump was introduced. Before this breakthrough a few prototype models were also manufactured mostly from locally available materials. Since 1986 the local production of the AF-85 model has been planned and a Finnish-Tanzanian company has been negotiated on the joint-venture principle. The development of local hand-pump production would be a real basis for self-sufficiency.

Other technical development has taken place in spring protection techniques and latrine construction although on a smaller scale.

On the whole, technology development was considered among the most positive characteristics of the project.

Standardization

The issue of standardization is the most acute one on the national scale. There are close to ten external supporting agencies active in the sector. Particularly the bilateral agencies tend to import their own technology and materials which do not necessarily match. In hand-pump and well structures some agreements have been made on the standardization of the rising main and fixing bolt. The project is involved in this standardization effort which seems to be quite difficult.

The project has been supported by three external agencies. Some respondents commented on the difficulties caused by different types of vehicles and pipe materials.

In the suggested local production of hand-pumps the number of different types of pumps must be limited but still at least a few models should be available. This would guarantee possibilities for proper competition and introduction of new models.

Local materials and equipment

In the project the use of local materials and equipment has been fairly small. The potential for using these materials is considered equal or even lower. Materials such as cement have been imported from neighbouring countries and Europe, since the few mills in the country have not been able to supply enough cement. This is the case although the project has been regarded among the most deserving ones by the local authorities.

The availability of aggregates (sand and gravel) is quite limited in the two regions. Since 1978 the project has had a crushing unit which has produced the required aggregate for concrete production. Some materials such as cement have been imported from abroad. The road connections in the regions are fairly bad particularly during the rainy season. On the other hand materials can be supplied via the harbour in Mtwara.

Organization development

From 1978 to mid-1984 the project organization was quite autonomous with very few links to the national institutions. The project offices and workshop, however, were located at the compound of RWE in Mtwara and as such contributed towards cooperation.

The inadequate integration to national organizations was considered the most negative aspect of the project. However, the very same reason made it partially possible to implement the project efficiently. The efficient implementation was regarded as the most positive aspect of the project.

In 1981 the project was evaluated by an international expert team but at that time it did not yet consider the lack of integration as acute (FINNIDA 1981). However, already in the late 1970s there was a debate on the approach. One respondent noted that there was a lack of farsightedness in planning and management and that self-criticism was lacking within the project. The desire to show good results was too evident and lead to wrong conclusions. However, it is very difficult to say which were the real reasons for keeping to the rather unchanged approach. The interviews and discussions indicate that at least in the 1970s there was high political pressure for potable water for as many people as possible.

The organizational and overall approach started to change in 1984. Some changes had already taken place before the evaluation by an international team in March 1984. The evaluation pointed out the development of responsibility transfer and later institutional capacity building.

The ability to change the project approach was regarded as a very positive aspect by different parties. The change of organization development shown in the profiles of stage III and IV (Figure 6.5 and Figure 6.6) is the highest one of all the characteristics included.

Cooperation

The cooperation characteristic comprised three major aspects. The first issue was the cooperation between the donor and other donors. The second aspect were the relations between the project and other externally supported rural water supply projects. The third one focused on the cooperation between the national authorities (water, health, sanitation).

During the third stage (III) the cooperation between the national authorities was considered the most negative one. During the identification and water master planning phases the view of the health authorities was that additional sanitation and health education components will not be needed because in principle the authorities were already running these activities in the regions. The cooperation was suggested several times according to some respondents but it proved to be too difficult. Since the introduction of the sanitation component to the projects, the cooperation with the health community development authorities has improved.

During the fourth stage (IV) the cooperation between the project and other donor supported projects was seen as the most negative one. Since 1985 most of the bilateral donors or their representatives have held regular meetings in Dar es Salaam. The FINNIDA-supported project is represented by an administrative officer whereas the other donors have either project coordinators or other persons relatively more involved in their projects. Additionally, the Mtwara-Lindi region suffers from quite bad traffic connections.

User involvement

Low consumer involvement was seen among the most negative aspects of the project. This lack is connected with the high production targets and autonomous project organization. In the first phases of implementation villages were even paid for the labour costs of well construction. Additionally, no initial payment was required. During the first phases of implementation users participated in well and pipeline digging but later their involvement has increased to some extent.

Since 1985 a number of wells have been handed over to villages who thus became responsible for their ownership, operation and maintenance. The responsibilities of the community and other parties are defined in the "Agreement form of shallow well construction in the village". After the request for a well from a village, a surveyor presents the agreement form to the village leaders. The surveyors also collect the initial deposits from the villages (1000 TAS in 1986) (Finnwater... 1986b).

Training

Training of national personnel has been performed by the project at different levels. The most difficult group for recruitment has been the engineers. In spite of several requests over the years the Tanzanian authorities were not able to supply counterparts to the project before 1985. Technicians, foremen and craftsmen have been more available.

Already during the water master plan period there was some training organized on-the-job. During the third stage (III) the project organized a formal technician training course. The course included lessons, exercises and practical work and it was organized during the rainy seasons from 1979 to 1982. Altogether seven of the participants received the IV Water Technician Grade (Kyber 1986).

The volume of training by the project was gradually increased when a full-time training officer was appointed in May 1983. Since 1978 the staff has included two assistant training officers. These posts have been filled by Finnish engineering students of TUT in their final year. The assistant training officers have been involved in training mainly during the rainy seasons.

In-service or on-the-job training has been given since the start of the project. In 1985 a more organized and planned in-service training was carried out. The fields of training covered mechanical workshop, garage storekeeping, well construction, spring protection, hand-pump maintenance, pipeline laying and operation and maintenance of pipelines and pumping stations (Kyber 1986).

In 1985-1986 the training was extended to include MAJI personnel as a part of the responsibility transfer process. The primary objective was to train MAJI well construction foremen at the district level. The project gave material and logistic support to the construction groups.

During 1985 altogether 15 counterparts were appointed. Thirteen of them were employed by MAJI in the two regions and the other two by the health authorities (AFYA). The primary aim of the counterpart training was to introduce the staff to the day-to-day activities of the projects. Additionally, some new skills were taught.

Many of the financial activities, purchasing and stores management have been executed mainly by the expatriate staff members. Considering the responsibility transfer to the counterparts these activities will be the most difficult ones (Kyber 1986). It is thus evident that external support to these areas will also be needed in the future.

The government-run Mtwara Technical Secondary School has students from different parts of the country. Just a few persons from this school have come to work for the project. The largest mission trade school is situated in Ndanda. The emphasis is on practical training. Some of the workshop mechanics for the project have originally been trained in Ndanda. The author's view is that this human resource could probably have been used more. There are also village-level technical schools. However, they suffer from the lack of basic materials, teachers and even students (von Troil 1986).

Von Troil (1986) pointed out the importance of pretraining for the expatriate staff. She suggested that the programme should include a thorough introduction to the local language (swahili) and culture. With the high number of personnel (so far about 80 persons) this would mean a massive programme. A briefing course would be beneficial for all but thorough knowledge will be practical for those working mostly in the field. It would probably be more important to arrange a short overlapping period of the staff so that the experiences could be transferred in practice.

On the whole, training was regarded fairly successful. However, some critics pointed out the lack of links to institution building.

Operation and maintenance

Operation and maintenance was considered the most negative aspect by the respondents. This agrees with the constraint analysis presented in Katko (1986). The issue included eighteen sub-questions. The aspects mainly depending on the national institutions and those depending more on the project itself were separated.

The purchasing of spare parts via the project was considered efficient whereas purchasing via the national authorities was among the least efficient characteristies. The lack of financial contributions was mentioned as a negative aspect in the open-ended questions. Affordability was estimated to be fairly low but still higher than the actual contributions. Indirectly this would indicate some potential for covering the costs.

In 1985 the handing-over of the operation and maintenance responsibility began. By December 1986 the handing-over took place in 86 villages. The slow progress in this matter is partially caused by the reluctance of the villages to pay for a tool set. In 1986 a deposit of 1000 TAS was used (Finnwater... 1986b). Evidently this reluctance is partially caused by the earlier policy of the Government - water supply free of charge.

Coordination

When the implementation started a Tanzanian MAJI staff member was appointed as project coordinator. In 1985 a formal steering committee was founded.

The level of coordination improved considerably between the third stage (III) and the fourth stage (IV). This is connected with the organizational development of the project.

On a national scale the issue of coordination is crucial as pointed out in the cooperation issue above.

Monitoring

In this context monitoring means mainly the reporting system between the implemented project and the client, FINNIDA (Purhonen 1984).

Progress reports are prepared by the consultant quarterly. A number of the persons interviewed regarded this too frequent. For each financial phase a separate report has been prepared by the consultant.

Reports are the main means of monitoring by the steering committee. The steering committee has representatives from the RWE office, MAJI headquarters, UNICEF, FINNIDA and the consultant. The committee should meet twice per annum. In practice it has been difficult to find a time suitable for all the parties.

The project document which defines the objectives, the expected outputs, plan of operation and inputs for a project phase was prepared for the first time for the period 1985 - 1987 (FINNIDA 1985b).

On the whole monitoring of the project was considered fairly negative indicating that there is a need for improving it. Some of the respondents pointed out that the commonly used rules and practices between the client and the contractor could also be utilized in development cooperation projects. This is related to the lack of supervision noted by a number of respondents.

Institutional capacity building

The capacity building of the national institutions was reinforced during the responsibility transfer stage (IV) when 15 counterparts were allocated to the project. As shown above the transfer of duties from expatriates has its own constraints.

FINNIDA has supported the water supply sector through the postgraduate courses organized by Tampere University of Technology. In 1985 MAJI recognized this activity by appointing two earlier course participants as RWEs for Mtwara and Lindi regions.

Private contractors have been utilized by the project only to a minor extent. The respondents considered that there would be some potential for this development.

The possibilities for strengthening the institutional capacity are undermined by the fact that, particularly engineers and other more trained employees are reluctant to stay in the project area for a long time. This constraint was expressed both by the Tanzanian and the foreign respondents.

According to the respondents the level of institutional capacity building has improved only slightly. The effects of training and the counterpart system were not yet remarkable. In the long run the increasing training efforts will increase the capacity.

All the respondents agreed that material and logistic donor support will be needed for a number of years.

General management of the project

The project management was considered the most positive characteristic during the third stage (III). During the fourth stage (IV) the responsibility is gradually being transferred to the local authorities. This has lead to more constraints and difficulties in project management.

7 HEALTH, SANITATION AND WATER PROGRAMME IN KAGERA, MARA AND MWANZA REGIONS (SIDA-SUPPORTED)

7.1 Project history

The geographical features, population, economy and water resources in the three regions were briefly described in chapter 4.1. Figure 7.1 shows the administrative boundaries of the Kagera (former West Lake), Mara and Mwanza regions and the location of the pilot areas.

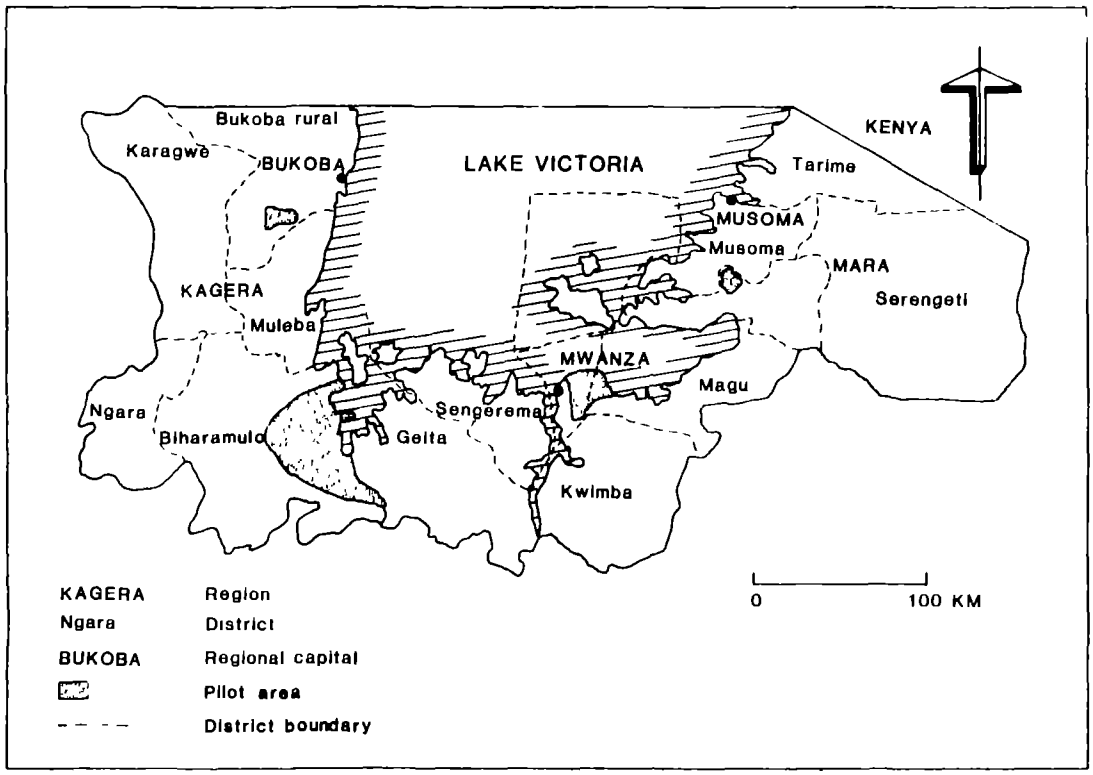


Figure 7.1 Administrative boundaries of Kagera, Mara and Mwanza regions and the location of pilot areas of the Health, sanitation and water (Hesawa) -project (SIDA 1986; modified by the author).

SIDA's assistance to the Tanzanian water sector dates back to the 1960s. Figure 7.2 shows different stages of SIDA's support which are of interest in this study. The general programme type assistance (stage I) to rural water supply decreased gradually and the support concentrated on the three regions.

In 1975 - 1978 the Swedish consultants Brokonsult AB prepared the Water Master Plan. The plan concentrated mainly on water resources inventory and did not include actual implementation. The results were mostly presented in computerized form. The documents comprised summary reports and over 20 volumes for each region. The main conclusion of the plan was that for most villages water supply should be based on a borehole drilling programme. Boreholes were in most cases the cheapest solution. It is of special interest to note that shallow wells were found to be fairly expensive (Brokonsult AB 1978).

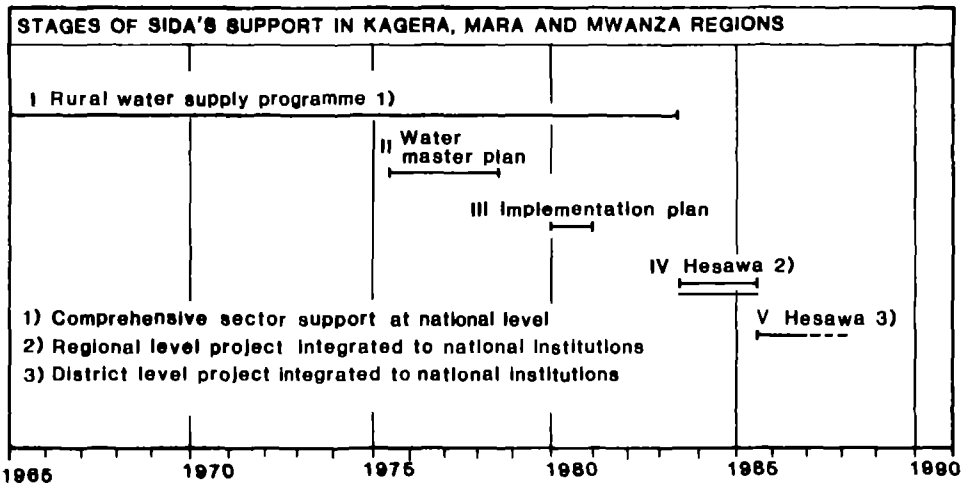


Figure 7.2 Stages of SIDA's support to rural water supply in Kagera, Mara and Mwanza regions; compiled from various sources by the author.

In 1979 the Mwanza Rural Development Programme financed by the World Bank started well construction. By 1984 they had constructed altogether 230 hand-pump wells with support from the RWE and the Dutch experts based in Shinyanga and Morogoro (PMO 1984).

In July 1980 SIDA and VIAK Consulting Engineers and Surveyors signed a contract on preparing an implementation plan (stage three (III) in Figure 7.2). The final report was ready in August 1981. The plan stated that the reliability of diesel-pumped schemes had been deteriorating. The consultant suggested that wells fitted with hand-pumps should be used when possible. As alternative methods the consultant suggested solar-powered and wind-powered pumps as well as rainwater harvesting. The plan suggested an extensive programme of mobilization at village level to attain participation and self-help. It also stressed the need for rehabilitation of existing water schemes (VIAK... 1981).

The rural water supply programme was continued and personnel assistance was given to the three Lake Regions. In 1982 a rehabilitation plan for 25 rural schemes was conducted. This support continued till the start of the Hesawa project (Nykänen 1986).

Hesawa approach

In the minutes between SIDA, PMO and MAJI in 1982 and in April 1983 the framework of the Lake Region Programme was officially accepted. The programme had the following objectives (SIDA 1984a):

- gradual transferral of responsibility from the Government to the consumers through increased involvement of the village community in all aspects of their water supply,
- reduced dependence on diesel schemes through intermediate technical solutions at a cost that can be born by the consumers, and

- protection of water sources and water handling from pollution and, in the long run, generally improved hygiene and sanitary practices in the community.

Thus the programme was to include activities that until then had not been under the responsibility of the RWE.

In November 1983 a Swedish consultant, HIFAB International AB was contracted by SIDA. The consultant was to provide expatriate personnel as well as material and equipment. Figure 7.3 shows the organizational structure of the programme.

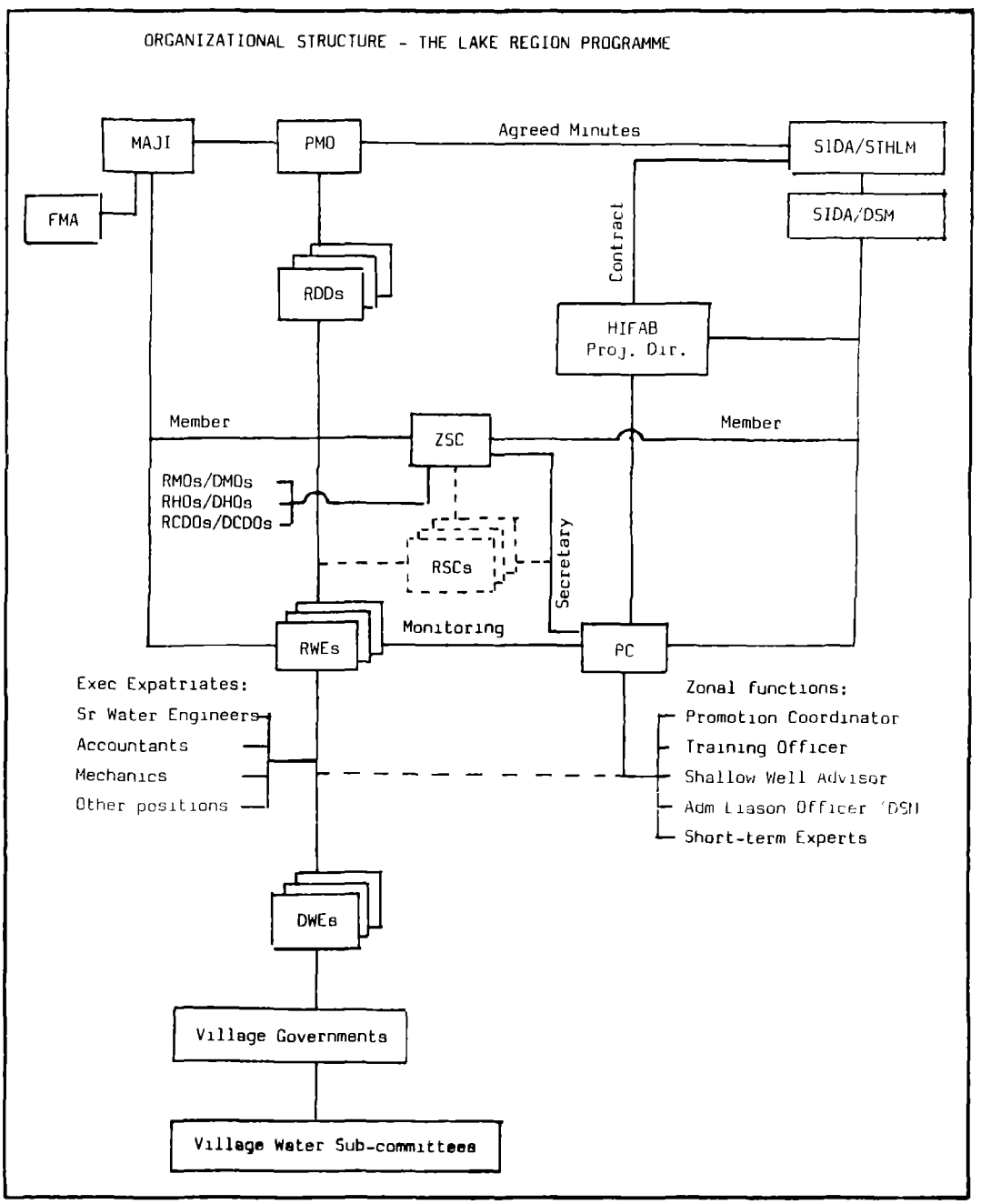


Figure 7.3 Organizational structure of the Lake Region Programme in 1984 before the decentralization of the project (SIDA 1984a).

The discussions and interviews implied that originally the objective was more towards programme than project type support. In spite of the Hesawa's different approach it can be called a project like the other ones in this study.

During the review mission in February 1984 the Hesawa principles were finally approved. The abbreviation derives from the integrated approach of health education, sanitation and water supply (stage IV in Figure 7.2). The review mission in November 1984 recommended that the project is to be carried out in one division of Mwanza region. The model suggested by Therkildsen (1984) provided a start for this step by step approach. As experiences are gained the model will be applied in the two other regions. The key AFYA, MAENDELEO and MAJI staff were to be seconded to this zonal project (SIDA 1984c).

In March 1984 Andersson and Brandström (1984) handed over a report on the principles and procedures for the Hesawa programme.

It is of special interest to note that quite a number of short-term consultants have been used for developing the Hesawa-concept and its technical and, particularly, organizational aspects. In 1983 Samset and Stokkeland... (1983) prepared a proposal on monitoring and evaluation systems. Book (1984) made a study on operation and maintenance in the regions. He noted that the existing organization (MAJI) was somewhat overpopulated, the morale was low and enthusiasm was almost non-existent. He suggested the adoption of an industrial attitude towards operation and maintenance.

In 1984 Wikner (1984) made a review of the potential water resources of shallow wells, medium deep and deep boreholes in the three regions. Van de Poel (1984) analysed current programmes and made a proposal for applied shallow well technology in the area. He suggested a small scale start, first in one of the districts only. He noted that this pilot project start appears to be difficult because of official planning procedures.

In 1984 SIDA (1984b) published its latest strategy paper on water supply programmes for rural areas giving guidelines for the next five years. The paper pointed out the importance of improved water supply, health and hygiene.

Nordberg (1985) made a consultancy visit to give recommendations on community participation, sanitation and health education. He noted that the project is very ambitious in trying to tackle several major problems at the same time: involvement of communities in planning, reorientation of technologies and integrated collaboration. He also stated that

> "Each of these three efforts is an important and difficult task. Combining them within the framework of one project is a major challenge, complicated by the fact that the project does not start from scratch, but is a continuation of an established water development programme with different objectives; somehow the Hesawa programme has to strike some sort of compromise between the old and the new, promoting a genuine spirit of intersectoral cooperation without frustrating too

much those who were involved in the implementation of the "old" water programme and who remain important also for the outcome of the Hesawa programme. The Hesawa programme means bringing health professionals and community development specialists into the main-stream of the activities, and this is most probably going to be difficult at times. Such collaboration is difficult and rare at all levels, but maybe less so at the periphery; prospects should therefore be reasonably promising at district level, where all the three mentioned sectors are firmly established."

Winblad and Kilama (1985) made a consultancy mission on environmental sanitation issues. They recommended

- gradual improvements and increased use of household latrines,
- a crash programme for schools, health centres and dispensaries,
- supplementary training for village health workers and supervisors, and
- purchasing and development of teaching and training materials.

Decentralization of the programme

After the strategic planning workshop in May 1985 the organizational structure was decentralized by the following changes (SIDA 1985):

- PMO became directly responsible for the overall implementation of the programme.
- The Zonal Steering Committee was abolished and replaced by Regional Steering Committees, and the zonal administration of the consultants was consequently to be regionalized, leaving only a small central organization.
- The responsibility for field operations and for O & M was to be gradually entrusted to district authorities and village bodies.

Figure 7.2 refers to these changes. SIDA and the Prime Minister's Office in Dar es Salaam operate at the strategy and policy decision level. PMO is the overall administrator and coordinator. The review in November 1985 stated that according to the experiences coordination is best done by a body outside the jurisdiction of any participating ministry (SIDA 1985).

The activities at the regional level are coordinated by the Regional Action Team (RAT) under the chairmanship of the Regional Planning Officer (RPLO).

The district bodies of MAJI, MAENDELEO and AFYA are responsible for decision-making and act as financial authorities for implementation as well as operation and maintenance. The new Ministry of Local Government and Co-operatives will be important in the Hesawa programme. The Hesawa activities are to be incorporated with district councils. The District Action Team (DAT) coordinates the activities at district level. The team is chaired by the District Executive Director (DED) other members being from the collaborating organizations (Mazzuki 1986).

The village level is expected to accept certain responsibilities in implementation as well as operation and maintenance such as (Mazzuki 1986):

- to contribute as a first condition 3000 TAS for a hand-pump payment
- to own shallow wells and be responsible for their operation and maintenance, and
- to provide labour for construction.

The villages have the final word in deciding whether to participate in the programme or not.

In the annual joint review of 1986 the following short term objectives for the project were announced (SIDA 1986):

- decentralization of decision making, planning, budgeting and implementation responsibilities to the district and village level,
- improvement of the integrated operation and maintenance functions, the systems and routines at all levels in decentralized organization,
- promotion of community participation, health education and sanitation through planned coordination of relevant MAJI, AFYA and MAENDELEO activities,
- improvement of women's situation through improved health and reduced burden of water collection,
- improvement of women's status through encouragement of women's active participation in planning and implementation, i.e. in village assemblies, Hesawa committees and in operation and maintenance arrangements,
- introduction of a functional cost control system,
- training of personnel according to the policies and guidelines of the HRD programme,
- improvement of existing traditional water sources,
- construction of wells or alternative low cost water supplies including gravity schemes,
- rehabilitation of existing and completion of ongoing gravity schemes, and
- rehabilitation and/or electrification of specifically approved diesel powered schemes when no feasible alternative can be developed.

The project concentrates on pilot areas in each of the regions (Figure 7.1). The activities and coordination are to be completed in one particular area or village before moving to another one. According to Mazzuki (1986) it would be difficult to integrate the activities without this areal concentration.

Some of the water schemes are to be constructed without full integration to health education and sanitation until the capacity for full integration has been developed. Thus in 1986 the project had two components (SIDA 1986):

- Hesawa integrated projects, and
- selected water schemes.

The integrated projects include hand-pump wells whereas the selected schemes are mainly piped systems.

7.2 Primary Inputs and Outputs

The author compiled time-correlated selected input and output data (Figure 7.4 and Figure 7.5).

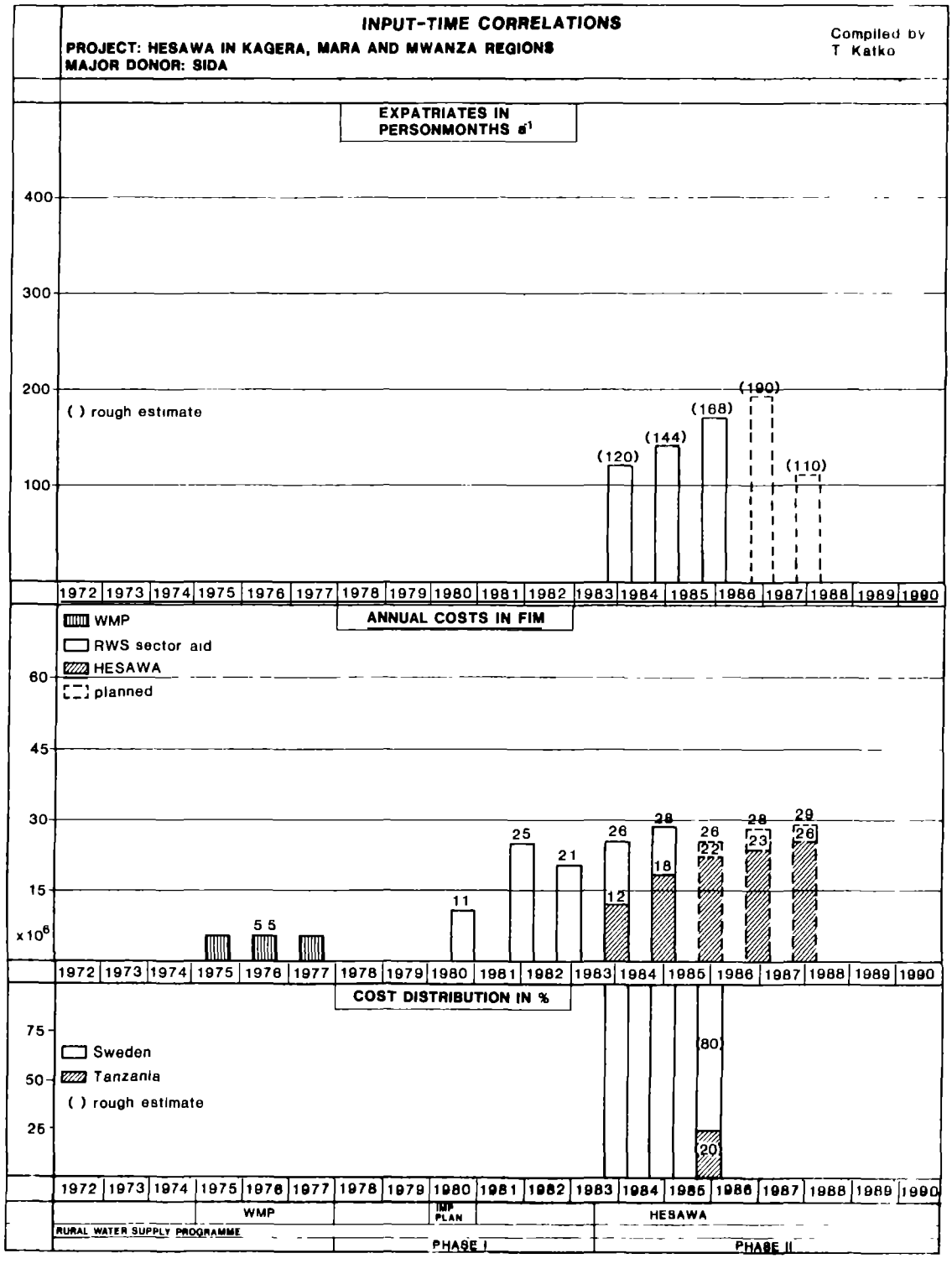


Figure 7.4 Selected input-time correlations of the Hesawa project (Kleemeier 1982; SIDA 1984a, 1984c, 1985, 1986; compiled and scheduled by the author).

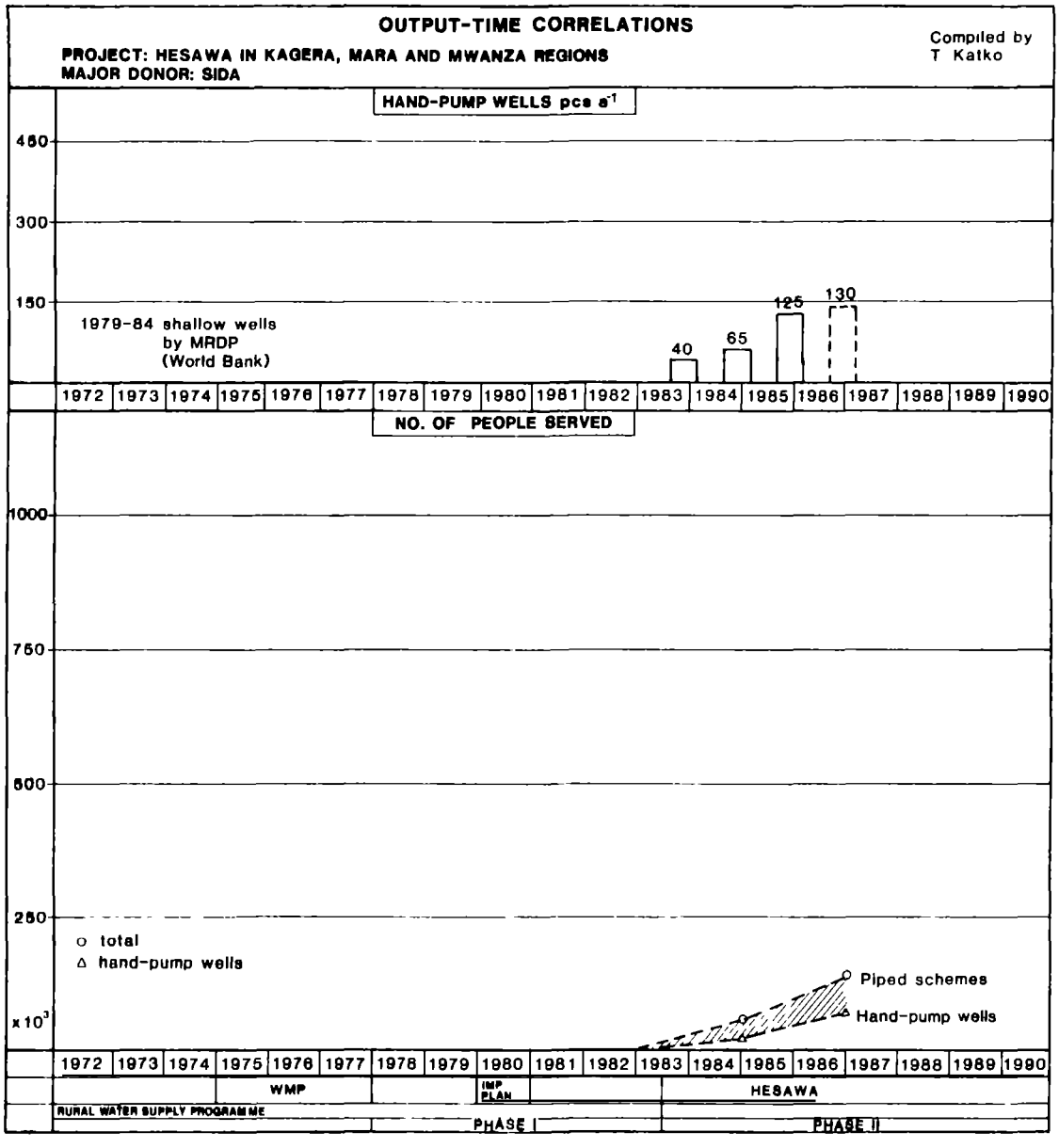


Figure 7.5
Selected output-time correlations of the Hesawa project in Kagera, Mara and Mwanza regions. (Hifab International 1987; PMO 1984; SIDA 1985, 1986; compiled and scheduled by the author).

The figures on cost distribution and annual expatriate personmonths are rough estimates. Particularly the progress reports before the financial years 1985/1986 concentrated on describing future strategies but left out basic follow-up data. The same applies to the outputs. Later the reporting has improved.

Costs

In 1985/1986 the Tanzanian share of the project costs was estimated to be about 20 per cent. Some of the respondents found it quite promising that there seems to be economic potential for financing a part of the total costs at the district level.

The annual costs of the water master plan were about 5,5 million FIM. The annual costs of Hesawa itself have increased from 12 to 23 million FIM. Respectively the sectoral rural water supply aid has decreased since 1983. In 1987/88 about 90 per cent of SIDA's support in the sector will be channelled through Hesawa.

Personnel

The number of expatriates has increased from 10 to 16 and is related to increased costs. In 1986/87 there have been 16 expatriates employed via the consultants. The main tasks of the consultant are to give professional advice and support in human resources development, promotion of integration and technical as well as operation and maintenance matters, monitoring and general management. The consultant also executes purhasing, cost control and reporting (SIDA 1986). In 1987 the number of expatriates has been reduced to ten (SIDA 1987).

The expatriate personnel is planned to be gradually replaced by local staff. For 1987/1988 there are plans for eight expatriate consultant posts to be kept (SIDA 1986).

Production and people served

During the first three to four years the production of wells and the number of people served has been fairly low. By the end of the financial year 1986/87 about 360 wells have been constructed. Additionally a number of piped schemes without the total integrated approach have been constructed (Hifab International 1987).

7.3 Strengths and Weaknesses

The number of respondents in the questionnaire to the earlier stages (I - III) of the Hesawa project were quite low. Therefore it was not possible to make any kind of frequency analysis on views. Profiles on selected characteristics were produced separately for the fourth stage (IV) and the fifth stage (V). The respective numbers of respondents were from five to seven and from six to ten only (Figure 7.6 and Figure 7.7). These numbers are low but still probably give an indication. The open-ended questions on the most positive and negative aspects (combined for stages four and five) are summarized in Table 7.1.

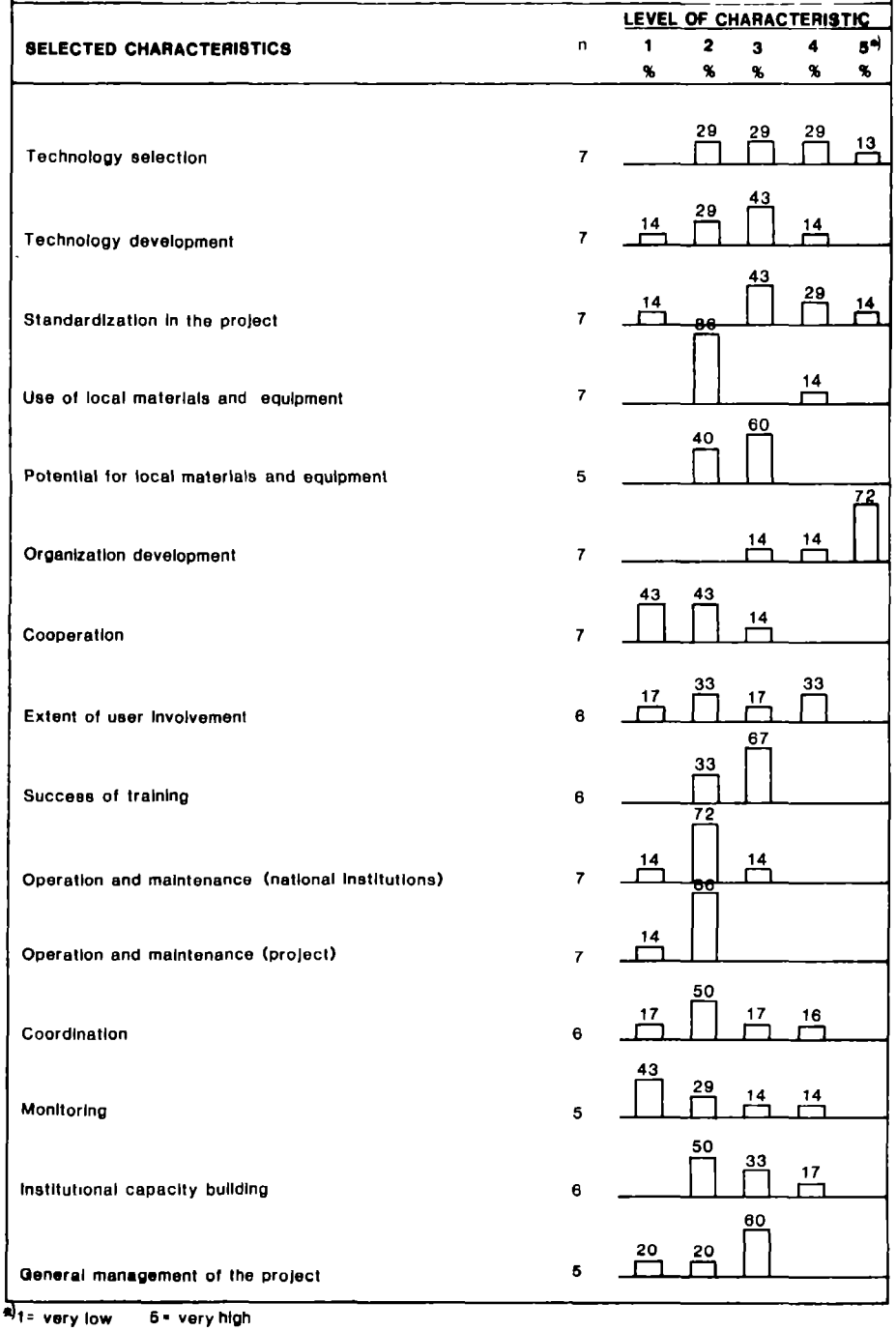
Technology selection

Technology selection is connected to the earlier SIDA-supported activities in the country. A few respondents reminded that still in 1980 there was a strong opposition towards shallow well technology in the area.

The Hesawa project gave up diesel-pumped schemes. Hannan-Andersson and Andersson (1985) recommended the improvement of traditional sources and simple technology. In Mwanza region shallow wells were constructed in 1979 - 1984 as a part of the World Bank financed Mwanza Rural Development Project (PMO 1984). After this project came to an end the Hesawa continued the hand-pump well construction and promotion. Rehabilitation of hand-pump wells is also included in the project (SIDA 1987).

JUNE 1987 / TK

PROJECT PROFILE
PROJECT: HESAWA IN KAGERA, MARA AND MWANZA REGIONS STAGE: IV
MAJOR DONOR: SIDA



a) 1 = very low 5 = very high
n number of respondents

Figure 7.6 Project profile of selected characteristics in Hesawa project in Kagera, Mara and Mwanza regions, stage IV based on the questionnaire and interviews.

The annual review of 1986 stated that water supply will concentrate on the protection of traditional sources and construction of shallow and medium deep wells. The size of qravity schemes is kept to a minimum because of operational problems of large schemes. According to Winberg (1987) the project offers a wide spectrum of technical alternatives. The most simple ones are based on improving traditional sources. These can include fencing of traditional pits separately for human and cattle use. They can also include open wells.

JUNE 1987 / TK

PROJECT PROFILE

PROJECT: HESAWA IN KAGERA, MARA AND MWANZA REGIONS STAGE: V
MAJOR DONOR: SIDA

SELECTED CHARACTERISTICS	n	LEVEL OF CHARACTERISTIC 1 %	2 %	3 %	4 %	5 % [4]
Technology selection	10	10	30	30	30	
Technology development	10		30	60	10	
Standardization in the project	10	10	10	20	30	30
Use of local materials and equipment	8	13	25	37	25	
Potential for local materials and equipment	9	11	33	11	22	22
Organization development	10		20	30	10	40
Cooperation	9	45	33	22		
Extent of user involvement	10		40	40	10	10
Success of training	6	33	17	33	17	
Operation and maintenance (national institutions)	9	11	78	11		
Operation and maintenance (project)	8	25	75			
Coordination	6	17	33	33	17	
Monitoring	7	43	29	14	14	
Institutional capacity building	9	45	22	22	11	
General management of the project	9	11	45	33	11	

[4] 1= very low 5= very high
n= number of respondents

Figure 7.7 Project profile of selected characteristics in Hesawa project in Kagera, Mara and Mwanza regions, stage V based on the questionnaire.

Table 7.1 Positive and negative aspects of stages IV and V in Hesawa project in Kagera, Mara and Mwanza Regions based on open-ended questions.

Positive and negative aspects
Project: Health, Sanitation and Water Programme (Hesawa)
Major donor: SIDA

Positive (+)	Negative (-)
Persons involved (18[1] + 1[2])	**Persons involved (17 + 2)**
+ user involvement (8[3] + 0[4])	- SIDA management (5 + 1)
+ decentralization to district level (6 + 1)	- low production (5 + 0)
+ simplified technology (6 + 0)	- complicated administrative structure (3 + 0)
+ intersectoral collaboration (4 + 1)	- too much stress on software side (3 + 0)
+ also including sanitation and health (4 + 0)	- too much concentration on pilot areas (1 + 1)
+ training (3 + 0)	- difficult to hand-over (0 + 2)
+ acceptance of village ownership (2 + 0)	- isolated from Maji (0 + 2)
+ acceptance of HESAWA-concept at lower levels (2 + 0)	- poor interest among government officers (2 + 0)
+ involvement of women (2 + 0)	- area too large (2 + 0)
	- too many expatriates (2 + 0)
Outsiders (10 + 1)	**Outsiders (12 + 3)**
+ working with district councils (4 + 1)	- low production (8 + 0)
+ simplified technology (3 + 0)	- too much promotion (4 + 0)
+ user involvement (3 + 0)	- introducing a parallel unity (0 + 3)
+ integrated with health (2 + 0)	- PMO as coordinator (1 + 1)
	- complicated management structure (2 + 0)

1) total number of responding expatriates
2) total number of responding Tanzanians
3) number of expatriate responses
4) number of Tanzanian responses

The Kagera region favours gravity schemes because of greater rainfall and more suitable topography than in the other regions. Altogether six gravity schemes were approved for construction during 1986/1987 and 1987/1988.

Simplified technology was considered among the most positive aspects of the project. However, the low level of production was seen as the most negative aspect by different parties.

Technology development

The profiles and the open-ended questions revealed that so far technology development has been slow. Because of changes in approaches over the years the possibilities for longer term development have been bad. The small volume of construction has perhaps not generated enough practical experiences.

SIDA (1986) mentioned about the use of solar pumping and rainwater harvesting as possible development fields.

Standardization

The issue of standardization was considered commonly fairly positive although some critical aspects were presented as well.

Local materials and equipment

The profiles show that there could be some possibilities to increase the use of local materials and equipment. This should be possible particularly when using improved traditional sources. The hand-pumps have so far been purchased from Morogoro. However, so far these pumps have mainly been manufactured in the Netherlands. Some materials have also been imported from Kenya.

Organization development

Organization development was the most positive characteristic included in the study. The decentralization to the district level was commonly considered a very positive approach. The integration of water supply, sanitation and health education under the same programme was also considered positive.

However, the organization development has its own drawbacks. The organizational structure and the whole Hesawa approach of three sectors in intersectoral collaboration was considered quite problematic. The organizational structure is complicated. Many of the respondents regarded the objective acceptable as such but they also considered the objective too ambitious. Some experts reminded that intersectoral cooperation is very difficult in developed countries as well.

Cooperation

Because of the Hesawa integrated approach it is natural that cooperation between the national authorities was relatively better than cooperation between the project and other donor-supported projects. The different approach to other externally supported projects could cause this lower level of cooperation.

User involvement

MAENDELEO is responsible for promotion and assistance in community participation. The tasks of MAENDELEO are (Mazzuki 1986)

- community mobilization and organization,
- supporting the planning and implementation of Hesawa programmes,
- monitoring and evaluating Maendeleo work and services, and
- giving support to human resources development particularly training programmes to women.

The intensity and quality of promotion activities vary within the programme. The general view of the joint review team in 1986 was that promotion is weak everywhere else except in the Bunda district in the Mara region (SIDA 1986). The consultants noted

that community participation has been very poor in the Biharamulo district in the Kagera region. While villagers have been active in seminars and meetings they have failed to help the shallow well teams. The consultant concluded that the reason is poor promotion by MAENDELEO (Hifab International 1986). Kleemeier (1986) noted that

> "Hesawa needs to reduce the role which Maendeleo plays in the programme. Otherwise, projects will fail because the department cannot perform the duties which Hesawa places on it".

She concluded that Hesawa cannot depend on government staff in involvement. Instead giving power to villagers and creating incentives for them to exercise this power becomes more important.

The respondents considered user involvement quite low. On one hand, the promotion was considered inadequate. On the other hand, the magnitude of the same issue was considered too high related to the low production of the water sources. One expert noted that no implementation can go on in the programme without first straightening out the so-called software components. As another expert put it: too much said not enough done.

Training

Since 1985 the project has had an expatriate training advisor on a zonal basis. In 1985 the project had a Tanzanian promotion officer based in the Mara region.

SIDA (1985) divided the human resources development activities into four main components, namely:

- training of accountants and stores management,
- managerial training,
- training of villagers, and
- technical training at WRI.

Management training included seminars and on-the-job training. Training of villagers aims at the improvement of traditional water sources.

The regional trainers of trainers of Village Health Workers (VHW) were trained in Arusha 1985. The regional trainer will train the district trainer who will then train a team of VHWs. Village health workers are expected to play a key role in the Hesawa programme at the village level (SIDA 1985).

Additionally an African Medical Research and Education Foundation (AMREF) health advisor is stationed in Bukoba (SIDA 1986).

The views on the success of training varied on a large scale. One half of the respondents had a negative view on the issue for the fourth stage (IV). Training was considered more successful during the fifth stage (V).

Operation and maintenance

Book (1984) noted that the operation and maintenance of the existing schemes is not good at all. If funds are not allocated to operation and maintenance activities the water schemes will break down faster than new ones will be constructed. He recommended a strong back-up, advice, funds and a lot of hard work.

In 1986 the joint review team wrote that one of the key issues of the programme is a decentralized and functioning operation and maintenance system. Special attention was to be given to large piped water supplies. The district councils were to ensure adequate funds for operation and maintenance. These maintenance costs and manpower requirements were to be included in the district council's plans and budgets (SIDA 1986).

According to the questionnaire operation and maintenance was considered the most negative aspect of the programme. These activities of the programme could be even more disappointing than those of the national institutions. Probably the integrated approach makes it more difficult to arrange operation and maintenance.

One expert commented that generally Tanzania seems to have enough funds to run a project at the district level. The availability of these funds has been a positive surprise in the Hesawa programme.

Coordination

The issue of coordination in this context is quite unspecified. On one hand the resident representative of the consultant in Mwanza acted as a coordinator by

- coordinating the consultant, government and SIDA,
- following the progress and recommending changes, and
- reporting.

On the other hand the donor representative in Dar es Salaam was quite involved in the project. Thus it is somewhat unclear which body should be the one to coordinate.

The joint review team of 1986 pointed out that the activities of coordinators at various levels are crucial. Coordinators are needed at least at regional and district levels (SIDA 1986).

Since January 1987 an expatriate programme coordinator under PMO has been stationed in Mwanza.

Monitoring

The consultant prepares a progress report twice a year. As pointed out in the input and output data analysis the reports concentrate on describing the future activities instead of measurable facts. In spite of the integrated approach and institution building measurable criteria should be developed for monitoring purposes. The amount of people served can be one of them although the primary aim is not efficient implementation. The lack of actual achievements was also noted by the annual review mission in 1985 (SIDA 1985).

Institutional capacity building

The Tanzanian respondents, mostly MAJI staff members, criticized the Hesawa approach quite a lot. Some of them were afraid of the introduction of a parallel unity. It was felt that MAJI is by-passed by this kind of unity. In the RWEs annual meeting in 1986 this view was strongly presented (Lucas 1986).

In addition to the training in the project SIDA has supported for years the Water Resources Institute (WRI) in Dar es Salaam. The WRI produces all water technicians in Tanzania. The syllabus of WRI has recently been revised towards more practical skills in collaboration with SIDA and WHO. In the water sector there is thus an unwritten agreement between FINNIDA and SIDA to support the human resources development at different levels.

Kleemeier (1986) concluded that foreign project implementors cannot greatly improve government staff performance. Instead they could make better use of private initiative in implementation and maintenance.

The respondents' views on institutional capacity building were on the whole fairly negative in spite of the fact that this issue is one of the main objectives of the programme. However, it is important to note that no representatives from AFYA, MAENDELEO and Districts responded to the questionnaire. Their views could be quite different.

In any case the presented views would again show the difficulty of an integrated approach. The different capacities of the major collaborating institutions at district level probably increase the difficulties.

General management of the project

The general project management was considered fairly negative during the both stages (IV and V). However, some improvement has taken place between the stages.

The open-ended questions showed critical comments on SIDA's management of the programme. This might among others be connected to the use of several consultants since the water master plan. Each of the consultants has come with his own preferences. According to SIDA (1987) many of these consultants have actually been subconsultants to Hifab International. On the whole the integrated programme has lead to a complicated management structure. This was also caused by the changes in the Tanzanian administration. Decentralization of the project finally resulted in involving five ministries instead of the three ministries as planned.

8 WATER SUPPLY AND SANITATION DEVELOPMENT, KIGOMA AND RUKWA REGIONS (NORAD-SUPPORTED)

8.1 Project History

The geographical features, population and water resources in the two western regions were shortly discussed in chapter 4.1. Figure 8.1 shows the administrative boundaries and the main areas of the project activities.

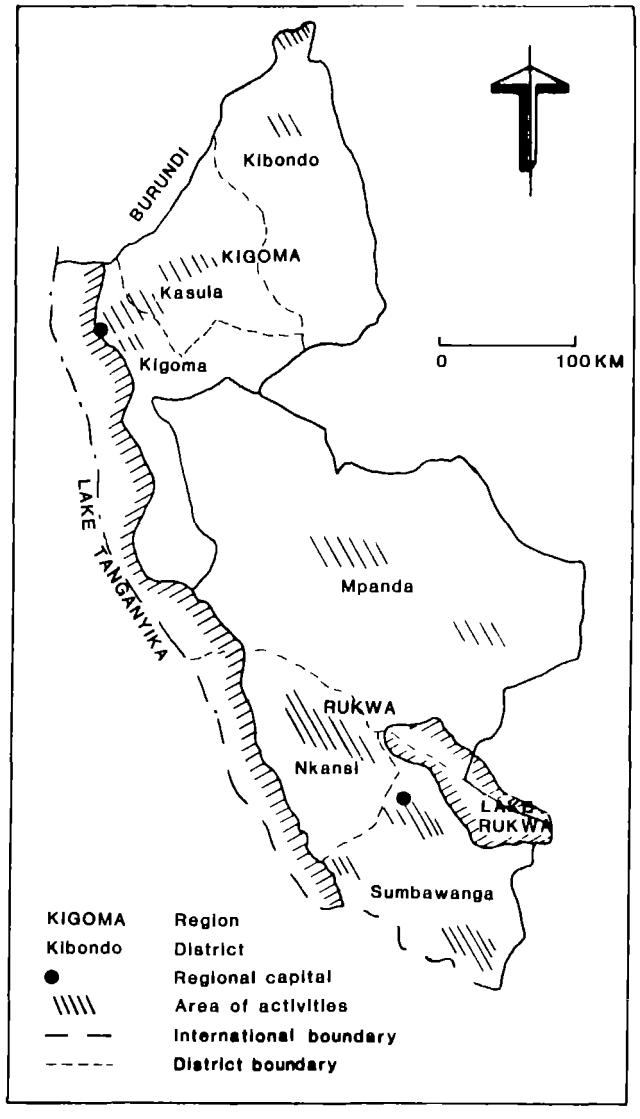


Figure 8.1 Administrative boundaries of Kigoma and Rukwa regions and the main areas of activities of the NORAD-supported project (Laugerud 1987, Norconsult...1986, Regional...1986; compiled and modified by the author).

Already in the early 1970s NORAD started to support the water sector in Tanzania with the extension of the hydrological network in Mbeya, Rukwa and Tabora regions via the Western Tanzania Project (Repp 1986). The Norwegian assistance particularly to the Kigoma and Rukwa regions started in 1979. According to the administration and financing the assistance has contained the following phases:

- Water Master Plan (Phase I) 1979-82
- Inception of Implementation (Phase II) 1981-83
- Implementation (Phase III) 1984-86
- Implementation (Phase IV) 1987-90

For this study the author divided the project into five stages according to their approach (Figure 8.2). From the viewpoint of this study the Norwegian support to the two regions is regarded as a project rather than a programme commonly used by the donor.

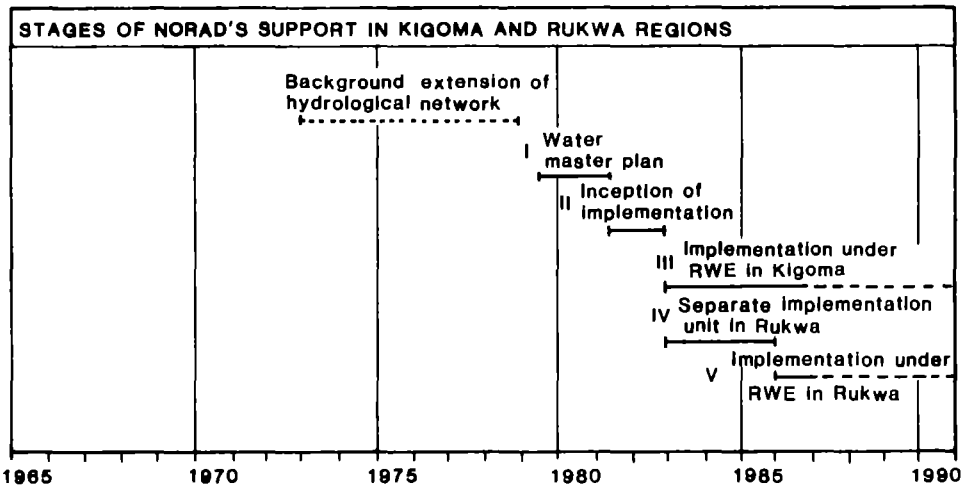


Figure 8.2 Stages of NORAD's support to water supply sector in Kigoma and Rukwa regions based on the approaches used; compiled from various sources by the author.

In 1978 an agreement was made between the governments of Norway and Tanzania regarding the water master plans in Kigoma and Rukwa regions. The Norwegian consultants Norconsult A.S. were given the contract to carry out the water master plan. The comprehensive plan was reported in eleven volumes for both regions. The plan contains technical, managerial and socio-economic data as well as scheme selection criteria (NORAD 1985).

Late in 1981 the inception implementation of the plans was started and this trial period, partly overlapping with the master plan, lasted for two years. The actual implementation started in mid-1983. It included water supply construction, rehabilitation as well as sanitation and health development.

In Kigoma the implementation was carried out by the Regional Water Engineer (stage three (III), Figure 8.2). According to Samset and Stokkeland... (1984) the process of merging the Implementation Unit with the Regional Water Engineers office was started at the end of 1982.

In December 1984 the Norwegian consultants Samset and Stokkeland made an evaluation of the water supply in the Kigoma

region. The remoteness of the region causing delays in deliveries was among the negative factors pointed out in the report. The mission criticized the plans of July 1984 to strengthen the implementation unit towards a more autonomous position. Instead the consultants suggested that the process of merging the implementation unit with the Regional Water Engineer's office should be pursued further. However, a separate material supply unit was recommended. The decentralization policy was reflected in the suggestions to enhance the capacity of the district water engineers (Samset and Stokkeland... 1984).

Until 1985 the project in Rukwa was partly carried out by the RWE and partly by an semi-autonomous implementation unit (IU) staffed by the consultants (stage four (IV), Figure 8.2, Norconsult...1984). The tasks of this semi-autonomous unit included drilling, construction, workshop, transport, stores and since 1984 also sanitation (Liengen and Røed 1986).

In the two regions the expatriate personnel have been recruited by NORAD or seconded by the consultants. The same consultants have been contracted for all the stages of the project so far.

In April...May 1985 NORAD had a review mission to assess the project. It recommended for example that (NORAD 1985)

- Operation and maintenance, training/human resources development and organizational development must be intensified.
- Particularly in Rukwa the semi-autonomous unit should be gradually integrated with the Regional Water Engineer's office. However, supporting functions should remain in the temporary implementation unit.
- The two regional projects should both have equal access to NORAD funds.
- Further development of MAJI's capacity at district level is an obvious target.
- The collaborating partner at central level in Tanzania should be the Prime Minister's office.

During the first half of 1986 the implementation unit was completely integrated into the Regional Water Engineer's organization. Figure 8.3 shows the organizational set-up in the Rukwa region. It shows separately the permanent and temporary sections. Assistance is also given to the district water engineers' offices. In 1987 the "Project Coordinator" has been changed to "Assistant to Regional Water Engineer" (Laugerud 1987).

In 1985 a Community Participation and Health Education (CPHE) team was set up in Rukwa under the responsibility of the Regional Water Engineer. The Norwegian Church Aid, a non-governmental organization was contracted by NORAD to lead this activity. In September 1986 a respective team was set up in Kigoma mainly with Tanzanian staff from different ministries. In October 1986 a review mission was organized to assess the CPHE activities in Rukwa and recommend future activities in the two regions.

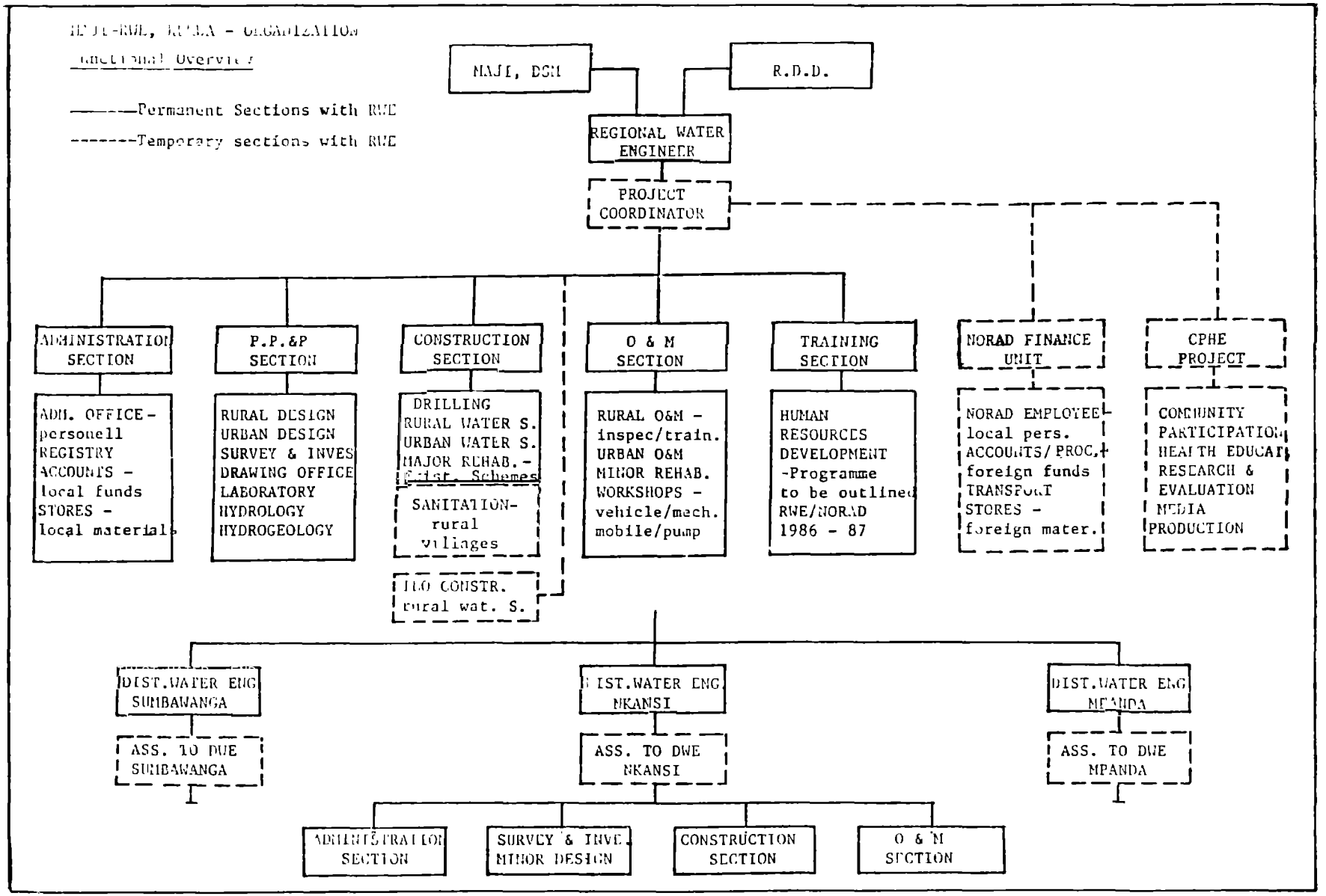


Figure 8.3 Organizational structure of the Water Supply and Sanitation Programme in Rukwa region (Røed 1986).

The mission recommended that the CPHE activities should be gradually integrated with the relevant local department as follows (Gleditsch et al 1986)

- In 1987-88 modes of integration and decentralization should be developed and links to other departments should be established
- From 1989 onwards the responsibility should be transferred to MAENDELEO and AFYA. A community participation (CP) unit should be established within MAENDELEO at the regional level. Both the community participation and health education activities should be implemented at district level.

From January 1987 on there are plans for the project to be integrated into the NORAD-supported Rural Development Programme (RUDEP). This programme financed by NORAD has been operating since 1985 and the involvement will gradually increase (Laugerud 1987).

Since the beginning of 1987 NORAD has decentralized its decision-making by reinforcing its field office in Dar es Salaam (NORAD 1986).

8.2 Primary Inputs and Outputs

The author compiled a selection of the time-correlated input and output data (Figure 8.4 and Figure 8.5).

Costs

Up to the end of 1985 the Norwegian share of the total implementation costs has been very high, over 95 per cent. Thus the local component has been minimal. The costs of the water master plan were distributed roughly equally between the two regions. In 1981-83 (phase II) and 1983-86 (phase III) about 65 per cent of the total funds were allocated to the Rukwa region (Norconsult...1986).

Personnel

The number of expatriates was planned to peak in 1987 close to 30 persons. The expatriate personnel is planned to decrease gradually along with the integration to the national authorities. In January 1976 the project in Rukwa still had only one counterpart engineer (Norconsult...1986).

In October 1987 Norconsult... (1987) noted that the total inputs including costs and external personnel are about 60 to 70 per cent of the estimated amounts shown in Figure 8.4. According to Laugerud (1987) there were seven expatriates in Kigoma and twelve in Rukwa region. Additionally, the procurement office in Dar es Salaam has two expatriates.

Production and people served

By the end of 1986 about 220 successful wells have been drilled. Almost all of these deep wells equipped with hand-pumps are located in the Rukwa region. In addition to the wells some piped gravity schemes, piped schemes with hydraulic rams as well as protected springs have been constructed (Liengen and Røed 1986).

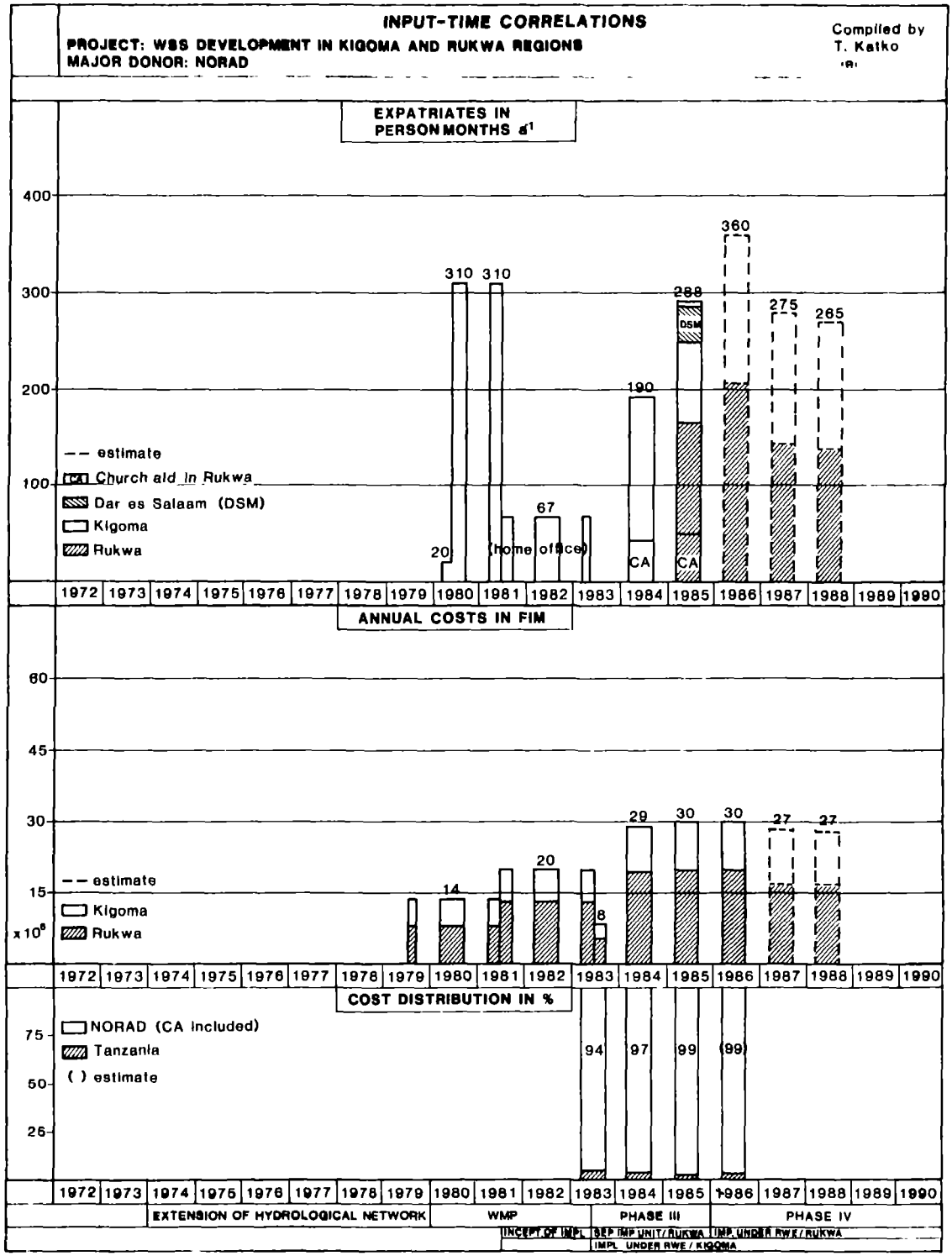


Figure 8.4 Selected input-time correlations of the Water Supply and Sanitation Programme in Kigoma and Rukwa Regions 1979-1988 (Laugerud 1987, NORAD 1985; Norconsult...1982a, 1982b, 1984, 1985, 1986, 1987; compiled and scheduled by the author).

Most of the services are based on rehabilitated schemes. By November 1987 the project had supplied water to about 150 000 - 200 000 inhabitants, mainly in the Rukwa region (Laugerud 1987).

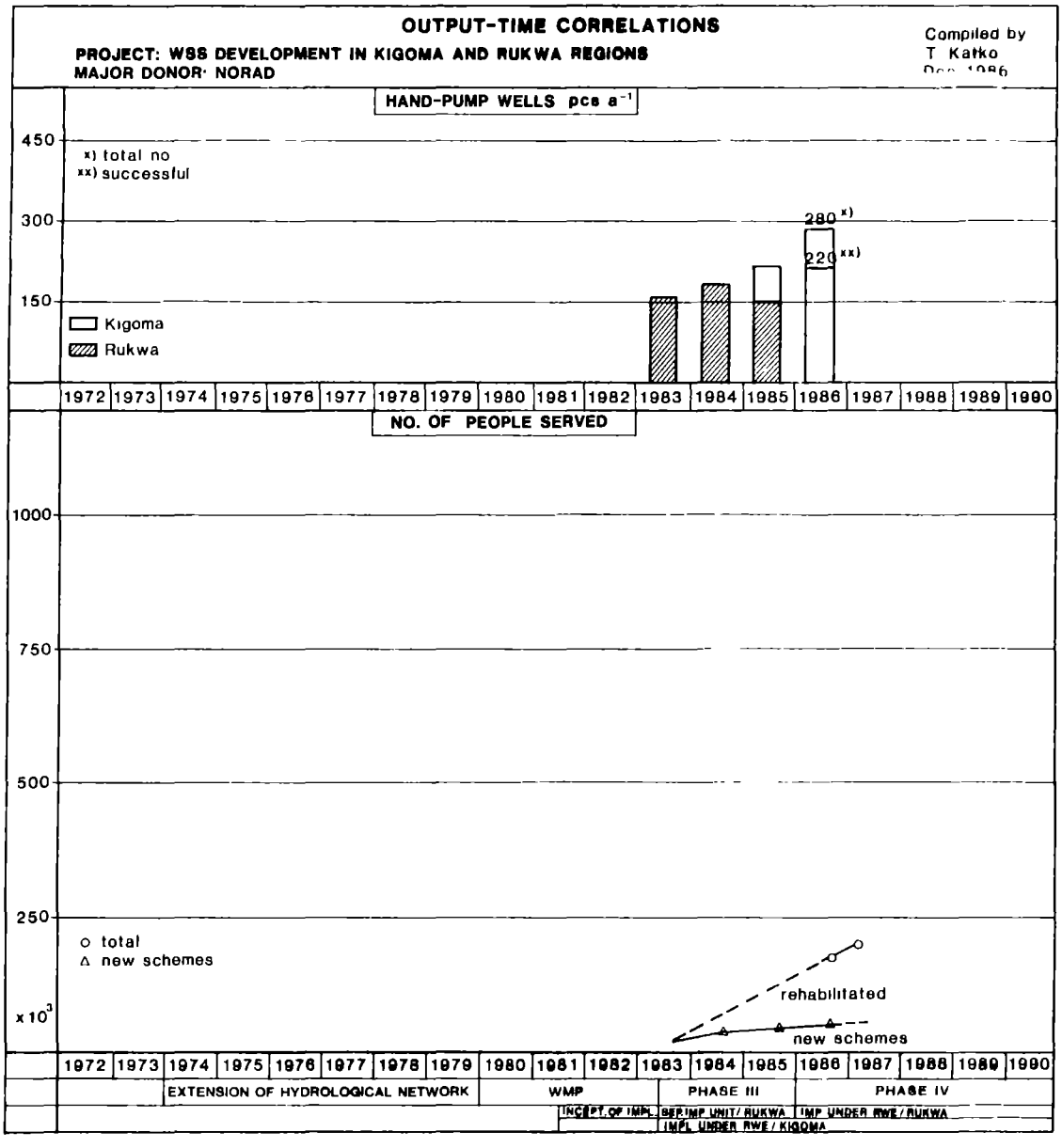


Figure 8.5 Selected output-time correlations of the Water Supply and Sanitation Programme in Kigoma and Rukwa regions 1983-1986 (NORAD 1985, 1986; Norconsult...1982a, 1982b, 1984, 1985, 1986; Rød 1986; compiled and scheduled by the author).

8.3 Strengths and Weaknesses

The number of respondents to the NORAD-supported project was 18. However, the comments on different stages and the two regions were diverse. The number of responses concerning the project stages three (III), four (IV) and five (V) varied from three to five per each stage. Therefore, it was not possible to make any profile of selected characteristics as in the case of FINNIDA- and SIDA-supported projects.

The views on the most positive and the most negative aspects of the project based on the questionnaire and a few interviews are summarized in Table 8.1. Unfortunately the number of Tanzanian views was negligible. The total number of responses is fairly low and therefore the views are only indicative.

Table 8.1 Positive and negative aspects of stages three (III), four (IV) and five (V) (combined) in Water Supply and Sanitation Development in Kigoma and Rukwa Regions based on open-ended questions.

Positive and negative aspects Project: Water Supply and Sanitation Development in Kigoma and Rukwa Major donor: NORAD Positive (+)	Negative (-)
Persons involved (13[1] + 0)[2]	**Persons involved (12 + 0)**
Rukwa + community involvement (4[3] + 0)[4] + open to soft component (3 + 0) + later appropriate technology (2 + 0)	Rukwa - poor planning of integration with RWE (1 + 0)
Kigoma + training of local staff (3 + 0)	Kigoma - NORAD's inconsistent policy on support (3 + 0) - inadequate support to RWE (1 + 0) - too little CP and HE (1 + 0)
Common + dynamic and flexible approach (2 + 0)	Common - inappropriate, too advanced technology (4 + 0) - unrealistic sanitation targets (1 + 0)
Outsiders (9 + 1)	**Outsiders (6 + 1)**
+ integration to national institutional framework (3 + 1) + generally good performance (0 + 1)	- creation of parallel implementation units (1 + 0) - dependence on diesel-pumped schemes (rehabilitation)(1 + 0) - new roles due to integrated approach (1 + 0)

1) total number of responding expatriates
2) total number of responding Tanzanians
3) frequency of expatriate responses
4) frequency of Tanzanian responses

Community involvement was considered the most positive aspect in the Rukwa region both by the persons involved and by outsiders. The integration to the national institutional framework was found very positive but criticism on the planning of this integration was also presented. The soft components, community involvement and health education were found positive.

In Kigoma the training of local staff was the most positive aspect. However, the support to the regional water engineer was considered inadequate. Particularly NORAD's inconsistent policy on support to this region was regarded negative.

The technology used at the earlier stages of the project was regarded less appropriate. The dependence on diesel-pumped schemes was one of the factors pointed out. Appropriate technology at the later stages was considered very positive. This refers to the use of hydraulic rams, protected springs and one horizontal roughing filter in pretreatment with slow sand filtration.

In wells five different types of hand-pumps have been tested. In the deep wells of the project India Mark II has been most promising. Spring protection development could be given more attention (Liengen and Røed 1986).

According to Repp (1986) most of the water master plans including Kigoma and Rukwa considered only the national hydrometric network. However, in most villages water has to be drawn from small catchments of less than one square kilometer.

Myhrstad and Haldorsen (1984)reported on the water quality study of the water master plan in Kigoma region. Surface water sources were almost always heavily polluted by bacteria. The turbidity of the surface water was high particularly during the rainy season. The bacteriological rather than chemical quality is dangerous to health. Myhrstad and Haldorsen suggested the "minimum treatment philosophy" for the two above-mentioned parameters.

On the whole it seems that the approach was quite dynamic and flexible. The integration of the project to the national institutions is a strong objective. The different approaches in the two regions have probably caused some confusion. On the other hand, they have given experiences of different approaches and thus made it perhaps easier to change these approaches.

9 RURAL WATER SUPPLY PROJECT IN IRINGA, MBEYA AND RUVUMA REGIONS (DANINA-SUPPORTED)

9.1 Project History

The geographical features, population and water resources in Iringa, Mbeya and Ruvuma regions were shortly summarized in chapter 9.1. Figure 9.1 shows the administrative boundaries of the three south-eastern regions and the main areas of project activities.

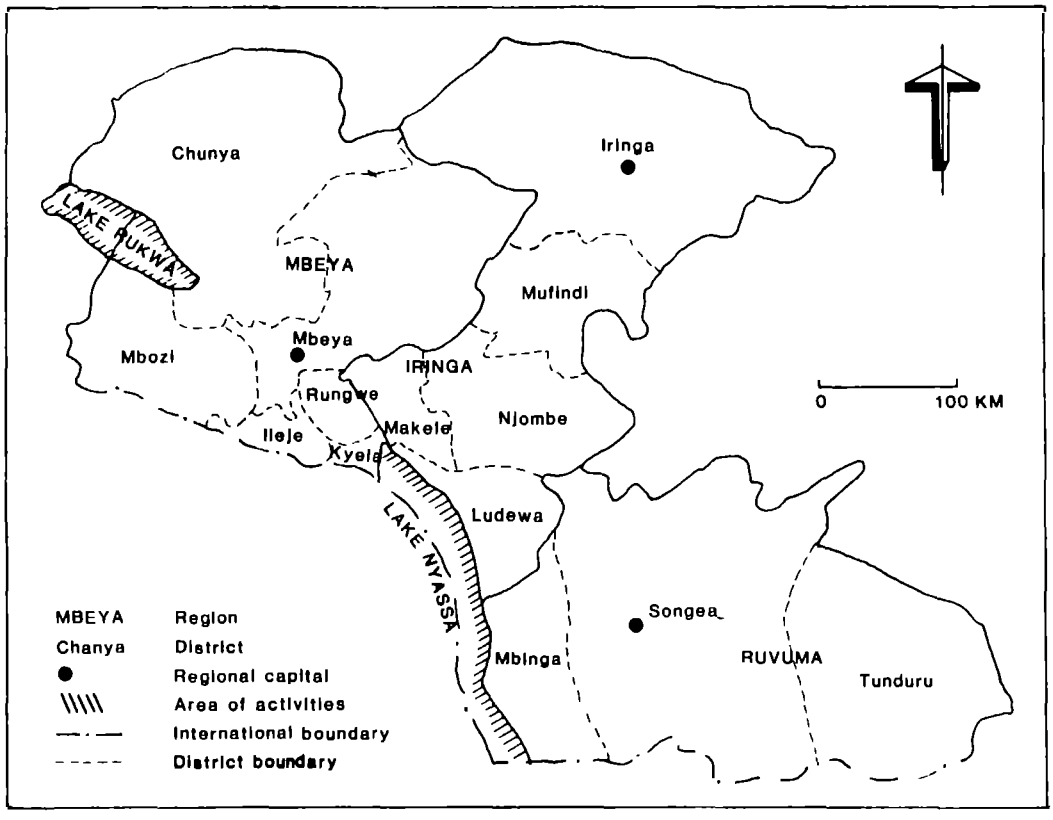


Figure 9.1 Administrative boundaries of Iringa, Mbeya and Ruvuma regions; compiled from various sources by the author.

According to the administration and finance DANIDA's support to the three regions has included the following phases

- Water master plan (Phase I) 1980 - 1982
- Socio-economic studies (Phase I) 1980 - 1983
- Implementation (Phase II) 1983 - 1986
- Implementation (Phase III) 1987 -

Figure 9.2 shows the different stages of DANIDA's support included in this study.

In December 1979 it was agreed that the Danish Government would finance the preparation of water master plans (stage one, I) in the three regions including socio-economic studies (stage two,

II). Additionally an agreement was reached on financing the implementation of a number of water supply schemes.

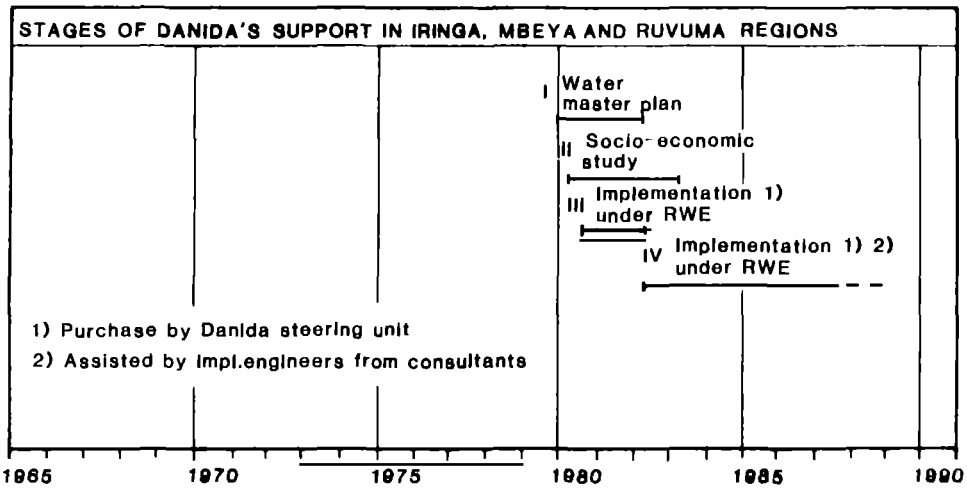


Figure 9.2 Stages of DANIDA's support to rural water supply in Iringa, Mbeya and Ruvuma regions; compiled from various sources by the author.

From January 1980 to March 1982 the Danish consultants, CCKK (a consortium of Carl Bro International A/S, Cowiconsult A/S, Kampsax A/S and Krüger I/S) were assigned to prepare the water master plan with the assistance of the MAJI counterpart engineers. Simultaneously from March 1980 to May 1983 BRALUP (Bureau of Resources Assessment and Land Use Planning) at the University of Dar es Salaam, later called IRA (Institute of Resource Assessment) and the Centre for Development Research in Copenhagen carried out the socio-economic studies. Among others the study recommended a cash deposit. A DANIDA Steering Unit (DSU) was established in Dar es Salaam to coordinate the activities between the engineering consultants, the socio-economic studies and the Tanzanian authorities (DANIDA 1984a).

The water master plan was structured so that it could serve three user groups: central government officials and general planners, technical staff in the water sector as well as specialists in hydrology and hydrogeology. The report comprised twelve volumes. The first six volumes dealt with one region only. The rest of the volumes dealt with all the three regions (CCKK 1982). Later one more volume of the socio-economic survey was published.

In September 1983 the two governments reached an agreement over the implementation of water supply projects in some 300 high priority villages. Additionally pilot projects in health education and sanitation were included in this phase (DANIDA 1984a).

Implementation

In 1983 the same consultants consortium, CCKK was assigned for the implementation of the water master plans. During the water master plan the project was considered a national project. The

Danish funds were transferred directly from the DANIDA Steering Unit to the Regional Water Engineers' accounts. From July 1983 the project was considered a regional project which was included in the regional development estimates. Thus the funds were transferred from the DANIDA Steering Unit through MAJI to the Ministry of Planning and Finance (Treasury) and from there to the Regional Development Directors. This approach caused delays of several months. In February 1984 the annual mission strongly pointed out this constraint. Since July 1984 the project was again classified as a national one (DANIDA 1984a, 1984b).

Since 1983 it has been a condition that a contract is made with a village in advance specifying the mutual obligations for construction as well as for operation and maintenance. The practice of village water committees and regional steering committees has also been established (DANIDA 1984a).

In 1984 the organizational set-up was strengthened with the division of responsibilities between the regional steering committees, regional implementation offices under the regional water engineers with technical and socio-economic aspects as well as the DANIDA Steering Unit in Dar es Salaam. In November 1984 the annual review mission recommended that (DANIDA 1984b)

- AFYA and MAENDELEO representatives should be encouraged to participate in regional steering committee meetings.
- Villages will be responsible for the operation and maintenance costs of the distribution network and the district council for the intake and the mainline.
- All villages should pay a scheme attendant for operation and maintenance.

Therkildsen (1985) had a short term consultancy on health education and sanitation issues and recommended among others that

- There is a general need to specify the objectives of the project.
- Village and district councils should not be by-passed. Their commitments in cash and other forms should be encouraged.
- Villages for rehabilitation or new water supply schemes should be selected areawise.

In October 1985 the annual review mission noted that villages will from then on be fully responsible for the operation and maintenance of the schemes. This was a remarkable change in the approach. They will be supported by a mobile maintenance unit. There was a serious shortage of site engineers and foremen in the three regions although six engineers and one technician had been provided during the year. The mission considered valuable the programme of short term specialists for instance on water quality surveillance, low flow measurements, drilling potentials and training of surveyors. The review mission recommended among others that (DANIDA 1985)

- Village water committees are to be supported and encouraged.
- Iringa and Ruvuma regions should establish a mobile maintenance unit and hand over the completed schemes.
- Training of village health workers is to be supported on a pilot scale.
- Low flow measurements should be conducted annually on high priority water sources, if any doubts exist on their yields. Reliable sources have to be identified before implementing any schemes.

During the water master plan a handbook on village participation was developed. After a few years of experience it was revised and published in 1985. The handbook describes the steps needed for participation (Table 9.1)

Table 9.1 Steps of the "Revised Handbook on Village Participation" developed in the DANIDA-supported project (Boesen 1986).

Step no.	Description
1	Starting the Procedure in the Village
2	Collect Information on Village
3	Send Information Letter to Village
4	Inform Village Assembly about Project and Elect Village Water Committee
5	Select VWC Chairman and Propose Location of Domestic Points (DPs)
6	Approve Location of Domestic Points
7	Survey of Distribution System
8	Signing of Agreement between Village and MAJI/DANIDA
9	Establish Group Scheme Committee and Start preparation of Construction Work
10	Select Scheme Attendants
11	Prepare Start of Construction
12	Work Planning during Construction
13	Discuss Need for Washing Slabs
14	Select Tap Attendants
15	Training of Scheme Attendants in their Duties related to Operation and Maintenance
16	Let the Water Flow
17	Finalisation of Training of Village Water Committee Scheme Attendants and Tap Attendants in Operation and Maintenance
18	Draft By-Laws for the Use of the Water Scheme
19	Agree on Group Scheme Committee's Role in Operation and Maintenance
20	Inspection of Scheme from Intake to last DeP
21	Hand-Over of Scheme to Village

Figure 9.3 shows the project organization in 1986. The DANIDA Steering Unit (DSU) acts as a project administrator and coordinator. The mission's view was that the technical checking taking place in the unit is mostly a formality. The unit controls the project expenditures and supervises the implementation. It is deeply involved in the logistics and reports to DANIDA. In each region an implementation office (DANIDA Implementation Office, DIO) carries out day-to-day activities. The offices are located in the MAJI premises and are staffed by CCKK experts, Tanzanian personnel seconded from MAJI, DANIDA expatriate staff e.g village participation coordinators and mechanics and Tanzanian staff hired by DANIDA.

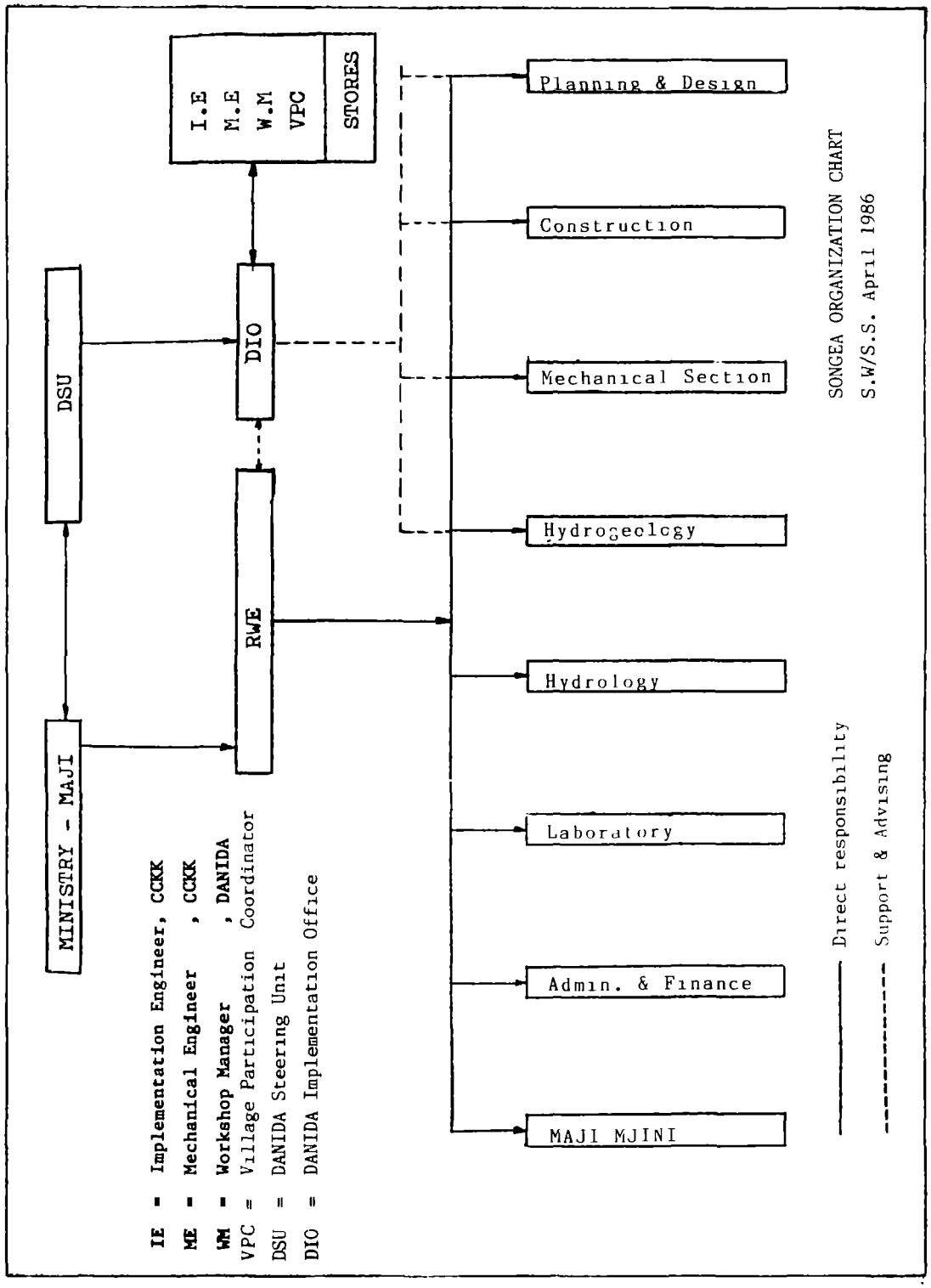


Figure 9.3 Organizational set-up of the Rural Water Supply Project in Iringa, Mbeya and Ruvuma regions (DANIDA 1986).

The review mission recommended among others the following measures to be taken (DANIDA 1986):

- clearer division of responsibility between DANIDA (Copenhagen and Dar es Salaam), DANIDA Steering Unit and DANIDA Implementation Offices,
- improved reporting, and
- improved budget control.

9.2 Primary Inputs and Outputs

Figures 9.4 and 9.5 present a selection of input and output data compiled by the author.

Costs

In 1985 - 1986 the total annual costs have been around 30 million FIM (in 1985 1 US $ = 6,2 FIM, in 1986 1 US $ = 5,1 FIM). This amount is close to the costs of the NORAD-supported programme (Figure 8.4) but somewhat higher than those of FINNIDA (Figure 6.4) and SIDA-supported projects (Figure 7.4). The Tanzanian share of the costs has been from one to three per cent only.

Personnel

The number of expatriates was not clearly stated in the accessible reports but it was to be declining. Later experiences show that the number was rather increasing (Therkildsen 1987).

Production and people served

By the end of 1986 just over 200 000 people have been supplied with water. This is a rough estimate because in most reports only the number of villages supplied with water have been mentioned. Figure 9.5 shows that the delays caused in channeling funds in 1983-1984 had an influence on the number of constructed schemes.

9.3 Strengths and Weaknesses

The total number of responses to the project was 18. However, the number of responses to the first three stages (I - III) was too low for making any analysis. Figure 9.6 shows the profile for the fourth stage. The number of responses varied from five to ten. However, the results can be considered indicative. The views of the open-ended questions on the most positive and the most negative aspects are summarized in Table 9.2.

Technology selection, development and standardization

About three quarters of the schemes have been gravity systems and the rest shallow hand-pump wells. The gravity scheme technology is seen as very positive and in mountainous areas like these they should be among the first alternatives. Emphasis has been placed on low flow measurements which is very important in these kinds of systems (Repp 1986). The technology selection was regarded highly appropriate and it was one of the most positive characteristics described both by the profile (Figure 9.6) and the open-ended questions (Table 9.2).

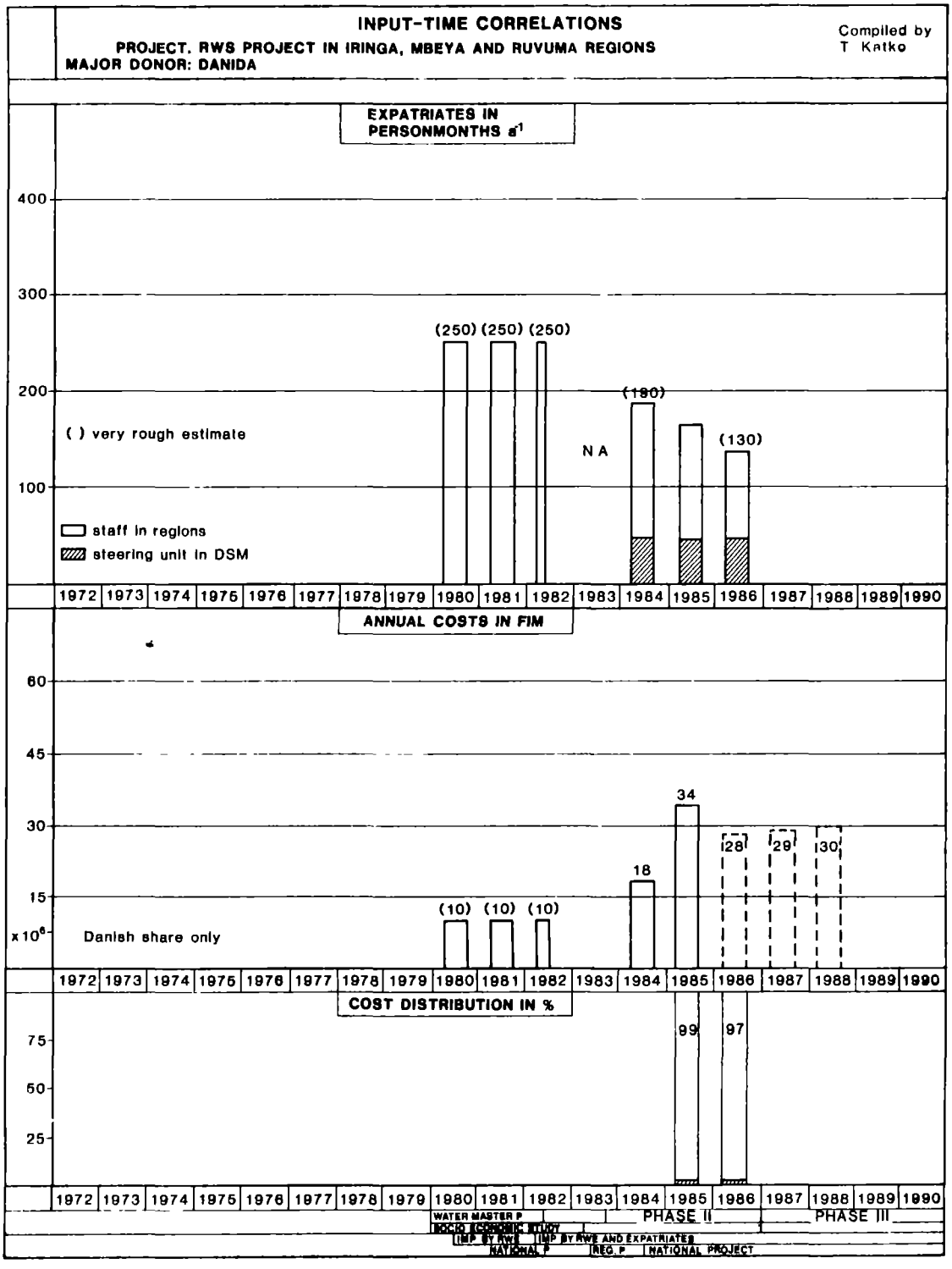


Figure 9.4 Selected input-time correlations of the Rural Water Supply Project in Iringa, Mbeya and Ruvuma regions in 1980 - 1988 (CCKK 1982; DANIDA 1984a, 1984b, 1985, 1986; IRC 1987; compiled and scheduled by the author).

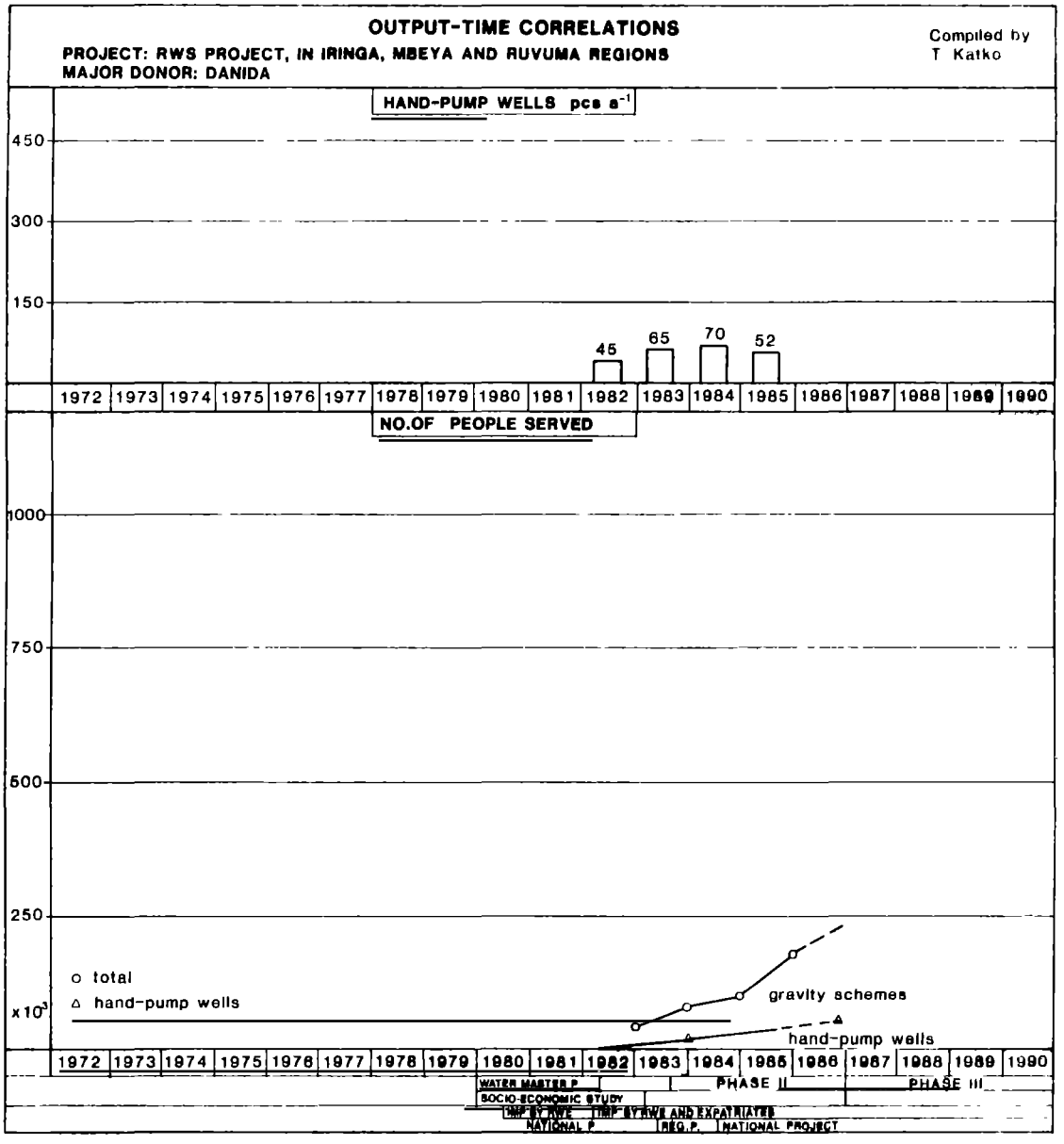


Figure 9.5 Selected output-time correlations of the Rural Water Supply Project in Iringa, Mbeya and Ruvuma regions in 1982 - 1986 (DANIDA 1984a, 1984b, 1985, 1986; compiled and scheduled by the author).

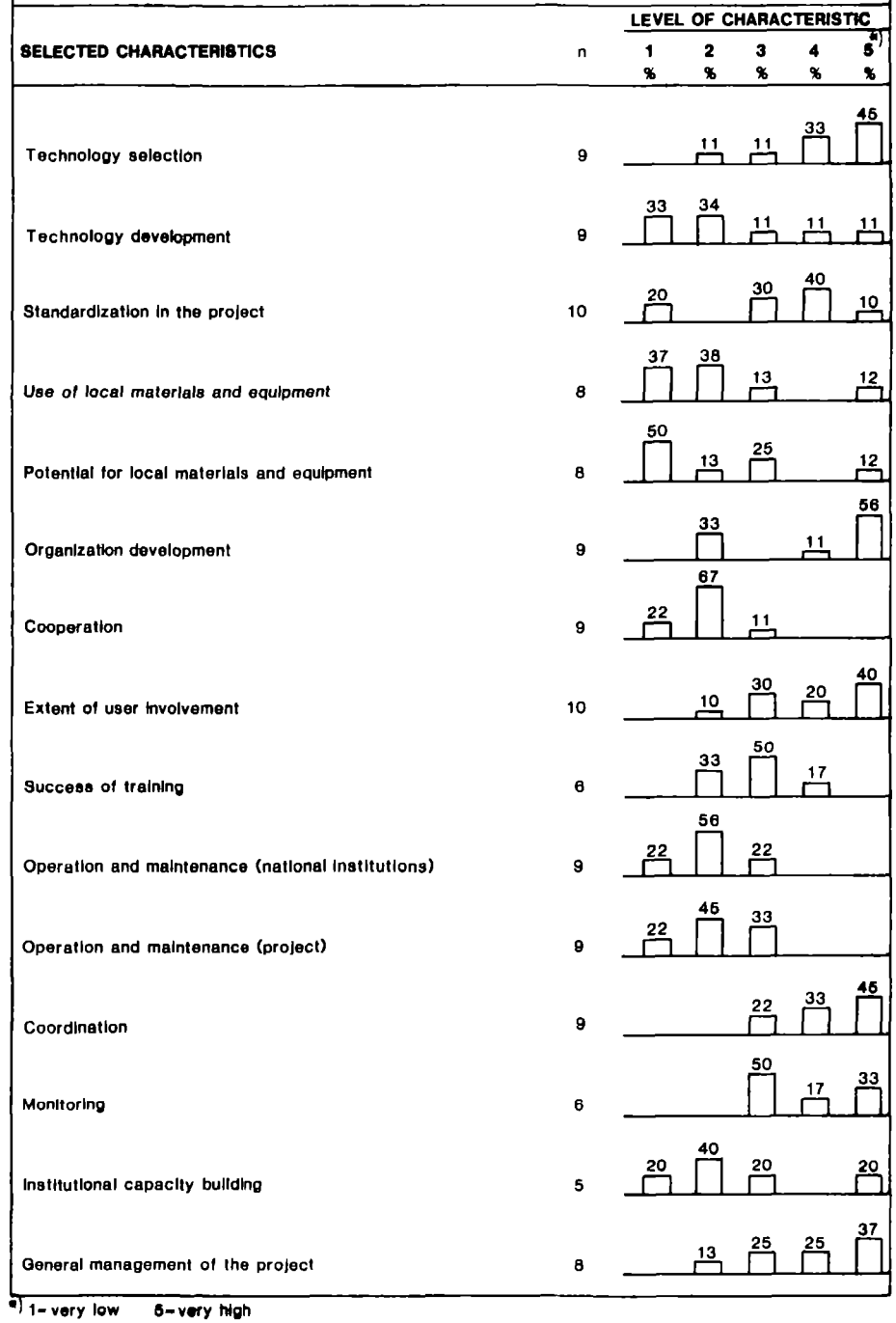
Development of technology by the project was considered fairly negative. This can be explained by the successful selection of technology which probably decreases the need for technology development. This can also reflect the general emphasis of the project on soft components.

Standardization was considered quite positive. This can be explained by the fairly small variety of technologies.

JUNE 1987 / TK

PROJECT PROFILE

PROJECT: RWS PROJECT IN IRINGA, MBEYA AND RUVUMA REGIONS STAGE: IV
MAJOR DONOR: DANIDA



a) 1- very low 5- very high
n= number of respondents

Figure 9.6 Project profile of selected characteristics in the Rural Water Supply Project in Iringa, Mbeya and Ruvuma regions, stage IV based on the questionnaire.

Table 9.2 Positive and negative aspects of all stages (I...IV) in the Rural Water Supply Project in Iringa, Mbeya and Ruvuma regions based on open-ended questions.

Positive and negative aspects Project: Rural Water Supply Project in Iringa, Mbeya and Ruvuma Major donor: DANIDA	
Positive (+)	Negative (-)
Persons involved (14[1] + 2)[2]	**Persons involved (14 + 2)**
+ community involvement (3[3] + 1[4]) + appropriate tenchnology (4 + 0) + involvement of all parties (2 + 1) + socio-economic focus (3 + 0) + water master plan practical tool for implementation (2 + 0)	- by-passing recipient organizations (3 + 1) - new schemes preferred by authorities (2 + 1) - future handing-over not properly prepared (0 + 2) - too ambitious level of planning (2 + 0) - too little emphasis on O & M in planning (2 + 0)
Outsiders (12 + 2)	**Outsiders (9 + 1)**
+ socio-economic focus (5 + 0) + community involvement (5 + 0)	- low integration to Maji (2 + 1) - separate from local structure (district) (2 + 0) - too much DANIDA dictation (2 + 0)

1) total number of responding expatriates
2) total number of responding Tanzanians
3) number of expatriate responses
4) number of expatriate responses

Local materials and equipment

The use of local materials and equipment was considered fairly low. The respondents, however, did not see potential for increasing this share. The project has used imported pipes and fittings which in the water master plan were estimated to result in savings of 30-35 per cent of the construction costs (DANIDA 1986). Since 1986 the exchange rate of the Tanzanian shilling has been changing drastically and therefore the use of local materials may be increasing.

Organization development

Organization development was considered one of the most positive characteristics of the project. The integration of the implementation offices under the responsibility of the regional water engineer was considered positive. However, the interviews of outsiders particularly revealed criticism towards a tendency to

act separately from the MAJI organization. The lack of support to the district level by the time of the interviews was considered negative. The DANIDA Steering Unit situated in MAJI, Ubungo is considered quite strong compared to other externally supported projects.

Cooperation

Cooperation between the project, other external supporters and their projects was considered the most negative one of the selected characteristics. The level of cooperation was also the lowest of all the three projects having their project profiles in this study.

Extent of user involvement

User involvement or village participation as called by the project is one of the key issues in DANIDAs approach. This participation includes (Benz 1986) prior to construction period, during construction period, and post construction period.

User involvement and organization development were considered two of the most positive characteristics of the project.

In April 1986 the review mission concluded that the expected savings by village participation in construction have by and large not materialized (DANIDA 1986). It is evident that the benefits will be achieved through possible increased sense of responsibility and will thus affect the long-term sustainability.

Success of training

As for training no remarkable positive or negative views were given.

Operation and maintenance

Operation and maintenance was found to be among the most constrainted areas also in this project. There were no significant differences between the operation and maintenance aspects of the national institutions and the project itself. With the community involvement the operation and maintenance is the responsibility of the consumers. The issue of how operation and maintenance should be carried out is here probably the more complex one. The inadequate interest in operation and maintenance in the planning phase was also criticised.

Mujwahuzi and Egerrup (1986) noted that there is a clear indication of lower maintenance costs with schemes which have village based operation and maintenance.

Coordination

Coordination was considered the most positive characteristic of the fourth stage of the project. However, this issue is two-folded. The project is coordinated by the steering unit located in Dar es Salaam. As shown earlier some criticism was presented on this strong unit.

Monitoring

Monitoring was considered among the most positive characteristics. The DANIDA Steering Unit in Dar es Salaam prepares the required progress reports. However, no copy was available for this study.

Institutional capacity building

The responses (five) were widely distributed over the scale of one to five. This issue seems to be among the least successful characteristics.

General management of the project

The general project management was considered a fairly positive characteristic.

10 ANALYSIS AND DISCUSSION

10.1 Comparative Analysis of the Nordic-Supported Projects

10.1.1 Primary Inputs and Outputs

The Nordic-supported rural water supply projects in Tanzania each have their own background and specified or unspecified objectives. The physical, social, economical and logistic conditions in the regions vary considerably. The technologies and design criteria used and thus the levels of service are somewhat different. Particularly some of the earlier project documents did not include a systematic follow-up of primary inputs and outputs. It is also uncertain as to what extent the constructed systems are actually operative. Some schemes still under construction have utilized resources without necessarily supplying consumers so far.

The outputs are related to the objectives of the projects. It is probably very difficult, if not impossible, to evaluate the health improvements, institutional building, training, community participation and other possible stimuli for rural development brought by the projects. Additionally all donors have different backgrounds in the sector and in the country which explains the different approaches. It is also very difficult to estimate the long-term effects and possibilities for sustainability of the projects.

It is obvious that the cost data is not necessarily comparable because of different calculation methods. The local components, particularly the local manpower costs are difficult to estimate. Additionally, it is unclear as to what extent the operation and maintenance costs are paid by the donor or by the recipient organization.

For all these reasons a cost-benefit or cost-effectiveness analysis is not considered appropriate. However, the cumulative primary inputs (costs) and outputs (no. of people served) of the time-correlated projects can give an indication of the strategic approaches of each project (Figure 10.1).

The cumulative costs of the projects by the end of 1986 are presented in constant prices and are thus comparable implementation (Figure 10.1). The costs of the FINNIDA- and SIDA-supported projects have been of the same magnitude. The costs of the NORAD-supported project have been somewhat lower whereas DANIDA's inputs in terms of costs have been the lowest, about 60 per cent of those of FINNIDA.

The number of people served is based on rough estimates or even "guestimates". Additionally the output data from some sources is quite controversial. Therefore, the output data of this study is less reliable. However, it shows at least that the production rate in the Mtwara-Lindi project has been several times higher than those of the other projects. It shows also that the output of the SIDA-supported project has been the lowest.

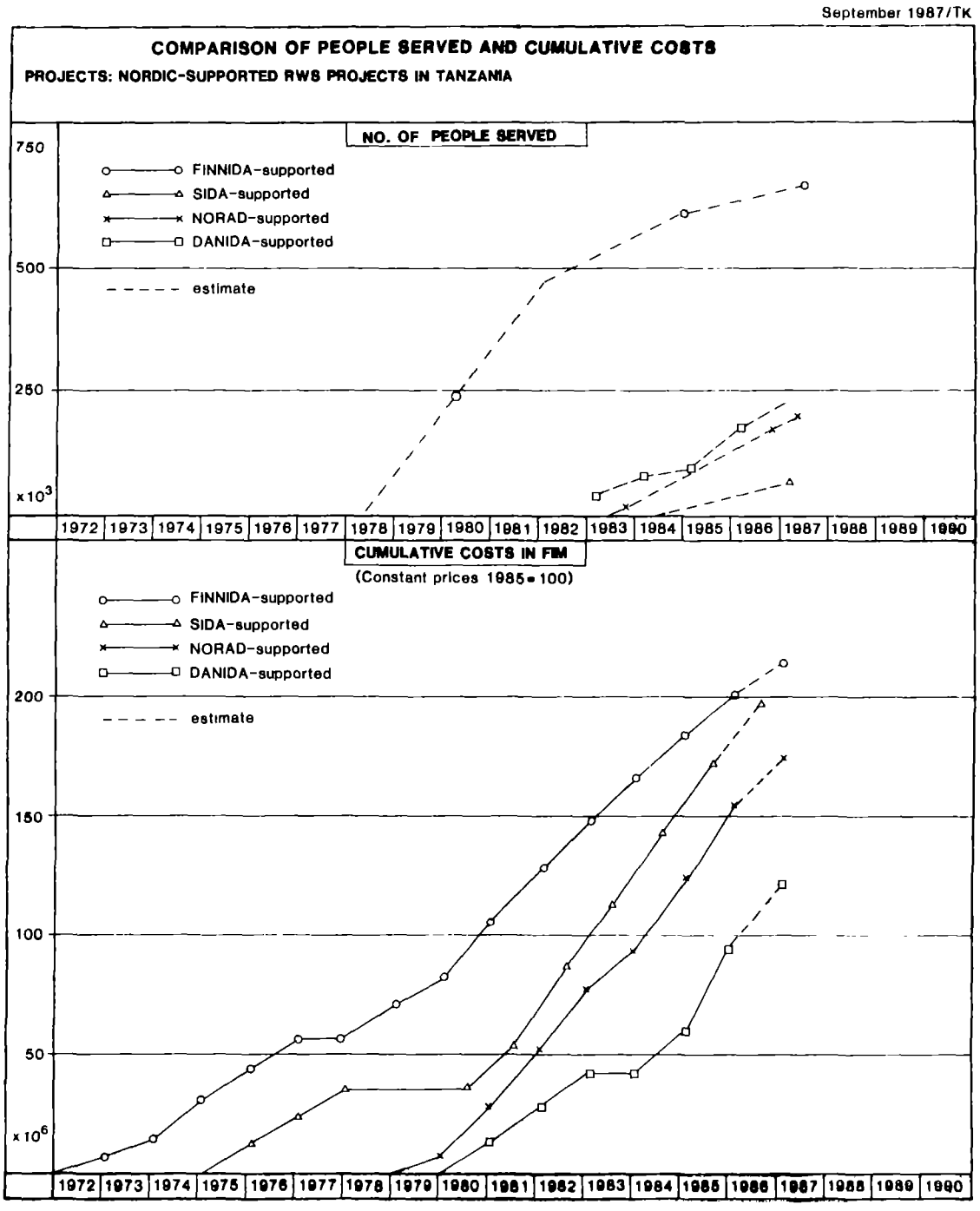


Figure 10.1 Comparison of the primary inputs (annual costs) and estimated outputs (no. of people served) by the Nordic-supported projects in Tanzania (compiled from Figures 6.4, 6.5, 7.4, 7.5, 8.4, 8.5, 9.4, 9.5). The price index is based on gross domestic product in purchasers' values in Finland (ETLA 1987).

The higher production rate of the Mtwara-Lindi project relates to the original objective of the so-called crash programme. The low production rate of the SIDA-supported project is related to the objectives of promotion and institutional capacity building. As for the latter perhaps 60 per cent of the people are served by the piped schemes. The rest, about 40 per cent are served by hand-pump wells. These wells are only a part of the integrated efforts of the Hesawa-approach.

The NORAD- and DANIDA-supported projects include more sanitation and health education than the FINNIDA-supported project but less than the SIDA-supported project.

Considering the total costs and the number of people served the following very rough estimates of efficiency can be presented.

- The efficiency of the Mtwara-Lindi approach, based on the crash programme in the first stage and gradual transfer of responsibilities later, is many times higher than that of the integrated approach of the Hesawa-project.
- The efficiency of the DANIDA-supported project in Iringa, Mbeya and Ruvuma having a supporting distinct management unit is perhaps half of that of the Mtwara-Lindi project. Respectively the efficiency of the NORAD-supported project in the Kigoma and Rukwa regions seems to be somewhat lower than that of DANIDA's project.

The rough figures on cumulative costs and number of people served indicate the different approaches of the projects. The most independent project has achieved higher efficiency than the projects that have been more integrated into the national institutions. Respectively the approach of integrating health, sanitation and water will make it more difficult to manage these projects and thus will decrease the production. These facts and findings support the original hypothesis of this study: the sooner the responsibility is transferred to the national institutions, the more they face the implementation constraints typical of developing countries. The study also implies that increasing integration will cause difficulties to donor management. It is, however, very difficult to estimate the long-term effects of different approaches and possibilities for long-term sustainability. These effects can probably be seen after one or more decades. Thus at the moment it is not yet possible to say which one of the approaches will be the best, if any. It is possible that the integrated approach with fairly low production will prove to be best in the long run. On the other hand the needs and conditions are changing all the time and therefore the approach which seems the most appropriate today might be outdated in the future.

It is obvious that in integrated approach with water, sanitation and health education it is advisable to have a technical core component around which the so-called "softer" components can be added. Practical results of implementation will guarantee the confidence and interest of the consumers.

10.1.2 Profiles on Selected Characteristics

Table 10.1 shows a summary of the selected fifteen characteristics based on the questionnaire. A positive characteristic (+) corresponds to at least 60 per cent positive responses (levels four and five of the questionnaire combined). A very positive characteristic (++) corresponds to a minimum of 75 per cent positive responses. The negative (-) and very negative (--) characteristics are defined respectively.

Any positive characteristic common to all or most of the projects could not be recognized in Table 10.1. In the Iringa, Mbeya and Ruvuma project the technology selection was considered very positive. This is partly explained by the advantageous physical conditions in the regions. The extent of user involvement and general management were other positive factors of this project. The Hesawa-project was considered very positive in organization development.

Institutional capacity building was negative in the DANIDA-supported and, surprisingly, in the SIDA-supported project. The latter can be explained by the respondents' wish to strengthen MAJI instead of integrating several institutions.

On the whole the profile of the DANIDA-supported project was more on the positive side than that of the other projects. The profile of the Hesawa-project was more on the negative side.

Changes in the project profile

The change in the project profiles between two different stages can be examined for the Mtwara-Lindi project and the Hesawa-project (Figure 6.6 and 6.7, Figure 7.6 and 7.7). In the Mtwara-Lindi project a clear positive change is seen in organization development and coordination. The first aspect reflects the responsibility transfer to the national organizations. Coordination is connected with the steering committee that was established during the fourth stage. The level of the general management of the project decreased. The transfer of responsibilities (which is no doubt advisable as such) increases the constraints and makes the project more difficult to manage.

In the Hesawa project a slight positive change was seen in the success of training. A slight negative change was recorded in organization development which, on the other hand, was the most positive characteristic of the project. However, the number of respondents to Hesawa was quite low.

Generally the Nordic-supported projects have been able to change their approaches when the need has arisen. The four projects have all developed towards more integrated approaches. Nowadays they include at least some sanitation and health education.

Table 10.1 Summary of the most positive and most negative characteristics of the project profiles based on the questionnaire.

Summary of positive* and negative ** characteristics Major donor:	FINNIDA		SIDA		DANIDA
Stage:	III	IV	IV	V	IV
Technology selection					++
Technology development					-
Standardization in the project				+	
Use of local materials and equipment	-	--	--		--
Potential for local materials and equipment	--	--			-
Organization development			++		+
Cooperation		-	--	--	--
Extent of user involvement	-	-			+
Success of training					
Operation and maintenance (national)	--	--	--	--	--
Operation and maintenance (project)	--	--	--	--	--
Coordination			-		++
Monitoring	-	-	-	-	
Institutional capacity building				-	-
General management of the project	+				+

*) + or - corresponds to ≥ 60 per cent positive or negative side responses, respectively

**) ++ or -- corresponds to ≥ 75 per cent positive or negative side responses, respectively

10.1.3 Selected Common Characteristics

The questionnaire included five characteristics which can be seen as common features for the whole project rather than for any certain stage of implementation. These characteristics were

- usefulness of the water master plan,
- usefulness of reviews and evaluation,
- development of the private sector (stimulation and possibilities), and
- continuity (Figure 10.2).

The same characteristics were compared by three interest groups (Figure 10.3) as well as by respondents of various professional backgrounds (Figure 10.4).

Usefulness of the water master plans

The water master plan in the DANIDA-supported project was considered the most useful. This is evidently due to its wider context including the socio-economic focus. Another positive feature is obviously the partial implementation during the water master plan. Since this water master plan was the last one of those studied it has been possible to profit from the experiences gained earlier.

The SIDA-supported water master plan was considered fairly useless. This is explained by the strategy change as well as the long period before starting the actual implementation after the water master plan was established.

Any significant differences between the interest groups (donor personnel, expatriates and Tanzanian experts) could not be recognized (Figure 10.3). However, there were different views among people with different professional backgrounds (Figure 10.4). Hydrologists considered the water master plans very positive whereas the views of socio-economists were fairly negative. However, the number of responses was very low. On the whole the views on the usefulness of water master plans varied widely.

Usefulness of reviews and evaluations

Reviews and evaluations were considered very positive in the DANIDA-supported project and fairly positive in the FINNIDA-supported project. The NORAD-supported project was considered fairly negative in this respect.

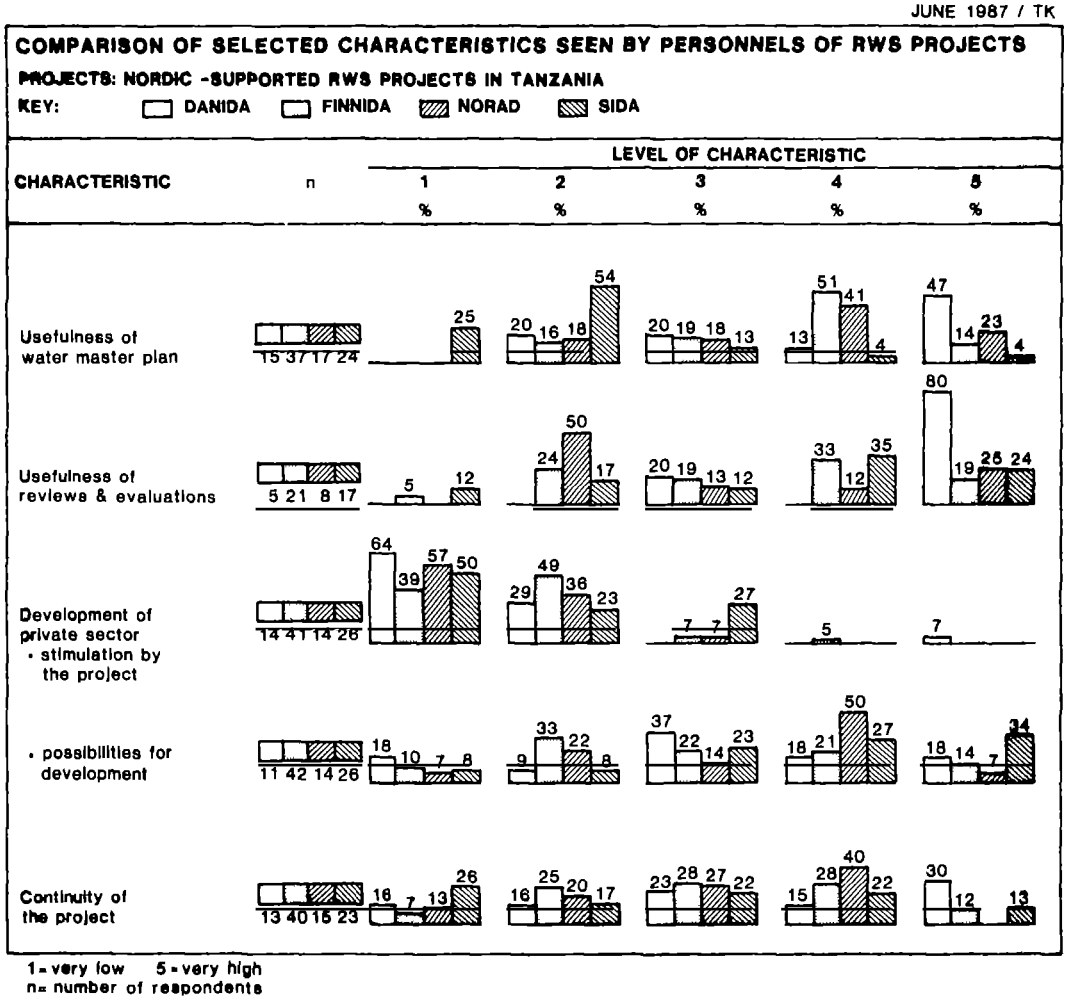


Figure 10.2 Comparison of selected common characteristics by personnels of the Nordic-supported rural water supply projects in Tanzania.

The donor personnel and representatives regarded the reviews and evaluations positive whereas the expatriates, composed mainly of project staff members, were fairly critical on this aspect.

The procedure of reviews and evaluations on the project has varied. By the end of 1986 the FINNIDA-supported project has been evaluated twice (the third in April 1987 excluded) by an international team having representatives from international organizations in addition to donor, project and recipient representatives. The DANIDA- and SIDA-supported projects have been reviewed annually by a team of donor, project and recipient representatives (Table 10.2). In 1987 the DANIDA-supported project was evaluated by IRC, the Netherlands (IRC 1987).

Some interviewed experts thought a review once a year being too often since there is often only half a year for action before the next mission. From the administration point of view the annual meeting during the same period before the annual negotiations on external assistance is appropriate. However, frequent reviews can be a burden on the recipient side.

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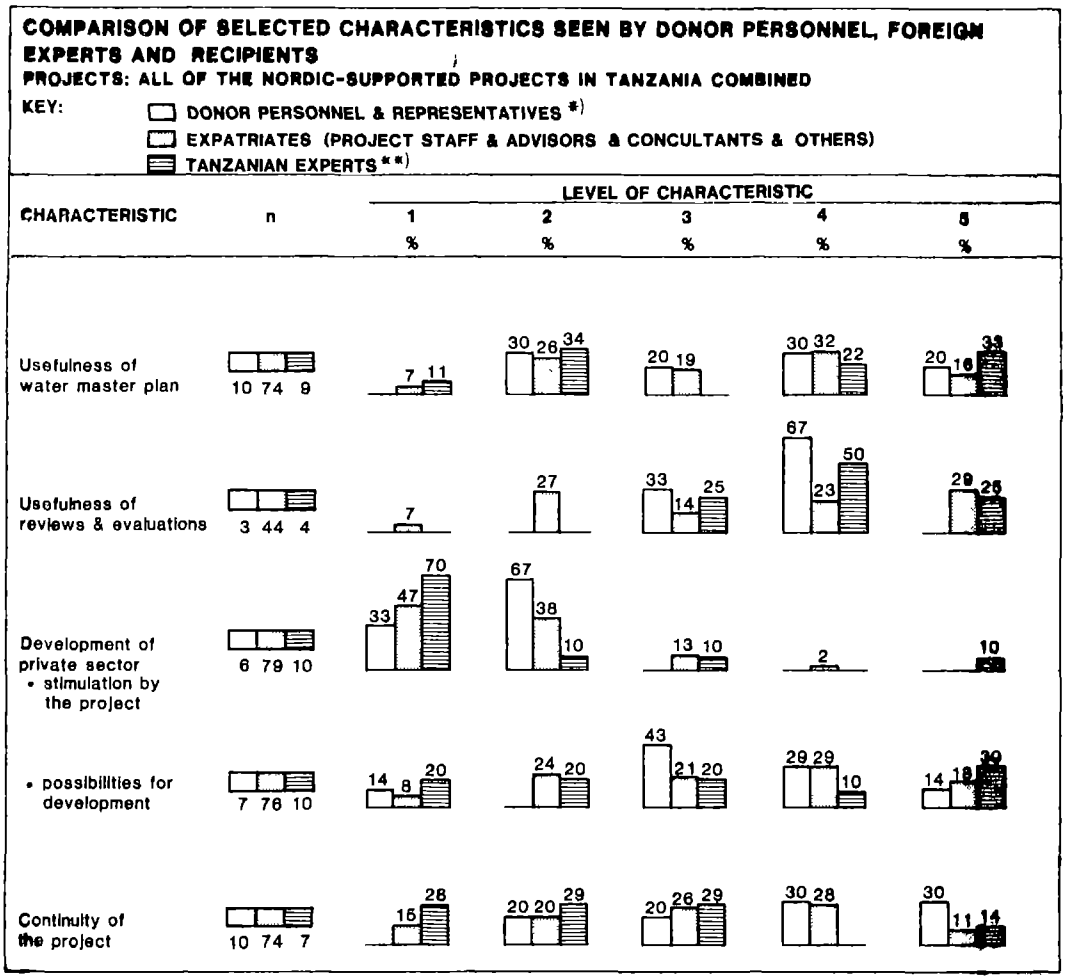

1 = very low . 5 = very high

n = number of respondents

*) includes all donor personnel in spite of their other possible interest groups

**) includes persons both directly and indirectly involved

Figure 10.3 Comparison of selected common characteristics by donor personnel, foreign experts and recipients.

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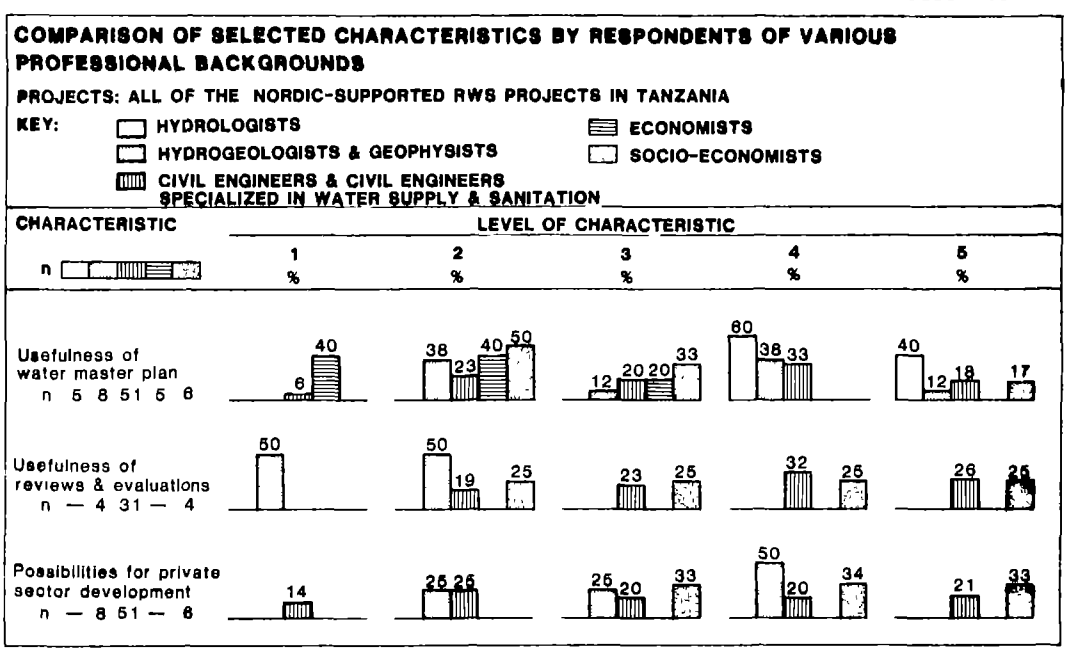

Figure 10.4 Comparison of selected common characteristics by respondents of various professional backgrounds.

Table 10.2 Representatives of the review and evaluation missions in Nordic-Supported rural water supply projects in Tanzania 1978-1986 (DANIDA 1978, 1984a, 1984b, 1985, 1986; FINNIDA 1981, 1984a; NORAD 1985; SIDA 1979, 1983, 1984a, 1984c, 1985, 1986).

Mission members	DANIDA Review				FINNIDA Evaluation		NORAD Review		SIDA Review					
	10/78 x)	2/84	11/84	10/85	5/81	3/84	12/84	9/85	9-10/78	4/83	2/84	12/84	11/85	/86
Total no. of members	6	6	6	6	8	8	2	3	8(-2)	9	8	10	8	9
Tanzanian members														
· AFYA													1	
· IRA		1	1	1	1									
· MAJI	1	2	2	2	2	2			2	2	2	3	1	1
· PMO									1	1	1	1	1	1
· Treasury														1
Donor representatives														
· Head office	2	1	1	2	1	1		2	2	3	1	3	2	3
· DSM office					1			1		1	2	2	2	3
Consultants														
· from donor country	2	2	2	1		2	2		1					
· from other country					1			1		1	1	1		
Multilateral organizations														
· UNDP/WB						3								
· UNICEF	1				1						1			
· WHO					1					1				
Consultants involved in the project								1						

x) Appraisal mission

Reviews alone are not necessarily adequate for assessing a project objectively. Naturally short term consultants can be contracted on specified topics. This procedure has been favoured by SIDA. An evaluation every third year with international team members has been favoured by FINNIDA. In this kind of mission it is necessary to have persons who are adequately familiar with the project and its background but who have not been directly involved in it. This kind of evaluation can be very useful but the selection of the team members is of very high importance. Wrong selection can mean a loss of a few years in the development of the project approaches. Assisting data collectors can also be utilized. The author's view is that in evaluation activities the Nordic countries would benefit from cooperation.

Private sector development

The stimulation of the private sector by the projects was considered very low by comparing the four projects and the three interest groups. However, the potential for this development was considered more positive than negative particularly by socio-economists.

So far the private sector has generally been a quite neglected area in official development assistance. In rural water supply this sector could contribute to local manufacturing, operation and maintenance particularly as regards repairs and spare part supplies.

Continuity

Views on the continuity of the project were widely varied but on the whole they were more on the positive side. In the case of SIDA the support to the sector since the 1960s is the basis for continuity. On the other hand, the frequent changes of consultants and thereby approaches have been partly negative. The use of the same consultant over the years by the three other projects was regarded positive.

Donor personnel considered the continuity generally positive whereas the Tanzanian experts had fairly negative views. In spite of continuity, the projects have to be dynamic and able to change the approaches with changing situations.

10.2 Appraisal of the Research Methodology

The comparative study of the four externally supported projects in Tanzania was based on analysing background data in reports and studies and particularly on a large questionnaire with 120 respondents. It proved to be quite difficult to get access to the project documents. Some of the project reports did not include clearly the actual inputs and outputs. Although the projects do not aim at maximum production, basic facts would be valuable instead of descriptive analysis only. Thus a lot of time was spent on trying to find out the basic facts.

The questionnaire proved to be too long. With a shorter questionnaire form the number of responses would have been higher. However, direct questions on the characteristics without any preceding questions would not have been informative enough. It is also obvious that the study should have concentrated on a fewer selected characteristics. In any case responsibility transfer is related to very many aspects of the projects. The number of the structured interviews of 18 persons in Finland and Tanzania was no doubt too small.

The statistical methods used in this study have been very simple. The frequency distribution used with the five categories in the questions is considered better than any single indicator such as the arithmetic mean, harmonic mean or mode. The lack of unambigous concepts and the fuzzy nature of the data based on opinions rather than facts makes this justified. The small number of responses in some cases makes the results only indicative.

This study has mainly an engineering focus on the water supply development. However, the study has tried to include all the aspects of technology including the economic, social and to some extent even the cultural dimensions. The author's view is that the development studies in this field have mainly concentrated on social aspects. It is possible that the environmental and technical boundaries and possibilities are not sufficiently considered in these studies. On the other hand the engineering-oriented studies are often limited to technical aspects only. The author wishes that this study has succeeded in narrowing the existing gap between these two approaches.

The author's involvement in the FINNIDA project as a staff member in 1978 -1979 can be thought to cause a bias especially because it was not possible to visit the other projects. It would have been important to get more familiar with the background of all the projects of this study. It would also have been very important to have more views from the Tanzanian professionals to include the views of the consumers. Research in the field in the regions concerned would have been beneficial. With the time and funds allocated to this study the procedure was the only possible one.

The study covers the project to the end of 1986. Some comments on later approaches have also been mentioned. Nevertheless, it is obvious that this kind of a study will always be lacking in the latest data and have a partly historical perspective.

10.3 Model for Semi-Autonomous or Distinct Management Units

The first and second part of the study were combined as a model applicable to semi-autonomous or distinct management units (Figure 10.5). This model is thus more valid for the DANIDA-, FINNIDA- and NORAD-supported sectoral projects. The SIDA-supported project based on integrated approach has clearly different objectives. The model is based on the phases of the "project cycle" concept. Due to the suggested overlapping phases it should rather be called a "project process model".

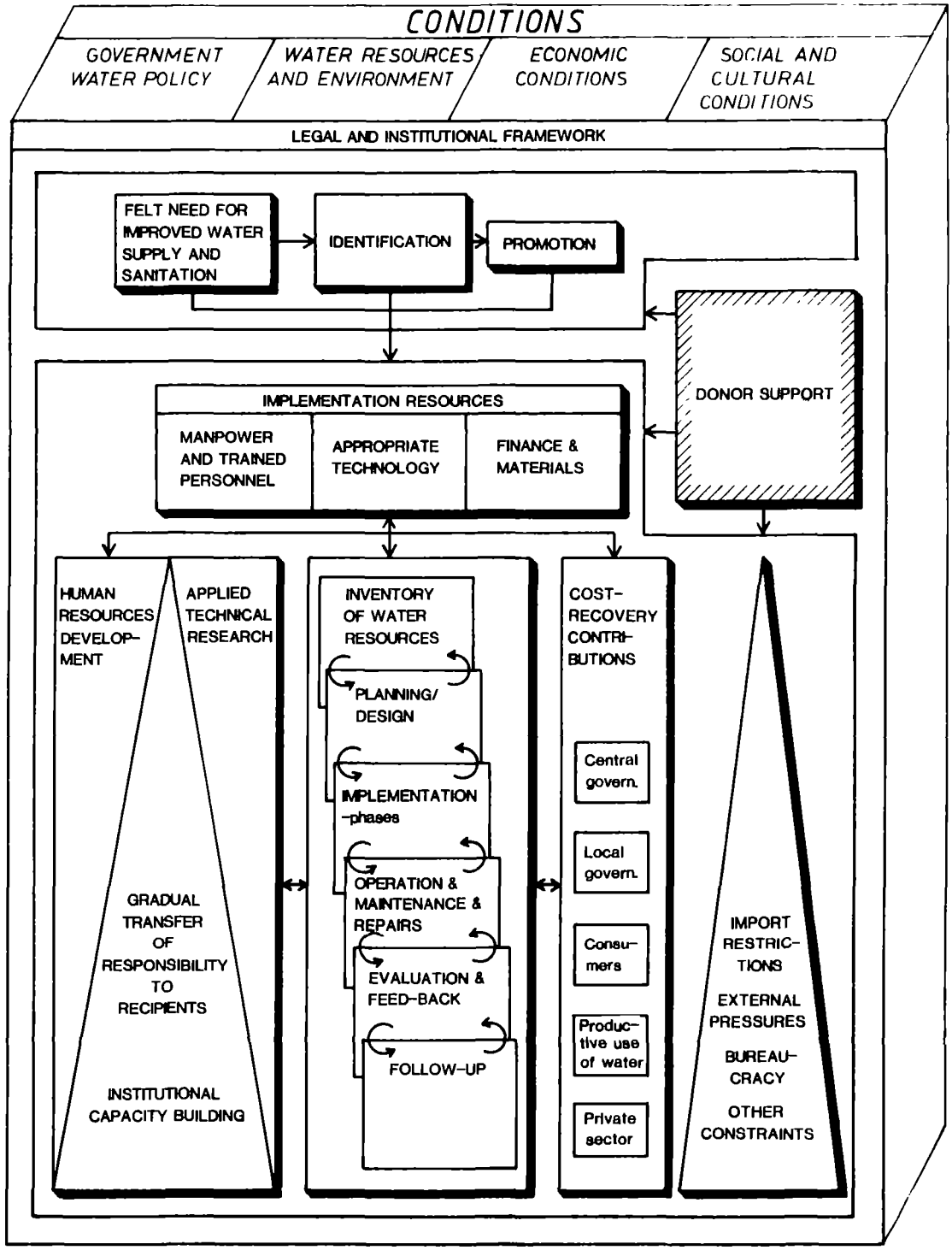

Figure 10.5 "Project process" model of semi-autonomous or distinct management units for externally supported rural water supply suggested by the author. The model is time related and shows the overlapping nature of different project phases.

The model (Figure 10.5) implies the following issues

- Consumers must have a felt need for improved water supply and sanitation. This can be enhanced by promotion. Promotion alone is not adequate but practical examples on appropriate technology have to be constructed if needed. To what extent such promotion and implementation should be carried out by externally supported projects is debatable.
- External support is only an addition to the basic resources: manpower, appropriate technology, materials and finance.
- The externally supported projects must be fitted in to the legal and institutional framework of the recipient country.
- Human resources need to be developed from the beginning of the project. How much should be done by a development assistance project and what should be the responsibility of national training institutions is open to debate. The author's view is that the national institutions should take the main responsibility of trainig.
- Applied technical research and pilot scale construction are necessary from the beginning of a project.
- Different project phases (water resources inventory, planning/design, implementation, operation and maintenance, evaluation and feed-back, follow-up) should be overlapping rather than following each other consecutively.
- Financing is of very high importance for long-term sustainability of the sector. Cost-recovery in monetary or non-monetary form is essential. This can be arranged by central or local government subsidies, indirect taxation, direct consumer payments and contributions, productive use of water and private sector development.
- The projects are affected by constraints such as import restrictions, external pressures and bureaucracy. The quicker the projects become integrated to the national sector institutions the more severe these constraints seem to become.

10.4 Need for Further Research

This study has raised a number of questions for further research. One of these is the question of water pricing and cost-recovery in the sector. They are considered a necessity for the long-term sustainability of rural water supply which free government and external funds for new development projects. The problem can be approached by the following questions:

- Can people afford to pay for drinking water?
- Is there willingness to pay for drinking water?
- What is the effect of the selected technology on the two above-mentioned aspects?
- What is the importance of water charges to the functioning of water supplies in developing countries?

Other research topics brought up by this study are as follows:

- applied technical research on water treatment and extraction in tropical conditions,
- operation and maintenance, particularly spare part purchase and supply,
- ways of improving monitoring,
- ways of improving review and evaluation, and
- ways of compromising the key constraints and continuously developing strategies; the roles of different interest groups and different professions.

11 CONCLUSIONS

11.1 Development Cooperation in Rural Water Supply

Improved water supply and sanitation in developing countries is **justified** because

- There is sufficient evidence on **health benefits** gained through improved water supply. The benefits will be increased by proper sanitation and health education.
- In addition to health benefits also the **economic effects,** mainly savings in time and energy as well as productive use of water resources, should be considered.

The **financial trends** in external support to the water supply and sanitation sector indicate that

- The Water Decade has not managed to attract additional external resources to the sector. The governments of the developing countries are not going to be able to increase their allocations either. Therefore **low-cost technology** and **cost-recovery** in monetary or non-monetary form have to be developed further.

A survey was done on the **major constraints** in the water supply sector in Kenya, Malawi, Sri Lanka and Tanzania. In spite of differences between the selected countries and between the different areas in each country, there are remarkable similarities.

- **The difficulties in operation and maintenance** combined with logistics are the most severe constraints in all countries as seen by both the national governments and foreign experts.
- The developing countries lay more stress on the **lack of trained personnel and funding,** whereas the foreign experts and particularly donors are more concerned about **inadequate cost-recovery.**

Appropriate technology is a common slogan. It is often seen as a synonym for low-cost technology.

- Appropriate technology has technical, environmental, economical, financial, social and cultural dimensions. In the implementation of **rural** water supply in developing countries, **low-cost** technology is in most cases appropriate.
- The low-cost technology approach is now accepted by all the parties. However, in practice, too sophisticated schemes are still being constructed. **Also high technology** is needed in rural water supply, for instance in the inventory of deep ground water resources.
- **Applied technical research** in practical water engineering should be increased. The solutions developed mainly in and for temperate or cold climates do not necessarily work in hot climates and rural areas of developing countries.

- If most of the water supply schemes constructed in the developing world were kept operative, it would be impossible to find funds for new investments in many developing countries. Thus it is likely that the governments in developing countries **have escaped bankruptcy** in the sector only because **most of** the **water schemes are not operative.**

- **Women,** the main drawers of water, must be involved at every stage of water supply and sanitation programmes.

Human resources development contains planning, training and management aspects.

- Lack of training is probably not the most severe constraint as often expressed by representatives of developing countries. Instead more attention should be paid to the **capacity of national institutions** to manage all the necessary activities.

- In externally supported projects training is seen as a key element. These projects are often criticized for inadequate training efforts. It is, however, obvious that the **national training institutions** should be mainly responsible for training in the sector.

- In externally supported projects **also the human resources of the supporting agency or country have to be developed.** This matter should be openly accepted and positively taken into account.

There are many organizational alternatives for external support.

- Because of historical and policy reasons, multilateral, bilateral and non-governmental **agencies** have their **own preference areas** in the sector. All of the agencies are needed but because of their huge number **coordination** is imperative.

- There is a **good potential** for cooperation in **"twinning"** between water supply boards, companies and training institutions in developed and developing countries.

- Different organizational forms of assistance are not contradictory but rather **support** each other.

11.2 A Study on Four Nordic-Supported Rural Water Supply Projects in Tanzania

The **approaches** and **objectives** of the projects have varied widely. This can be explained by different histories of the donor activities, differences in the conditions of the regions and the policies of the agencies as well as the policy changes of the Tanzanian government during the last decade.

- The cumulative implementation costs of the FINNIDA- and SIDA-supported projects have been of the same magnitude. The costs of the NORAD-supported project have been somewhat lower. The DANIDA-supported project is the latest one and its cumulative inputs are about 60 per cent of the FINNIDA and SIDA inputs.

- The efficiency of the FINNIDA approach, based on the crash programme at the first stage and gradual transfer of responsibilities later, is many times higher than that of the integrated approach of the SIDA.

- The efficiency of the DANIDA-supported project in Iringa, Mbeya and Ruvuma having a supporting distinct management unit is perhaps half of the FINNIDA project. Respectively the efficiency of the NORAD-supported project in the Kigoma and Rukwa regions is roughly of the same magnitude.

Mtwara-Lindi Rural Water Supply Project (FINNIDA-supported)

- **Technology selection** and particularly the development of an appropriate **hand-pump** have been the most positive characteristics of the project.

- The more the project has been integrated into the national institutions the more difficult and complicated the general management of the project has become. Still the integration and the institutional capacity building are necessary.

- The **efficient organization** was probably needed to **introduce** and promote the low-cost technology (hand-pump wells). However, the **transfer of responsibilities** and institutional building should have started **much earlier.** The extended production orientation means that external support will be needed for a **long period** to ascertain operative systems.

Health, Sanitation and Water (Hesawa) Programme in the Kagera, Mara and Mwanza Regions (SIDA-supported)

- Organization development is the most positive aspect of the project. However, most parties see that the water sector and the national water authorities are partly by-passed.

- The integration of water supply, sanitation and health is a preferable objective. However, this approach by the **Hesawa** project is **very difficult.** The possible success in promotion and health education will be undermined by the **low production rates.**

- A higher rate of simultaneous implementation is probably needed to avoid disappointments and loss of motivation by consumers. The district level focus suits the present Tanzanian Government policy. This approach could create possibilities to increase local funding and consumer payments which is a must in the long run. Institutional capacity building with this approach will probably need long-term support.

Water Supply and Sanitation Development, Kigoma and Rukwa Regions (NORAD-supported)

- The project has used somewhat different approaches in the two regions. In the Rukwa region it has been implemented by a distinct management unit within the regional water

office. This temporary unit has been merged into the water authority. In Kigoma the project has always been the responsibility of the regional water office. Experiencies of the approaches have been gained but the different approaches have also caused confusion. A supporting management unit is situated in Dar es Salaam.

Rural Water Supply Project in Iringa, Mbeya and Ruvuma Regions (DANIDA-supported)

- DANIDA's support is also channelled via the regional water offices. The steering unit in Dar es Salaam is very strong and in practice autonomous. It is obvious that the role of the unit should be reconsidered and it should be in practice more integrated with the national water authority.

- In the regions the project is run on an advisory basis. The experiences of the earlier projects have been taken into account by the youngest projects of this study.

Selected characteristics common to the four projects

- **Water master plans** have generally been fairly **useful** although the information they contain has **not** been sufficiently **utilized.** During the water master plan preparation **simultaneous implementation** and pilot research could be carried out.

- There seems to be **potential for private sector development.** This could help, for instance, in operation and maintenance activities as well as in local manufacturing.

- Evaluation and review are very important. Annual reviews alone may not be adequate. **Evaluation** teams should also have **external members.** By the end of 1986 this was practiced only by FINNIDA.

- **Reporting** as a part of monitoring should be developed. Appropriate **indicators** for institutional capacity building and integrated approaches should be developed instead of using purely descriptive reporting.

- There seem to be fewer differences in the views of various interest groups than between people with different professional backgrounds. Supporting agencies probably should have more **engineering oriented personnel** whereas the projects should recruit more **socially oriented staff.** There is already a clear trend in this direction.

Other common findings on the four projects

- The most independent project has achieved higher efficiency than the projects that have been more integrated into the national institutions. Thus indirectly this supports the original hypothesis of this study: **the sooner the responsibility is transferred to the national institutions the more they face the implementation constraints typical of developing countries.** Increasing integration will also cause difficulties to donor management.

- It is very **difficult** to **estimate** the long-term effects of different approaches and possibilities for **sustainability.** Efficiency on the short term does not necessarily guarantee sustainability.

- The **success** of any rural development project depends on the set **objectives.**

- The donors' share of the implementation costs of the projects has been over 90 per cent, in some cases close to 100 per cent. It has been assumed that the Tanzanian authorities will be fully responsible for the operation and maintenance of the constructed schemes. Considering this set-up and the self-sustained objective of the projects it is obvious that the **local contribution** has been **too small.**

- The projects have generally managed rather well to **change their approaches** when need has arisen.

- There is a need to improve the **information flow** and **exchange of experiences** between development projects in the sector. The recent informal cooperation of bilateral agencies in Tanzania is a positive sign in this direction.

- Externally supported projects will need some forms of **long-term support** to ascertain that the facilities will be kept operative.

- A lot of experience has been gained by different approaches of externally supported projects. Although there are understandable reasons for these differences more similar approaches would pay the way to implementation of larger programmes and policies. This concerns particularly key policies such as **pricing of water** and **institutional development.**

11.3 General Findings and Recommendations

The following general findings and recommendations can be presented

- Health education and sanitation are important additional inputs into any water supply project. However, if measurable results are wanted it seems to be necessary to have water supply as a **technical core** which is complemented by health education and sanitation. Thus water supply is the basic requirement, although not by itself adequate, for improving health conditions.

- Community participation is now accepted by all parties. Instead of community participation it would be more appropriate to speak about **community or consumer contributions** and **village based management.** It will be absolutely **necessary to give up the policy of free water** common in many developing countries. Instead of regarding water supply as a social service consumers should pay directly for water.

- **Socio-economic** studies are important. Instead of being separate studies they should be an integrated and continuous part of any development cooperation project. So far these studies have concentrated on **social aspects** although the **economic aspects** are equally important. The studies have not sufficiently taken into account the **limits of** the selected **technology and water resources** occurrence. Socio-economic studies should rather be carried out by national experts familiar with the culture than by foreign experts. These studies should contribute to minimising the most severe constraints in the sector, the lack of proper operation and maintenance and inadequate cost-recovery. The **dialogue** between different parties should be increased.

- **Donor responsibility** in the **operation and maintenance** of the constructed water supply schemes is becoming a key policy question.

- **Administrative weaknesses** are often beyond the control of development assistance projects and experts. **Management** oriented training and advice is particularly needed.

- **Institutional capacity** building will demand personal responsibility from consumers which comes from the sense of ownership and contributions. Institutional building is to be seen in its broadest sense including the development of local consultants, contractors and other private entities.

- Externally supported projects should offer a fairly wide **variety of technologies.** This would enable the consumers to select systems which they can **afford** to which they will be **willing to contribute** and which can be **kept operative.**

- The **experiences** gained by external support people in rural water supply should be fully analysed. Appropriate approaches are to be developed for the obvious focus of the sector in the coming decade: sub-urban and urban water supply, sanitation and solid wastes disposal.

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APPENDIX 1

TAMPERE UNIVERSITY OF TECHNOLOGY (TUT)
Department of Civil Engineering
Water Supply and Sanitation

6 Jan 1987

DEVELOPMENT COOPERATION PROJECTS IN RURAL WATER SUPPLY AND SANITATION

- Alternatives for Transferring Responsibility to Recipients

Questionnaire

Part A:	Background information
Part B:	Development cooperation projects in rural water supply and sanitation in Tanzania
Part C:	Your general experiences

POSTAL ADDRESS
P O Box 527
SF-33101 TAMPERE 10
Finland

TELEPHONE
(931) 162 111

TELEX
22 -313 ttktr-sf

A BACKGROUND INFORMATION

1(21)

Note that this information is **confidential** but for possible further contacts your name and address are appreciated. No names will be mentioned in reporting.

A1 Your name_____ Nationality_____

Home address_____

_____ Tel_____

Office address_____

Tel_____ Telex_____

Telefax _____

Address for **future contacts if not above**

_____

_____ Tel_____

Valid from ___/___198__ Till ___/___198__

A2 Your professional **specialization** (tick in by x, several options possible)

1. __ Hydrologist
2. __ Hydrogeologist
3. __ Geophycist
4. __ Civil engineer
5. __ Civil engineer, specialized in water supply and sanitation engineering
7. __ Water chemist
8. __ Limnologist
9. __ Microbiologist
10. __ Economist
11. __ Socioeconomist
12. __ Mechanical engineer
13. __ Electrical engineer
14. __ Other, which?_____

_____

IN RURAL WATER SUPPLY AND SANITATION IN TANZANIA

Your views are requested on

(i) Rural water supply project in Iringa, Mbeya and Ruvuma regions (DANIDA-supported)
(ii) Mtwara-Lindi rural water supply project (FINNIDA)
(iii) Water supply and sanitation development, Kigoma and Rukwa Regions (NORAD)
(iv) Health, sanitation and water programme in Kagera, Mara and Mwanza regions (SIDA)

Task:

Kindly give your views on the donor supported project you are **best familiar** with (either worked in the project or followed it by supervision, evaluation, review, research etc.)

If you are not at all familiar with **any** of the above-mentioned projects, go to B 39.

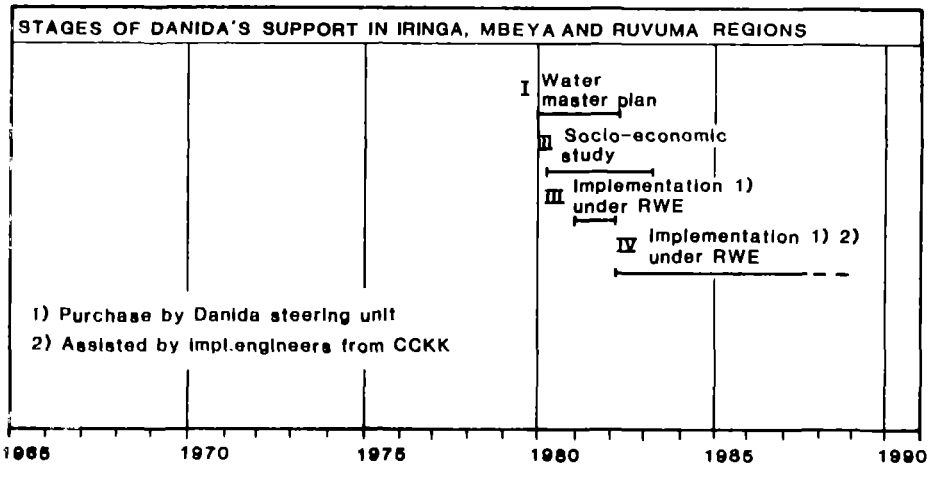
If any of the questions is not applicable to the project and the stage you comment on, please mark N.A. (= not applicable).

B1 Name of Project to be commented (tick in)

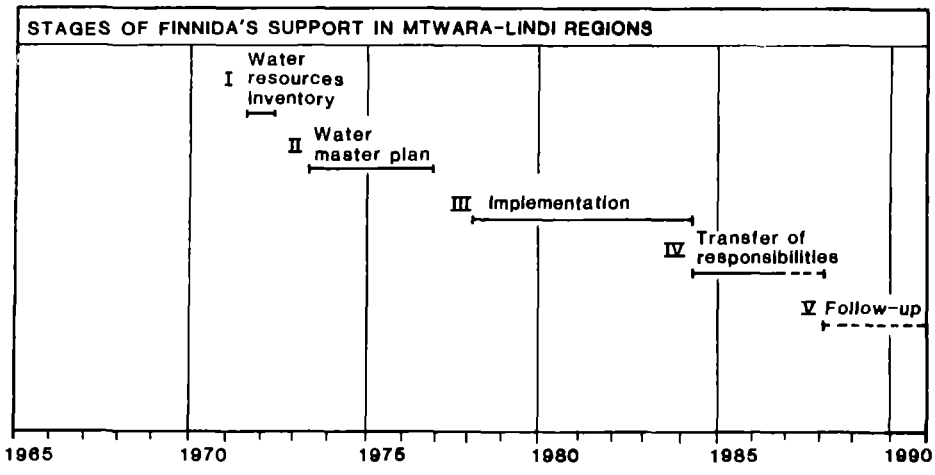
DANIDA-supported (i) ___ NORAD-supported (iii) ___
FINNIDA-supported (ii) ___ SIDA-supported (iv) ___

B2 In this study each of the four projects has been divided into different stages based on their approach and strategy as follows (not necessarily according to phases based on finance). Give your comments if you do not agree with the suggested stages.

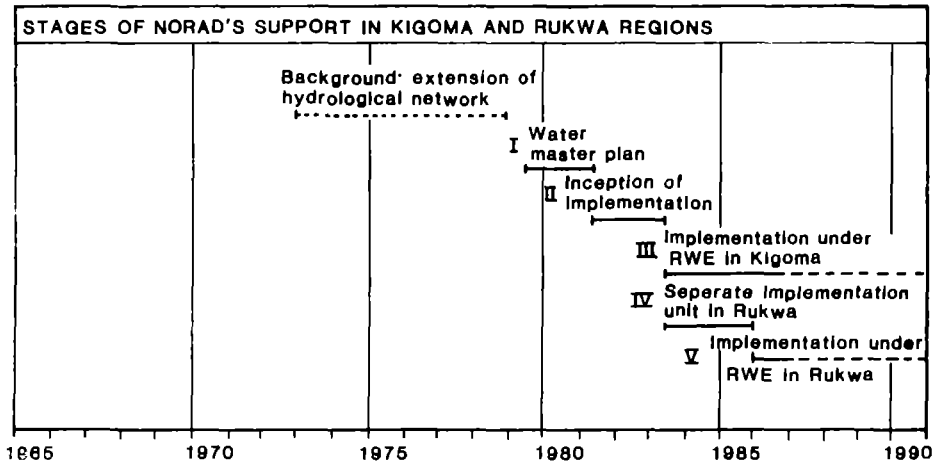
(i)



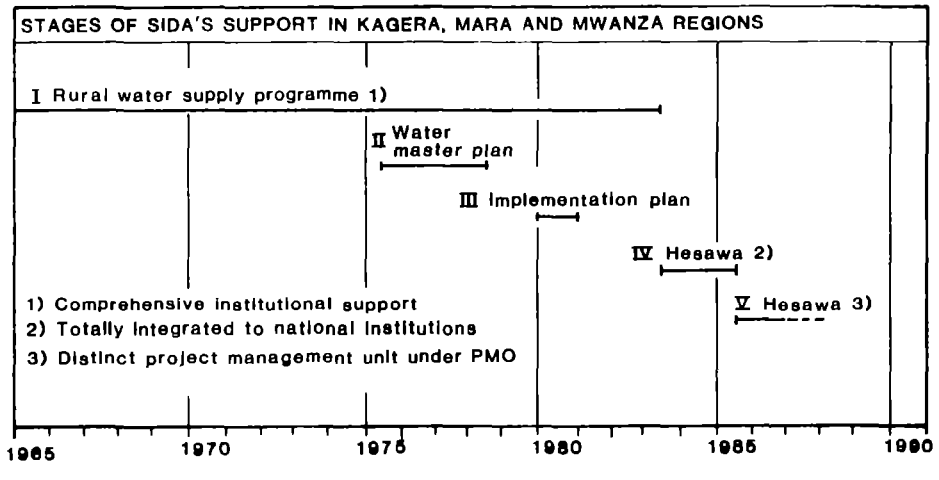
(ii)



(iii)



(iv)



Select one stage of the project on which you will mostly give your comments.

Stage I __ Stage II __ Stage III __ Stage IV __ Stage V __

B3 (This question for **project staff only**!) 4

Your service period(s) in the project

*) From ___/___ to ___/___ Contract with _____

Your post_____ Duty station_____

From ___/___ to ___/___ Contract with _____

Your post_____ Duty station_____

From ___/___ to ___/___ Contract with _____

Your post_____ Duty station_____

B4 (This question **for non-project staff**!)

In which position/post did you become familiar with the particular project (several posts possible)?

		*)	*)
1.	Tanzanian civil servant in Maji.....	from ___/___	to ___/___
2.	Exeatriate adviser/expert outside the project.....	from ___/___	to ___/___
3.	Donor representative in head office.....	from ___/___	to ___/___
4.	Other, which?.....	from ___/___	to ___/___

*) month/year

B5 How much have you followed the project in addition to your service period(s) (B3, B4)

		not at all				very much
1.	Before your service period.....	__	__	__	__	__
2.	After your service period.....	__	__	__	__	__

(i) Positive/negative aspects **B6-B7**

B6 What do you consider the **most positive aspects** of the project?

B7 What do you consider the **most negative aspects** of the project?
What should have been done otherwise and why?

(ii) Water master plan **B8 - B9**

B8 How much was/is the **water master plan critized** in the implementation?

	not at all				very much
Water resources data.....	—	—	—	—	—
Plans for water supply schemes.....	—	—	—	—	—

B9 According to your experience and knowledge how **useful** was the original **water master plan** in the project area?

totally useless				very highly useful
—	—	—	—	—

If you have other comments on water master plans, please state them here!

7

From (iii) onwards, give your comments on that particular stage of the project you are most familiar with (B2)!

(iii) Professional sub-sectors **B10**

B10 Was there any **professional sub-sectors** which should have received less or more of the total resources available during your commentary stage? (note the scale!)

	less		appro-priate		more
1 Hydrological investigations	—	—	—	—	—
2 Follow-up of hydrometric network	—	—	—	—	—
3 Hydrogeological investigations	—	—	—	—	—
4 Follow-up of hydrogeological network	—	—	—	—	—
5 Geophysical investigations	—	—	—	—	—
6 Planning of schemes	—	—	—	—	—
7 Design of schemes	—	—	—	—	—
8 Construction	—	—	—	—	—
9 Operation and maintenance	—	—	—	—	—
10 Transport	—	—	—	—	—
11 Purchase of materials	—	—	—	—	—
12 Water quality control	—	—	—	—	—
13 Economic analysis/cost follow-up	—	—	—	—	—
14 Socio-economic studies	—	—	—	—	—
15 Promotion to consumers	—	—	—	—	—
16 Training of skilled manpower	—	—	—	—	—
17 Training of sub-professionals	—	—	—	—	—
18 Training of professionals	—	—	—	—	—
19 Data collection and recording	—	—	—	—	—
20 Training of village administration	—		—		—

Other, which? _____

_____

Comments on professional sub-sectors.

(iv) Technology selection B11 - B12

B11 Were there in the project area any **water sources** which should have been used more or less by the project considering their overall **potential**?

	less		appro priate		more
1 Boreholes	—	—	—	—	—
2 Charcos/small dams	—	—	—	—	—
3 Covered shallow wells	—	—	—	—	—
4 Impoundments/dams	—	—	—	—	—
5 Improved open wells	—	—	—	—	—
6 Infiltration galleries	—	—	—	—	—
7 Large lakes	—	—	—	—	—
8 Mountain streams	—	—	—	—	—
9 Protected springs	—	—	—	—	—
10 Rainwater collectors	—	—	—	—	—
11 Rivers	—	—	—	—	—
Other, which?	—	—	—	—	—

B12 On the whole how **appropriate** was **the technology used** during your commentary stage? (acceptability, affordability, availability)

not appro priate at all				very highly appro priate
—	—	—	—	—

Comments on technology selection.

(vii) Technology development **B13**

B13 How much did the project introduce new technical ideas and methods during your commentary **stage?**

not at all — very much

Comments on technology development.

(vi) Standardization **B14**

B14 Estimate the **level** of **standardization** in the project during your commentary **stage?**

	very low — very high
1 Standardization of working/construction methods.....	
2 Standardization of equipment.....	

Comments on standardization.

(vii) Local production **B15**

B15 a) How much were **local materials** and **equipment** used during your commentary stage?

not at all — very much

b) What is the potential for using local materials and equipment?

very low — very high

Comments on local production.

(viii) Project organization development **B16**

B16 How much has the project developed its **organization** during your commentary stage?

	not at all				very much
	—	—	—	—	—

Comments on organization development.

(ix) Cooperation **B17**

B17 What was the level of **cooperation** during your commentary stage?

	very low				very high
1 Cooperation between the donor of the project and other donors.....	—	—	—	—	—
2 Cooperation between the project and other donor-supported rws projects	—	—	—	—	—
3 Cooperation between the national authorities (water, health, sanitation).	—	—	—	—	—

Comments on cooperation.

(x) User involvement/community participation **B18**

B18 What was the **extent** of **user involvement/community participation** in the project during your commentary stage? (note the scale!)

	very low				very high
	—	—	—	—	—

Comments on user involvement/community participation.

11

(xi) Human resources development B19 - B22

B19 Were there **regional human resources** available for the recruitment of the project?

	not available at all				very much available
1 Engineers	—	—	—	—	—
2 Technicians	—	—	—	—	—
3 Field technicians and craftsmen	—	—	—	—	—

B20 How serious were the following possible **constraints in human resources** in the project? (note the scale!)

	very serious	quite serious	not serious
1 Trained national personnel left for other sectors	—	—	—
2 Lack of incentives for national personnel by the project	—	—	—
3 Lack of incentives for national personnel by the government	—	—	—
4 Lack of briefing/training of expatriates	—	—	—
Others?	—	—	—

B21 What was the **extent of training** given by the project at different levels during your commentary stage?

	Given		far too little				far too much
	No	Yes					
1 Villagers/consumers	—	—	—	—	—	—	—
2 Pump/weil attendants	—	—	—	—	—	—	—
3 Craftsmen	—	—	—	—	—	—	—
4 Foremen and technicians	—	—	—	—	—	—	—
5 Engineers	—	—	—	—	—	—	—

B22 On the whole how successful was the **training** given by the project at different levels during your commentary stage?

	Given No	Given Yes	not successful at all				very highly successful
1 Villagers/consumers.....	—	—	—	—	—	—	—
2 Pump/well attendants.....	—	—	—	—	—	—	—
3 Craftsmen.....	—	—	—	—	—	—	—
4 Foremen and technicians.....	—	—	—	—	—	—	—

Comments on human resources development.

(xii) Operation and maintenance **B23 – B24**

B23 Please estimate the following **operation and maintenance** (o & m) related issues in the project?

	very low				very high
1 o & m funds from central government.....	—	—	—	—	—
2 o & m funds from local government.....	—	—	—	—	—
3 Monetary contributions from consumers (fees, taxes).....	—	—	—	—	—
4 Non-monetary contributions from consumers (labour, materials).....	—	—	—	—	—
5 Affordability.....	—	—	—	—	—
6 Channels to gather o & m fees, taxes.....	—	—	—	—	—
7 Preventive maintenance.....	—	—	—	—	—
8 Village level maintenance.....	—	—	—	—	—
9 Ward level maintenance.....	—	—	—	—	—
10 District level maintenance.....	—	—	—	—	—
11 Regional level maintenance.....	—	—	—	—	—
12 Availability of spare parts.....	—	—	—	—	—
13 Purchase of spare parts via project.....	—	—	—	—	—
14 Purchase of spare parts via national author.	—	—	—	—	—
15 Purchase of spare parts from private sector..	—	—	—	—	—
16 Import restrictions.....	—	—	—	—	—
17 Water quality monitoring.....	—	—	—	—	—
18 Sanitary inspection of water sources.....	—	—	—	—	—
19 Other, which?.....	—	—	—	—	—

B24 What are the **most urgent needs** in operation and maintenance?

1. _____
2. _____
3. _____

Comments on operation and maintenance.

(xiii) Coordination **B25 - B26**

B25 Did the project have a **coordinator** or coordination unit between the donor, national water administration and the project itself? __ No __ Yes

If yes, where located?_____

What were the major tasks of the coordinator/coordination unit?

B26 How useful was the coordinator/coordination unit?

not useful at all				very highly useful
—	—	—	—	—

Comments on coordination.

(xiv) Monitoring **B27**

B27 How efficient was the **monitoring** of the project by the following methods?

	existent no	existent yes	not efficient at all				very highly efficient
1 By progress reports	—	—	—	—	—	—	—
2 By feed-back to progress reports	—	—	—	—	—	—	—
3 By steering commitee	—	—	—	—	—	—	
4 By monitoring missions	—	—	—	—	—	—	—
5 Overall efficiency of monitoring	—	—	—	—	—	—	—

Comments on monitoring.

(xv) Review/evaluation **B28**

B28 The project was **reviewed/evaluated**

__ annually __ otherwise, how?_____

__ biannually __ not at all

How useful do you find **the reviews/evaluations**?

Review or evaluation (which one)	month/ year	not useful at all				very highly useful
_____	__/19__	__	__	__	__	__
_____	__/19__	__	__	__	__	__
_____	__/19__	__	__	__	__	__
_____	__/19__	__	__	__	__	__
_____	__/19__	__	__	__	__	__

Comments on review/evaluation.

(xvi) Rural sanitation **B29 - B30**

B29 Did the project include **rural sanitation**?

__ No __ Yes. If yes, what were the major sanitation **constraints/problems** of the project?

_____

_____

_____

_____

_____

_____

_____

B30 Is there need for **ventilated improved (VIP) pit latrine** in the project area?

	not needed at all				very highly needed
1 in rural areas.....	__	__	__	__	__
2 in semi-urban areas.....	__	__	__	__	__

Comments on rural sanitation.

(xvii) Institutional capacity building B31 - B34

B31 During your commentary stage how successful was the training of **counterparts** *)?

Given		Success of counterpart training				
No	Yes	not successful at all				very successful
—	—	—	—	—	—	—

B32 **a)** How much has the project stimulated the development of the **private sector** like local contractors, manufacturers, handpump mechanics etc?

not at all				extensively
—	—	—	—	—

b) Do you see **possibilities** for this development?

none at all				very many
—	—	—	—	—

B33 How **long** will **donor support** be needed for the project after the responsibility is transferred?

_____ years.

Material support _____years

Experts _____years

Others, which? _____years

..... _____years

B34 On the whole how do you rate the **success of institutional capacity building** done by the project during your commentary stage?

not successful at all				very highly successful
—	—	—	—	—

Comments on institutional capacity building.

(xviii) Continuity **B35 - B36**

B35 What would be the **optimum length of continuous service** of national and expatriate professionals in the project?

	Years				
	≤1	2	3	4	≤5
1 National professionals.....	__	__	__	__	__
2 Expatriate professionals.....	__	__	__	__	__

B36 How do you see the **continuity of the project**?

- possible breaks during different phases
- same/different consultant(s)
- recruitment of persons who have worked earlier in the project
- reporting of experiences
- overlapping of service periods

	very low				very high
1 Level of continuity in the project.....	__	__	__	__	__
2 Importance of continuity.....	__	__	__	__	__

Comments on continuity.

(xix) Management **B37 - B38**

B37 Where there any external pressures affecting the project?

__ No __ Yes If yes, what kind ?_____

B38 How was the project generally managed?

very poorly				very well
__	__	__	__	__

Comments on management.

(xx) Views on the other Nordic-supported water supply projects in Tanzania B39

B39 Estimate briefly the **positive** and **negative aspects** of the other three Nordic projects.

Project:	
Positive aspects:	
Negative aspects:	

Project:	
Positive aspects:	
Negative aspects:	

Project:	
Positive aspects:	
Negative aspects:	

(xxi) Your own work **B40 - B41**

B40 What were the **most positive aspects** in your own work?

B41 What were the **most negative aspects** in your own work?

Please go back to B6 and B7 and check again if you have something to add to positive and negative aspects. Then proceed to part C.

Instructions:

These views are requested **from all the respondents!**

C1 What are the **most important/urgent needs** of the rural water supply development in Tanzania at the moment?

1) _____
2) _____
3) _____
4) _____
5) _____

C2 Should water supply, sanitation and health education approach be **integrated** in development cooperation projects in rural Tanzania?

	very low				very high
Need for this integration.....	—	—	—	—	—
Practical possibilities.....	—	—	—	—	—

Comments on integration.

C3 What are the most important areas of **applied technical research** in rural water supply and sanitation in the least developed countries?

1 _____
2 _____
3 _____
4 _____
5 _____

21

C4 Is **research** needed and to what extent should it be linked/integrated to development cooperation projects (instead of separate studies)?

	very low				very high
1 Overall need for applied technical research (ATR).....	__	__	__	__	__
2 Need of ATR in the projects.....	__	__	__	__	__
3 Overall need for socio-economic research (SER).....	__	__	__	__	__
4 Need to integrate SER to the projects.....	__	__	__	__	__

Comments on research.

C5 Have you worked in any other developing country/countries in water sector not mentioned in B1, B3, C1 or C2?

1 Country_____	From (month/year) __/__ to (month/year) __/__
Post_____	Organization_____
2 Country_____	From (month/year) __/__ to (month/year) __/__
Post_____	Organization_____
3 Country_____	From (month/year) __/__ to (month/year) __/__
Post_____	Organization_____
4 Country_____	From (month/year) __/__ to (month/year) __/__
Post_____	Organization_____
5 Country_____	From (month/year) __/__ to (month/year) __/__
Post_____	Organization_____
6 Country_____	From (month/year) __/__ to (month/year) __/__
Post_____	Organization_____

C6 Would you be willing and interested to participate in personal interviews or additional questionnaires at a later stage of the research project? __ Yes __ No

Finally we want to thank you sincerely for your kind cooperation and very valuable comments.

TAMPEREEN TEKNILLINEN KORKEAKOULU
VESI- JA YMPARISTOTEKNIIKAN LAITOS
JULKAISUSARJA A

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TAMPERE UNIVERSITY OF TECHNOLOGY
Tieteenkatu 21, Hervanta
POSTAL ADDRESS: P O BOX 527
SF-33101 Tampere
FINLAND
TEL 358 - (9)31 - 162 111
TELEX. 22313 ttktr+sf
TELEFAX: 358 - (9)31 - 162 907

TAMPEREEN TEKNILLINEN KORKEAKOULU
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TAMPERE UNIVERSITY OF TECHNOLOGY
Tieteenkatu 21, Hervanta
POSTAL ADDRESS: P O BOX 527
SF-33101 Tampere
FINLAND
TEL 358 - (9)31 - 162 111
TELEX. 22313 ttktr+sf
TELEFAX: 358 - (9)31 - 162 907