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Water Supply and Sanitation Programmes Shinyanga Region, Tanzania 1990-2006

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Preface

Support to water supply and sanitary facilities has been a priority for Netherlands development co-operation for many years. For the current policy on development co-operation, the Millennium Development Goals (MDGs) are the guiding principle. These include the target to halve, by 2015, the proportion of people in 1990 without sustainable access to safe drinking water and basic sanitation.

The purpose of support to water supply and sanitary facilities goes beyond sustainable access: it is intended to reduce the burden of water collection (typically a task of women and girls); improve health; raise school enrolment and attendance; improve livelihoods and ultimately reduce poverty.

The Policy and Operations Evaluation Department (IOB) of the Netherlands Ministry of Foreign Affairs has initiated a series of impact evaluations of Netherlands-supported water supply and sanitation programmes. There is consensus worldwide on the impacts of programmes for water supply and sanitary facilities; conventional evaluation studies do not, however, normally quantify these. In the impact studies, a combination of quantitative statistical and qualitative methods and techniques are used. With the series of impact studies IOB wishes to explore how the magnitude of the effects of these programmes can be measured.

The first in the series is this evaluation of the Netherlands-supported rural programmes in Tanzania, Shinyanga Region. The experience built up in Shinyanga Region has served as a reference for the current national Water Sector Development Programme, rural water supply component.

The focus of the impact evaluation is on the effects of the support provided to water user communities on the population of Shinyanga region, and on the contribution of the concerned local level institutions to sustainable results.

The lessons and issues drawn from the findings are relevant to the Water Sector Development Programme.

Rita Tesselaar of IOB was responsible for the evaluation. The main consultants were Jan Willem Gunning, Professor of Development Economics; Chris Elbers, Associate Professor in Economics; Stephen Turner, Senior Consultant Resource Development, Free University of Amsterdam, the Netherlands; and Eke Abrahams Mwaipopo, AMKA Consult Consortium, Dar es Salaam, Tanzania. The pilot testing and implementation of the community-based survey, data collection at dispensaries, and data processing were done by a team from the Tanzanian research institute REPOA, in collaboration with Tobias Lechtenfeld of the Free University of Amsterdam.

A reference group, consisting of Mr J Mukumwa, Assistant Director Rural Water Supply, Ministry of Water, United Republic of Tanzania; Mr D. de Waal, Policy and Advisory Team Leader, WaterAid Tanzania; Ms C. Sijbesma, IRC International Water and Sanitation Centre; Mr D. van Ginhoven and Mr P. Bastiaenen of the Netherlands Ministry of Foreign Affairs, provided comments and advice on this report.

Thanks are due to all respondents in the impact evaluation. These include: members of Water User Groups and households; the Regional and District Water and Sanitation Teams; staff of DHV; non-governmental and private sector organisations in Shinyanga region; government officials of the Ministry of Water and other concerned ministries; staff of the Royal Netherlands Embassy of the Kingdom of the Netherlands in Dar es Salaam; and donor agencies involved in the water sector in Tanzania.

Special thanks go to Mr J. Mukumwa, Assistant Director Rural Water Supply; Eng. Yohana Monjesa, Assistant Administrative Secretary in the Shinyanga Secretariat; Mr Karangi J. B. Bwire and Mr I. M. Lyimo of DHV Water BV; Mr D. de Waal of WaterAid and Mr. J. Wiersma of the Royal Netherlands Embassy for their inputs and facilitation of the study.

IOB bears responsibility for the contents of the report.

Bram van Ojik
Director Policy and Operations Evaluation Department

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Abbreviations

BOS	Bureau of Statistics
BWO	Basin Water Office
CBRC	Community Based Resource Centre
CDTF	Community Development Trust Fund
CORP	Community Owned Resource Person
CRIN	Child Rights Information Network
CWIQ	Core Welfare Indicator Questionnaire
DAC	Development Assistance Committee
DED	District Executive Director
DFID	Department for International Development
DGIS	Directorate-General for International Co-operation
DRDP	District Rural Development Programme
DWE	District Water Engineer
DWSP	Domestic Water Supply Programme
DWST	District Water and Sanitation Team
EDI	Economic Development Initiatives
ERP	Economic Recovery Programme
GDP	Gross Domestic Product
GON	Government of the Netherlands
GOT	Government of Tanzania
ha	hectare
HIPC	Highly Indebted Poor Country
IOB	Policy and Operations Evaluation Department
IRC	International Water and Sanitation Centre
IWP	Improved Water Point
LGA	Local Government Authority
LGCDG	Local Government Capital Development Grant
LGRP	Local Government Reform Programme
MDF	Management for Development Foundation
MOF	Ministry of Finance

MOH	Ministry of Health
MOU	Memorandum of Understanding
MOW	Ministry of Water
MTR	Mid Term Review
MWLD	Ministry of Water and Livestock Development
NAWAPO	National Water Policy
NBS	National Bureau of Statistics
nd	not dated
np	no page number
NGO	Non-Governmental Organisation
NMFA	Netherlands Ministry of Foreign Affairs
NRWSSP	National Rural Water Supply and Sanitation Programme
NSC	National Steering Committee
NWSDS	National Water Sector Development Strategy
O&M	Operations and Maintenance
OECD	Organisation for Economic Co-operation and Development
PHAST	Participatory Hygiene and Sanitation Transformation
PMO-RALG	Prime Minister's Office - Regional Administration and Local Government
PORALG	President's Office - Regional Administration and Local Government
PRS	Poverty Reduction Strategy
RAWG	Research and Analysis Working Group
RCU	Regional Consulting Unit
RDTC	Regional Development and Training Centre
RNE	Royal Netherlands Embassy
RS	Regional Secretariat
RSC	Regional Steering Committee
RWE	Regional Water Engineer
RWSP	Rural Water and Sanitation Programme
RWSSP	Rural Water Supply and Sanitation Programme
SHUWASA	Shinyanga Urban Water and Sewerage Authority
SWAP	Sector-Wide Approach to Planning
TASAF	Tanzania Social Action Fund
ToR	Terms of Reference
TOT	Training of Trainers
ULOM	User Level Operation and Maintenance
UNAIDS	United Nations Programme on HIV/AIDS
VIP	Ventilated Improved Pit
VLOM	Village Level Operation and Maintenance

VWSC	Village Water and Sanitation Committee
WEDECO	Water and Environmental Development Company
WES	Water and Environmental Sanitation
WSDP	Water Sector Development Programme
WSS	Water Supply and Sanitation
WUA	Water User Association
WUG	Water User Group
WVI	World Vision International

Main findings, lessons and issues

Introduction

From 1971 to the end of 2006 the Netherlands has provided support to rural water supply and sanitation development in Tanzania, Shinyanga Region. Over the years, these programmes made the transition from construction and rehabilitation of improved water sources (mostly shallow wells) to support to water user communities to establish Water User Groups or Associations and manage their water and sanitation facilities for a long period of time. In addition, the programmes increasingly focussed on capacity building of stakeholders in the public and private sector to support communities to achieve this objective.

The recently completed Rural Water Supply and Sanitation Programme (2002-2006) had been designed and implemented in line with the National Water Policy (2002), and served as a reference for the national Water Supply Development Programme (2006-2010), rural water supply component. The Netherlands support to the Shinyanga programme has come to an end. The Netherlands now provides sector budget support to the Water Sector Development Programme.

To gain insight on the impact of the programmes on the rural population of Shinyanga Region, the Policy and Operations Evaluation Department (Dutch abbreviation: IOB) initiated an impact evaluation covering the period from 1990 to 2006. This is the first in a series of impact evaluations of Netherlands-supported water supply and sanitation programmes. The evaluation coincided with the final scheduled review of the Rural Water Supply and Sanitation Programme (RWSSP), a joint activity of the Ministry of Water and the Royal Netherlands Embassy. The impact evaluation and the final review have been merged. In addition to the impact of the programmes, the contribution of the institutional strategy to sustainable results was assessed.

The purpose of the evaluation is to account for the long term support provided and draw lessons for policy development and/or implementation by the concerned development partners at national, regional and local level.

The methodology for the evaluation has been a mix of quantitative statistical and qualitative methods and techniques. The main data collection technique for the quantitative impact analysis has been a survey using a random sample of communities with and without Water User Groups. In addition, test kits were used to assess the quality of the water from the main source used for drinking, and diagnosis data recorded in dispensaries were collected.

Main findings

1. *A substantial increase in the coverage of the rural population of Shinyanga Region with access to an improved water source has been achieved. However, reaching the national targets for rural water supply is still a major challenge.*

At the end of many years of support, the proportion of Shinyanga's rural population that has access to improved water sources has risen to about 43%, up from a reported 10.5% in 1992. The increase equals about 1.1 million people over a period of fifteen years. The large majority of water schemes are constructed with Netherlands support. Taking into account the scarce water resources, scattered population in Shinyanga region, and the estimated total cost of the programmes since 1990 of approximately EUR 20 million, this is a major achievement.

However, about two-fifths of the Water User Groups in the survey reported that, in addition to the well, other (unimproved) water sources are still used for drinking water, although varying by season and share of households. A little less than half of those Water User Groups surveyed reported that not all households in the community are members, and non-members are not allowed access to the well.

The coverage of the population with access to an improved water source is still less than the estimated national rural average of 54% (2006). Rapid population growth (3.3% p.a. between the 1988 and 2002 censuses), increasing pressures on scarce water resources, and the necessity of more expensive technologies in areas where shallow wells are inappropriate or population densities are higher, mean that the achievement of national targets for access to an improved water source (a coverage of 65% in 2010 and 90% in 2025) is still a major challenge.

2. *The quality of the water from the wells requires more attention.*

The water quality analysis facility of the Ministry of Water in Shinyanga has carried out physical and chemical analysis of the water in new wells. The wells were subjected to bacteriological analysis, and disinfected before being put to use. Thereafter, no regular bacteriological or other monitoring has taken place.

The study included water quality testing in each of the communities included in the study sample. The quality appeared quite high for ammonia, nitrate, sulphide and iron. However, fluoride content is high: the levels found in most cases were lower than the norm set by the Government of Tanzania, but higher than the WHO norm. Three quarters of the wells yield water with coliform bacteria indicating that the water is not sufficiently treated with chloride.[1] Water quality may be further affected by both carrying it home from the source, and storage at the homestead.

Members of Water User Groups are generally aware of water quality issues, and have been advised to boil water before drinking. However, the majority of users do not follow this advice. Many users refer to the supposedly standard procedure of chlorinating wells quarterly, but report that in practice this happens infrequently or irregularly, if at all.

3. *The programmes have resulted in a significant reduction in the time women spend fetching water. They also resulted in gender-balanced management committees. However, women's effective participation and gender sensitivity in water supply management leaves room for improvement.*

Fetching water is typically a woman's task and, to a lesser extent, a girl's. The mean time per trip to fetch water within Water User Groups is now little less than half an hour. Time use has fallen substantially, by about 60%. The 'extra' time women now have available is spent mainly on housework, firewood collection and field work. Girls spend their extra time partly on housework and firewood collection, while about 40% of the Water User Groups reported that it is used to go to school.

In line with the national rural water supply policy goal on gender sensitivity, Water User Groups generally conform to the standard of a gender-balanced management committee. However, some women office bearers are still dominated either by male colleagues or by other senior men in the community. When water supply problems arise, there is less urgency for men to tackle the problem than for

1 The water quality test kit used detects general coliform bacteria and does not give specific information on the presence of E. coli.

women, because it is the latter who must obtain water from alternative, usually more distant and difficult-to-draw sources. Most water collection continues to be done by women, while men are more prominent in commercial water selling.

4. *The hygiene and sanitation strategy has raised awareness on the importance of good hygiene and basic sanitation. Some evidence of good hygiene practices was found, but not at all critical times. Most households use simple pit latrines made of local materials.*

The Participatory Hygiene and Sanitation Transformation (PHAST) approach, adopted in 1997, has become an integral part of the approach to rural water supply. Members of Water User Groups clearly revealed knowledge of good hygiene and sanitation practices promoted by this approach. The vast majority of the Water User Groups in the survey reported that children wash their hands before meals, but not after toilet use. On a very positive note, simple pit latrines were already being promoted by the Government of Tanzania (GOT) in the 1970s; most households continue to use this type of latrine made of local materials.

5. *The population's health has been improving over time, even in communities without a Water User Group. In addition, a strong and significant effect on health improvements was found of a community's status as Water User Group.*

Water User Group members reported substantial improvements regarding the incidence of a number of diseases. Statistical analysis indicates that the switch from unsafe (open) water sources to wells is an important factor in explaining these health improvements: communities which have made such a switch have experienced a substantial reduction in the incidence of those diseases. These coefficients were statistically significant for eye infections and scabies.

A similar analysis was performed using data on the incidence of diseases collected from records kept at local dispensaries. This analysis indicates that the use of improved water sources for drinking water is an important determinant of the incidence of a number of water-related diseases. The effect is statistically significant and remarkably strong for four diseases: malaria, diarrhoea, intestinal worms and scabies. For example, if households' use of improved sources for their drinking water increases by twenty percentage points, this then reduces the incidence of each of the four diseases by over 20%.

To investigate whether the differences in incidence could perhaps be due to factors other than improved water sources, 'fixed-effects' regressions[2] (that can eliminate the effect of such differences - at least to the extent that they do not change over time) were run. In this case, significant (and strong) effects for dysentery and diarrhoea were found. However, the fixed-effects results could still be due to the confounding effect of a trend (a variable that *does* change over time): health is generally improving over time, even in communities without Water User Groups. Survey data were used to test this hypothesis and found that, in addition to a positive general trend in health (which in itself is a very encouraging finding), there is a strong and significant effect of a community's status as a Water User Group.

6. The institutional strategy adopted has contributed significantly to the achievement of sustainable results. However, sustainability is not yet assured.

Commencing in the 1980s, the transition from a focus on construction and rehabilitation, to a step-by-step process approach towards support by government and private sector to user communities owning and managing their water facilities, has been crucial for the success of the programmes. Roles and responsibilities of all parties concerned have now been clearly defined, and are generally well known, understood and practised. These arrangements represent a significant step forward. So too does the harmonisation of programme planning with district council planning cycles. Much progress has been made in developing capacity at all levels, notably among Water User Groups and Regional and District Water and Sanitation Teams, as indicated by the speeding up of implementation over the years and the increase in the percentage of constructed wells that are operational (currently about 90%). NGOs and the private sector have increasingly important roles to play but still lack the capacity to fulfil them adequately or at all.

At all levels the emphasis so far has been on implementation: installing technical and institutional capacity without necessarily ensuring that the institutions at user level will function in the long term. There is growing awareness of key environmental sustainability issues, but little capacity so far to address them. Operational technical sustainability is not assured because financial sustainability is not yet assured: it is not clear that users will have the resources for future maintenance and replacement of the infrastructure. Prescribed maintenance bank accounts have often proved of little use and have even resulted in a financial loss for many Groups. Although the shallow well technology developed in Shinyanga is

2 A brief guide on regressions, a statistical technique for data analyses, is included in the report as Annex 3.

cost-effective from a construction point of view, its sustainability is not yet fully assured for financial and institutional reasons. Most fundamentally, more needs to be done to secure the (gender sensitive) institutional sustainability of water user organisations on which positive impact in the sector ultimately depends. Current backstopping and monitoring arrangements are inadequate for this purpose. Results-based monitoring is largely restricted to outputs, and monitoring information is only partially used to ensure longer term sustainability of community managed facilities. Although stakeholders are looking for solutions, the remaining issues in ensuring the sustainability of institutional capacity are the principal reason why the overall long-term sustainability of the results in rural water and sanitation in Shinyanga is still in doubt.

Lessons

The key lessons drawn from the findings are:

1. Rural water supply and sanitation programmes can achieve real benefits. In Shinyanga, the evidence shows that a large majority of wells are operational and that they result in better health and in time savings for women and girls. Time saved by girls contributes to school attendance. It deserves the attention that it is now receiving across Tanzania.
2. Most rural Tanzanians are poor, and the poor have been the major beneficiaries of rural water supply and sanitation programmes. In some but certainly not all cases, the very poorest may be excluded from use of improved water facilities; continued vigilance is needed on this point.
3. Not surprisingly, it takes time to develop a workable step-by-step approach and system for the installation and operation of rural water supplies and the promotion of hygiene and sanitation. Experience has shown that community ownership and responsibility are vital ingredients of success. Experience has also shown that the availability of capable support to facilitate the process towards the firm establishment of the approach is crucial. Partly as a result of efforts in Shinyanga, Tanzania now has a workable approach and system, appropriately linked to reformed local government structures. It should persevere with them, not leaving out any of the steps and recognising that it will take many further years of strong commitment and expanded resourcing to meet the national targets for the sector.
4. Tanzania is rightly giving more emphasis to the roles of the private sector in rural water and sanitation. But realism is needed about the capacity available. Ways must be found to strengthen the private sector for a growing role in supporting and providing services to community owned and managed

facilities. With a growing role of the private sector, special measures may be needed to prevent exclusion of the poorest.

5. It is essential to take demographic and environmental realities into account into programming for rural water and sanitation. Populations are growing fast in some areas, meaning that extra effort is needed to expand water and sanitation systems even faster. AIDS is taking a toll on institutions, and AIDS-affected households need more water. Accelerating urbanisation increases the complexity and cost per capita of water and sanitation facilities. There are areas, including parts of Shinyanga, where suitable water resources are scarce and affordable water probably unobtainable. These realities increase the need for integrated regional, economic and natural resource planning and management: major governance challenges for a changing society like Tanzania.
6. In rural water supply and sanitation, as in many other development sectors, there has been an emphasis on installation and implementation, at the expense of long-term support and monitoring. Some of what is done may be unsustainable as a result. The sector needs much stronger efforts to support user institutions and to monitor technical and institutional performance – but not at the expense of expanded installation programmes.
7. Many challenges thus remain with regard to institutional sustainability. District Water and Sanitation Teams are rightly being strengthened, but need long-term attention with a special focus on front-line staff dealing directly with Water User Groups, if they are to remain viable and effective. Ward Development Committees have an important co-ordinating role to play and could help village governments to link their monitoring of Water User Groups and sanitation issues into the structures of district councils. Water User Groups cannot be expected to fend completely for themselves once established. They should be monitored and, when needed, be helped to maintain and refresh their capacity.
8. Water quality is a key part of the monitoring challenge. Maintenance of adequate water quality in wells and other improved sources, and ongoing publicity about safe water and sanitation, are vital.
9. The policy of requiring Water User Groups to open and operate maintenance bank accounts has proved too rigid, and is often unhelpful or costly. Emphasising user responsibility for maintenance is important, but it should be realistic about user ability to pay for major repairs, and about the wider range of fund raising and saving strategies that Groups can adopt.
10. Rural water and sanitation programmes have made real progress in easing women's burdens and promoting women's management rights and capacity.

However women's participation in management committees does not automatically lead to gender sensitive management of facilities. Continuing commitment and effort are needed in this regard.

Issues

The Netherlands has decided to continue support to rural water supply and sanitation development through budget support to the national Water Sector Development Programme. In view of the positive experience built up in Shinyanga Region, as well as the remaining issues that affect (long-term) results, some form of further collaboration is desirable to ensure these issues are addressed. The success of the rural water supply and sanitation component of the national programme ultimately depends on the quality of the approach, institutional arrangements and available funding for investments, operations and follow-up support at the local level, including in Shinyanga Region. Keeping track of processes, effects and issues at the micro-level is crucial for policy discussion at the national level. The main issues that arise from the findings at that level are the following:

1. Safety of water: apart from the existing inadequate monitoring arrangements, measures to ensure the safety of water are not in place.
2. Capacity of local (support) organisations: proper arrangements for ongoing (refresher) capacity building of Water User Organisations, District Water and Sanitation Teams and private sector facilitators to collaborate and implement the step-by-step approach, need to be ensured (with emphasis on staff that directly work with user communities).
3. The Participatory Hygiene and Sanitation Transformation approach: more research into the effectiveness of the approach and monitoring of progress is needed to ensure that remaining gaps are efficiently addressed.
4. Long-term results: the approach developed falls short of ensuring long-term results. Financial arrangements for payment of maintenance costs and infrastructure replacement in the long run are not adequate. A workable structure for support to Water User Groups (when needed), after the completion and handing over of the facility to the water user community, is lacking.
5. Result-oriented monitoring and evaluation: a monitoring system that tracks the community managed water facilities on whether these are operational, on safety of the water and on functioning of the institutions, is not fully in place. Evaluations are hampered by the absence of baseline information.

Baseline information, notably on the water sources, water use and health status of the communities, and the time needed to fetch water, would make direct measurement of effects possible.

1 Background of the evaluation and methodology

1.1 Reason and purpose of the evaluation

Tanzania and the Netherlands are signatories to the Millennium Development Goals (MDGs). A shared policy priority is the MDG target to half the proportion of the population without sustainable access to safe drinking water and basic sanitation.

To gain insight into the effects of Netherlands-supported water supply and sanitation programmes, the Policy and Operations Evaluation Department (Dutch abbreviation: IOB) of the Netherlands Ministry of Foreign Affairs initiated a series of impact evaluations.

The first in the series concerns the Netherlands-supported Rural Water Supply and Sanitation Programmes in Tanzania, Shinyanga Region, where the Netherlands' involvement started as long ago as 1971. The evaluation coincided with a planned final review of the 2002-2006 Shinyanga Rural Water Supply and Sanitation Programme, a joint activity of the Ministry of Water and the Royal Netherlands Embassy. The impact evaluation and the final review have been merged.

The objective of the evaluation is to gain insight into the nature and magnitude of the effects of the Netherlands-supported programmes in Shinyanga Region. In addition, the study addresses the contribution of the programmes' institutional strategy to sustainable results. The purpose of the evaluation is to account for the support provided and, based on findings, to identify lessons for policy development and implementation for concerned development partners at national, regional and local level. The terms of reference for the impact evaluation are attached as Annex 2.

1.2 Evaluation questions

The key questions addressed are:

1. What have been the outcomes of the Netherlands-supported Rural Water Supply and Sanitation Programmes in Shinyanga Region?
   - 1.1 What has been the change in the percentage of the population with access to an improved drinking water sources since 1990?
   - 1.2 Is access to the drinking water source continuous throughout the year?
   - 1.3 Is the water from the improved source safe? Are traditional water sources still used?
   - 1.4 What has been the change in the quantity of water consumed?
   - 1.5 What has been the change in the percentage of the population with access to an improved sanitation facility since 1990?
   - 1.6 Are the necessary hygiene practices exercised by all members of the household at critical times?
2. What has been the impact of the Netherlands-supported programmes on the target population?
   - 2.1 What has been the change in time used to collect water?
   - 2.2 Has there been productive use of time savings and/or greater water availability?
   - 2.3 Have the time savings affected girls' education?
   - 2.4 Has the prevalence of water and sanitation-related diseases changed? To what extent can the identified changes be attributed to the Netherlands-supported programme?
   - 2.5 Were there households in the communities that did not have access to the improved water source and, if so, why?
3. To what extent have the programmes been cost-effective?
4. To what extent has the institutional strategy contributed to sustainable results in drinking water supply and sanitation?
5. Which lessons can be derived from the findings?

1.3 Focus and methodology

The impact evaluation covers the last three Netherlands-supported water supply and sanitation programmes in Shinyanga Region. The period covered follows the baseline set for the MDG targets, notably the period from 1990.

A combination of quantitative statistical and qualitative methods and data collection and analyses techniques has been used to answer the evaluation questions. The evaluation started with a desk study to describe the programmes supported from 1990: the objectives, approach, beneficiaries, costs and funding, and achievements.

Three domains of impact have been considered, in line with programme documents:

- health improvements: reduced incidence of water and sanitation-related diseases; reduced mortality;
- gender equality:
  - changes in time taken to collect water, particularly by women and girls;
  - use of time saved by girls to go to school;
- livelihood: changes in economic activities, poverty reduction.

While the programme documents indicate that these were the benefits expected from the programme, no baseline was established: in none of these areas was the situation measured prior to the intervention. For example, no attempt was made to measure the time women spent fetching water, or the incidence of water-related diseases, or the quantity and quality of the drinking water used prior to the establishment of the wells. Without baseline data, the evaluator is severely handicapped. However, in this evaluation it was nevertheless possible to measure and attribute changes in health as a result of the programmes using a combination self-reported health changes and dispensary data. This was not possible for mortality. In addition, changes in the incidence of cholera could not be measured; fortunately the incidence is already so low that it is not possible to attribute differences between communities to interventions.

It was also possible to analyse changes in time taken to collect water. However, in the absence of baseline data this analysis had to be based on the self-reported changes recorded in the survey. Data collection in the area of livelihoods has been more limited. Existing household survey data can be used to measure changes over time, but these data are not representative at the level of a Water User Group. At that level, a purpose-built household survey would be needed to establish the

current situation. However, in the absence of baseline data this would not help to establish changes over time. This may not be a serious limitation: the descriptive analysis in Chapter 3 indicates that the use of water to establish other forms of livelihoods (e.g. vegetable gardens) has been quite limited.

The impact analysis is based on three data sources: a survey in a sample of communities; data on water quality in the sample communities; and diagnosis data recorded in health dispensaries. Part of the survey covered a randomly selected sample of communities with and without Water User Groups. In the statistical impact evaluation, changes over time (such as in health) were compared between the two types of communities. However, differences in health changes need not reflect the introduction of a well and a Water User Group: the two types of communities may differ in other respects anyway. The regression methodology was used to control (to the extent feasible) for such other differences and their effect on the observed outcomes and impacts (Annex 3 provides a brief guide on the statistical methodology). This methodology was used to attempt to solve the attribution problem by eliminating the effect of other differences between the communities. In this way the effect of the well and the institution of the Water User Group were isolated. This was possible only to the extent that such other differences have been observed in the survey. This left unobserved differences as possible confounding factors. In the regression analysis this problem was addressed by relating changes in outcomes (such as the incidence of a disease) to changes in policy variables (e.g. the introduction of a well).[3] This technique controls for unobserved differences between communities, provided these are constant over time. Sections 3.1. and 3.2. provide further detail on the topics covered by the survey and the data analysis techniques.

The focus of the assessment of the institutional strategy has been on the programmes' institutional innovations at user and district level, with reference to other levels of government, as well as to NGOs and the private sector. For the assessment of the institutional strategy, the survey included a number of enquiries about the structure and operations of the Water User Groups. In addition, relevant documents were studied and semi-structured interviews held with key stakeholders at different institutional levels, focusing on Water User Groups and Water and Sanitation Teams at district and regional level. Section 4.1.2 provides additional information on the approach to the assessment.

3 This is called 'fixed-effects estimation'. On this methodology see e.g. W.H. Greene, *Econometric Analysis*, New York, Macmillan1993, Ch. 16.

1.4 Structure of the report

The report starts with the main findings and, on the basis of the findings, the key lessons and issues to be addressed. After the first chapter on the background to the evaluation research and the methodology, Chapter 2 presents a problem-oriented description of the situation in Shinyanga Region and a description of the policy context (Tanzanian and Netherlands policy) of the Netherlands-supported programmes in Shinyanga Region. Chapter 2 continues with a description of the three programmes from 1990 onwards: the objectives, approach, beneficiaries, cost and funding, and the achievements. Chapter 3 addresses the research questions on outcome and impact. Chapter 4 presents the assessment of the contribution of the institutional strategy to sustainable results.

2 The context for water supply and sanitation and programmes in Shinyanga Region

2.1 Shinyanga Region

2.1.1 Location, size and districts

For environmental, economic and demographic reasons, Shinyanga Region has long presented special challenges to rural water and sanitation initiatives. Located in northern Tanzania, it has an area of 50,780 square kilometres and comprises eight districts, including the Shinyanga Municipality or urban District. One of the seven rural districts, Kishapu, was only recently created (from part of Shinyanga Rural District) and therefore does not appear in many of the earlier statistics on the Region.

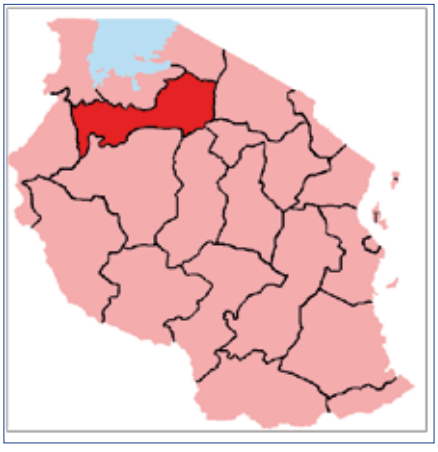


Figure 1 *Location of Shinyanga Region in Tanzania*

Figure 2 *Districts in Shinyanga Region*

2.1.2 Natural environment

The natural environment of Shinyanga is not conducive to the provision of safe water supplies for a scattered rural population, nor for a growing and often crowded urban one. The Region has no perennial rivers or streams. Most watercourses flow for only a few days per year. Traditionally, people used standing pools of rainwater for most human and livestock needs during the wet season, and dug shallow pits in the river beds during the dry season. Because of the instability and bacteriological unsuitability of surface water resources, the water supply programmes of recent decades have had to depend on groundwater.

The groundwater resources are themselves limited. The extent of aquifers is restricted, and the yields of wells and boreholes are generally low. Although limited, Shinyanga's groundwater is often available at relatively shallow depths, meaning

Traditionally used water source

Traditionally used water source

that hand-dug wells five to ten metres deep are able to serve many rural communities. After excavation, these wells are lined with concrete rings. The simplicity of this technology has been an important asset in the Region's rural water supply programmes. Water quality ranges from very high to poor, with salinity and high fluoride content being significant problems in some areas – fluoride especially in deeper wells that have to be drilled in places where hydrogeology does not allow shallow well development. The relatively low yields of the Region's groundwater resources hamper the use of boreholes for piped urban water supplies. This is one of the reasons why most urban centres in the Region are supplied from dams, or are not supplied with water at all (DHV, 1978).

An environmental study by DHV estimated that human and livestock demand for water in the Region increased fourfold between 1957 and 1997. The problem at that time was not yet acute because only 25% of the population made use of groundwater, while most of the livestock was watered from surface water resources as well. Furthermore, during the rainy season a large part of the population drew its water from surface water sources (DHV, 1997).

2.1.3 Population

A key concern for water policy and programmes in Shinyanga is the extent to which they are managing to maintain or increase safe water supply coverage for a

growing, shifting population. Tanzania carried out a national census in 2002, its first since 1988. According to the 2002 data, the predominantly rural Shinyanga Region has been experiencing a higher than average population growth rate (3.3% p.a., compared to 2.9% for the nation as a whole and 2.4% for all rural areas).

Table 1 *Shinyanga Region: population growth*

Year	Population	Annual growth rate to the next census	Population density 1957 per sq. km.
1957	600,000	3.1	12
1967	988,500	3.6	19
1978	1,323,500	2.9	26
1988	1,763,800	3.3	35
2002	2,796,630		55

Sources: DHV, 1997, Annex 4:3; BOS, nd; NBS, 2003, 2004.
Note: different National Bureau of Statistics (NBS) publications give slightly different data for the 2002 census.

Most of Shinyanga's population lives in rural areas. A number of wards across the Region are classified by the 2002 Census as 'mixed'. The only 'urban' wards are in Shinyanga town. Their total population in 2002 was 16,863, but the population of the town is undoubtedly larger and has been experiencing significant growth. A number of small district towns are also growing fast (although they may still be classified as rural settlements) and are increasingly in need of functioning piped water supplies and sanitation systems.

2.1.4 Economy, development and poverty

At the start of the study period, national economic constraints were a significant obstacle to sustainable water and sanitation development in Shinyanga. Neither central government nor the district councils were able to fund the recurrent costs of the water and sanitation programmes, which were paid by the Netherlands until the end of 1992 (RWSP, 1993).

Economic reforms, dominated by market liberalisation and privatisation of various government services and assets, have been continued through the 1990s to date, with strong commitment to the Vision 2025, the Poverty Reduction Strategy (2000/01-2002/03) and the current National Strategy for Growth and Reduction of Poverty (known in Swahili as MKUKUTA), which attributed 'positive results' to 'years of enduring structural reforms in a stable social-political environment'

(GOT, 2005a: 2). The real GDP growth rate has averaged 6.9% per annum since 2001, reached 7% in 2005 and is estimated at 7.2% for 2006.

Despite this impressive growth, Tanzania remains one of the poorest countries in the world with an estimated annual per capita income in 2005 of USD 340 (World Bank, 2006). There does appear to be a gradually declining trend in poverty indicators. Thirty-six percent of the national population were estimated to be below a basic needs poverty line in 2000-2001, which was three percentage points lower than the 39% estimate for 1991-1992.

Poverty is widespread in Shinyanga Region. The percentage of the population below the 2000-2001 basic needs poverty line quoted above ranged from 21.8% in Shinyanga Urban District to 52.9% in Meatu District (RAWG, 2005). A 2004 survey of the seven rural districts of Shinyanga (thus excluding Shinyanga Urban) found that 42% of the 70% of these districts' population who live in 'rural' areas were below the basic needs poverty line (EDI, 2004). This study found that 13% of households lived below the basic needs poverty line in Kahama District, and 16% in Bukombe, while the proportions were approximately 40% in most of the other rural districts and 48% in Meatu.

Inadequate water supply and sanitation arrangements are a key indicator of poverty, and are prominent in the poverty of Shinyanga Region. The economy of the Region is predominantly based on subsistence agriculture, livestock production and mining. The majority Sukuma ethnic group in the Region are agro-pastoralists for whom cattle have enormous cultural and economic importance, and for whom livestock watering is therefore a key element in any water resources development strategy. Sheep and goats are also raised in the Region. The main subsistence crops, produced on average household farm areas of 3.2 ha, are maize, paddy, millet, sorghum, cassava, beans and sweet potatoes. The main cash crops, whose production is subject to the vagaries of market behaviour, input supplies and transport and processing capacity, are cotton, tobacco and oil seeds.

2.1.5 Health

Mortality rates for infants and children aged under five are high in Shinyanga Region. The average infant mortality rate for the Tanzania mainland in 2002 was 95 per 1000; in Shinyanga it ranged from 77 in the Municipality to 108 in Bariadi District. The national under five mortality rate was 154; in Shinyanga it varied between 113 in the Municipality and 178 in Bariadi. Two thirds of those who had been ill in the four weeks preceding a 2004 survey had suffered from fever or

malaria, while a further 18% reported diarrhoea. Fever was suffered predominantly by children under five. Among males, diarrhoea was most often suffered by younger children. Among females, however, it was the 10-29 age group who had experienced diarrhoea most often (EDI, 2004). The data suggest that the gravest health issues in the Region (apart from HIV/AIDS) are malaria and water-borne diseases. The installation of safe water supplies can clearly achieve a significant improvement in rural health standards.

The HIV/AIDS pandemic has been declared a national disaster in Tanzania. Its many impoverishing effects have multiple links to the poverty caused by inadequate water and sanitation. Households' and community institutions' ability to construct, manage and maintain water and sanitation systems are diminished by the burdens of illness and of caring for the sick, and compounded as key members of families and institutions die. At a practical level, households' water requirements rise when they have to care for AIDS patients.

2.1.6 Gender

Gender is a key dimension of poverty in the water and sanitation sector. Women and girls do most of the work of water collection. Where no standpipes or other services are available, they may have to spend several hours a day on this arduous task, which imposes personal costs on them as well as economic costs on society. Girls' schooling often suffers or stops because of their water collection duties. Being primarily responsible for family food preparation and hygiene, women are likely to be the leading beneficiaries of improved water supply and sanitation arrangements.

2.2 National policy

Tanzania's water policy has been revised once during the study period. In 1990, the Government prepared its first national water policy in response to a requirement of the ruling party's 1987-2002 Action Programme. This policy, adopted in March 1991, was intended to help bring about equality and strengthen social and economic changes under the principles of socialism and self-reliance. It sought to give priority to drought stricken areas (e.g. by considering the use of water from Lake Victoria) and emphasised the need to 'develop and strengthen local capability so as to avoid donor dependence'. Another objective was to 'clarify the role of the beneficiaries, donors, ministry, institutions, authorities and various committees on the implementation of water projects through self-help' (RWSSP, 1993: 6-7). It required users to take full responsibility for owning and managing

water supply installations. An amendment in 1995 required communities to form autonomous legal entities to manage water schemes, collecting contributions from users in order to be able to cover operations and maintenance on a full cost recovery basis (Chaliga et al., 1996).

Tanzania published its current National Water Policy (NAWAPO) in July 2002. The basic level of service for domestic water supply in rural areas is set at 25 litres of potable water per capita per day through water points located at 400 meters from the furthest homestead and serving 250 persons per outlet. Like its predecessor, this policy deals largely with institutional issues and is therefore discussed in more detail in Chapter 4 below. NAWAPO is set out in the framework of, and with explicit links to, Tanzania's Vision 2025 and its first Poverty Reduction Strategy. The Development Vision 2025 for Tanzania includes a target of universal access to safe water (GOT, 2002:4). The 2005 National Strategy for Growth and Reduction of Poverty (Tanzania's Poverty Reduction Strategy) has a national target of increasing the proportion of the rural population with access to clean and safe water from 53% in 2003 to 65% in 2009/10 (GOT, 2005a:46). Tanzania is also committed to achieving the Millennium Development Goals, including the halving of the proportion of the population unable to reach or afford safe drinking water by 2015. For Tanzania, this means achieving 74% safe water supply coverage by that date (MOW, 2006).

The current target for sanitation, as specified by the Poverty Reduction Strategy, is that by 2010, 95% of Tanzanians should have access to basic sanitation (GOT, 2005a). Following intensive and successful campaigns in the 1970s that achieved a significant increase in latrine coverage, little more has been achieved:

> 'Planning for sanitation is already largely decentralised with most sanitation related activities being carried out by local authorities, However, budgets are small and fragmented while expenditure is difficult to monitor. In the past hygiene promotion and sanitation in rural areas were embedded within water and sanitation projects. With less aid flowing through projects some components of sanitation and hygiene promotion must now be funded by government...'
> (WaterAid, nd: 3).

The National Strategy for Growth and Reduction of Poverty identifies gender as one of the key cross-cutting issues that is mainstreamed across all three of its main strategic clusters. It states that 'gender issues will be mainstreamed into

policies, plans, budgets and implementation mechanisms including gender monitoring and indicators for good governance' (GOT, 2004: 51). NAWAPO recognizes gender sensitivity as one of the policy issues to be addressed and includes as goal 'Active and effective participation of women and men in water supply programmes' (GOT 2002: 61).
In order to implement the NAWAPO, Tanzania has developed a Sector-Wide Approach (SWAP) to the delivery of Water Supply and Sanitation (WSS) services. 'With the SWAP the WSS activities will be implemented through NAWAPO guidelines based on community demand, decentralised management through local governments and dedicated water user entities or authorities'. In terms of this SWAP, a National Water Sector Development Strategy (NWSDS) 'sets out the road map for NAWAPO implementation' (MOW, 2006:3). The Rural Water Supply and Sanitation component of this Strategy has the following components:

- strengthening decentralised planning, project preparation, funding, implementation and management through local governments;
- improving the capacity of central government institutions to facilitate and channel technical assistance to local governments;
- increasing the capacity for sustained delivery of goods and services by developing and utilising local private sector capacities in facilitation, engineering, construction, spare parts distribution and maintenance; and
- developing a strategy for national hygiene promotion, sanitation and communication.

The Netherlands-supported experience in Shinyanga Region, notably the Domestic Water Supply and Sanitation Programme (Section 2.6) helped to lay the foundation for these new national approaches, many of which were further pioneered through the Rural Water Supply and Sanitation Programme 2002-2006 (Section 2.7). The World Bank-financed Rural Water Supply and Sanitation Project has rolled out the NAWAPO model of decentralised, demand-responsive delivery in 12 pilot districts in 2006. From January 2007, the model will be implemented across the country through the Water Sector Development Programme (WSDP).

There have been a number of significant trends over the years since Tanzania began to implement its 2002 National Water Policy. As WaterAid pointed out in a recent presentation (WaterAid, 2005) the era of donor-funded rural water projects has almost come to an end. Instead, donors are putting more of their support into basket funds and general budget support (mostly for other sectors than water).

Mostly in urban areas there was a shift towards 'bankable' water projects and strong involvement of the private sector, although the prominent involvement of international companies in the Dar es Salaam water supply was unsuccessful. Meanwhile, despite the apparent commitment to the funding and delivery of water supply programmes through local government, WaterAid stated in 2005 that more than 90% of government's water sector development funding was being channelled to 'national' projects - specifically the pipeline from Lake Victoria to Shinyanga and Kahama towns and 54 villages along the route (and potentially beyond). Only 10% of the water sector budget went to local authorities through the Local Government Capital Development Grants, and district councils were allocating very little of their own revenue to the water sector. The World Bank-funded Rural Water Supply and Sanitation Project mentioned above remained a centrally controlled venture, too, with a project implementation unit in Dar es Salaam. Overall, WaterAid concluded, the water sector was afflicted by a rural investment vacuum; the costs of preferred technology per capita were rising, and the spatial equity of investments was declining, as much of the funding was devoted to the Shinyanga/Kahama pipeline.

This vacuum should be at least partially filled as the WSDP gains momentum through 2007 and beyond. More centrally co-ordinated donor funding will become available, via a national programme and procedures, for use in the rural water and sanitation sector through the plans and budgets of local government authorities. As institutional approaches inspired by the Shinyanga experience are rolled out across the country, the WSDP will of course have to tackle major capacity challenges in order to meet its coverage targets. 'Ensuring that the targets are attained will require the rapid scaling-up of planning and implementation capacity at every level, and within sub-sector related institutions in particular' (WSDP, 2006:4-16).

2.3 Local government

Under Tanzania's Decentralisation Act of 1972, central government took responsibility for policy formulation and implementation. Water programmes were implemented through Regional and District Development Directors. New legislation in 1982 reintroduced local government structures that were responsible for the implementation of policies formulated by line Ministries. From 1986 through the first half of the 1990s, austerity measures imposed major cuts on civil service numbers and ensured poor remuneration for local government staff (Chaliga et al, 1996).

The National Water Policy is partly framed by Tanzania's more recent local government reforms through the policy of decentralisation by devolution. The Local Government Reform Programme (LGRP) involves 'political decentralisation, with a devolution of powers to locally elected councils and committees, and with an integration of the previously centralised or deconcentrated service sectors into a holistic local government system with local councils as the most important political bodies' (GOT, 2005b: 2-3). Complementary processes of financial decentralisation, administrative decentralisation and changed central government-local government relations should all help to build the roles of local councils as key agencies of development planning and management.
The institutional implications of the LGRP for the rural water and sanitation sector are explored in Section 4.2.2 below.

2.4 Netherlands policy

The Netherlands Ministry of Foreign Affairs produced its first policy document in 1989 on drinking water supply and sanitary facilities. The document strongly endorsed an integrated approach in which improvements in water supply are linked to improvements in sanitation, drainage, solid waste disposal and hygiene behaviour. Furthermore, it emphasized the need for user participation, which was seen as an essential element in ensuring more appropriate technology choices, a greater sense of responsibility among users and, in the long run, the devolution of operation and maintenance tasks. The memorandum underlined the importance of sustainability (GON, 1989a). In 1989 the Ministry also published the policy document 'Women, water and sanitation' that specified the role of women in user participation with a view to arrive at better management and maintenance of facilities, safer hygiene behaviour and reduction of women's workload (GON, 1989b). In 1998 the policy document 'Drinking water supply and sanitation' was published. The central principle for drinking water and sanitation laid down in this document is to ensure the sustainability of water supply and sanitation facilities by designing, implementing and operating facilities which are desired by and can be managed or co-managed by the users themselves (GON, 1998).

Since the end of the 1990s the Netherlands has been promoting a sector-wide approach to development co-operation, including for water supply and sanitation. This implied a move away from the traditional project based approach (GON, 2002). In 2005 the Minister for Development Co-operation made a commitment to contribute to Millennium Development Goal 7 - to ensure environmental

sustainability, by providing sustainable access to safe drinking water and basic sanitation with an additional 50 million people by 2015 (GON, 2005).

Netherlands-supported water supply and sanitation programmes in Shinyanga region

The selection of Shinyanga for Netherlands support was rather arbitrary. Tanzania had no explicit regional priorities. A crucial criterion in the selection was the focus on target-group orientation, as Shinyanga was one of the poorer regions of Tanzania. The Tanzania-Netherlands Co-operation Programme for Rural Water and Sanitation Development in Shinyanga Region included the following:

1. Shinyanga Region Water Resources Survey (1971-73)
2. Shinyanga Shallow Wells Project (1974-78)
3. Shinyanga Wells Rehabilitation Project (1980-82)
4. Shinyanga Rural Water Supply Programme (1985-87)
5. Shinyanga Rural Water Supply and Sanitation Programme (1988-93)
6. Shinyanga Domestic Water Supply Programme (1993-2002)
7. Shinyanga Rural Water Supply and Sanitation Programme (2002-2006)

In line with the policy to promote a sector-wide approach, and to enhance Tanzanian ownership and sustainability of the approach and results in 2002, a new institutional strategy was adopted. The Rural Water Supply and Sanitation Programme (2002-2006) fell within the National Water Policy and Tanzanian local government system. A major difference from the former Domestic Water Supply Programme, whereby the project approach was practiced, is that the programme based its activities on prepared district plans.

2.5 The Rural Water and Sanitation Programme, 1988-1993

2.5.1 Objectives

As mentioned in Chapter 1, the study period began almost 20 years after the first Netherlands support to the rural water sector in Shinyanga. In 1990, that support was directed to the Rural Water and Sanitation Programme (RWSP), which had begun in November 1988. This programme, which operated in Morogoro and Shinyanga Regions, emphasised local responsibility at community, district and regional levels in the planning, installation, operation and maintenance of rural water supplies. Its long-term objectives were:

- to develop a functional village-based, district-supported system for the operation and maintenance of rural water supply facilities, so as to

ensure (to the maximum extent possible) a continuous supply of clean potable water in adequate quantities and with ease of access for drinking, domestic purposes, and personal hygiene, and for other related uses where this is technically and economically feasible;

- to promote community development through the active participation of the village communities in all stages of water supply development, so as to enhance self-reliance and the sustainability of the water supplies, in particular their operation and maintenance;
- to promote sanitary conditions through health education and sanitation and drainage/waste disposal improvements;
- to develop the capacity of the districts to undertake rehabilitation and repair of existing village water supplies that are deficient or out of order;
- to strengthen the capacity of the Regions to provide the necessary support to the districts for them to meet their expanded responsibilities for rural water supply development; and
- to strengthen the capacity of the districts, and the related support capacity of the Regions, to plan, design and implement approved new construction of water supplies.

2.5.2 Approach

The RWSP developed a 'system design' and a 'step-by-step approach' that it had inherited from earlier Netherlands-supported projects. Under the 'system design', central government played a supporting role. The Regional Development Committee was responsible for the management and control of this central government support and of donor support. It delegated this task to the Regional Water and Sanitation Committee, of which the District Executive Directors (DEDs), the programme advisers and 'the donor representative/Team Leader' were members. This latter phrase from the RWSP's final report implies that the consulting engineers also served as donor representative (RWSP, 1993: 11). The consultants (the Dutch company DHV) certainly played a central role in the institutional arrangements. The 'step-by-step approach' detailed the actions to be taken by the different actors in the delivery of the services. Further information on this approach is provided in Chapter 4.

Training was emphasised as a major component of the RWSP. Spanning community development, health and water supplies, it was provided at regional, district, field staff and village levels, with those trained at one level then serving as trainers for the level below. Much of the early training aimed to familiarise people at all these levels with the approach and methodology of the project. Pilot training

was also provided to ten Village Water Supply and Sanitation Committees and village government members in financial management and administration. The project adopted a demonstration strategy with regard to sanitation. The intention was that District Health Officers and Village Health Assistants would stimulate households to build their own Ventilated Improved Pit (VIP) latrines, using demonstration latrines built by the project as a model. However, a national review in 1993 reported that 'all projects have abandoned the promotion of ventilated improved pit latrines, as they are too costly... The projects supported by [the Netherlands and Sweden] now encourage households to make good pit latrines by themselves, using local materials...' (IRC, 1993: 26).

For its first three years until June 1991, the RWSP focused on the rehabilitation of existing shallow wells. Typical tasks were to clean and repair the well structures and surrounds and to replace the hand pump. Materials, including cement, were supposed to be provided by the well users, but were sometimes donated by the district council. The project provided the new pumps. Most of the work was done by district staff. Later, the RWSP gave greater emphasis to the construction of new wells. Most of these were excavated ring type wells, with a smaller number of tube wells (for which hand drilling equipment was used).

Mukuyuni Water User Group, Kahama District

As part of its institutional shift towards greater user responsibility for water systems, the RWSP developed a reporting and monitoring system that was intended to function at village, ward, district and regional levels. However, a 1991 evaluation condemned the monitoring and reporting system as too complex, and unsustainable: 'the achievements in this respect are far from satisfactory' (Matrix Consultants, 1991: 12). The programme's final report in 1993 said that the system was mainly being used just for reporting, rather than for active monitoring. It confessed that 'the Monitoring System in its present form is very elaborate and time consuming... Although all people involved have been trained on the monitoring procedure, no proper guidance has been given on its meaning and on good methods for an analysis of the data. This results in an inefficient use of the system... Findings from the Monitoring System are at present not accessible to the community. It is not used as a tool to create awareness and self-reliance in the communities' (RWSP, 1993: 112).

2.5.3 Participation and beneficiaries

The intended beneficiaries of the RWSP were the rural and small town populations of Morogoro and Shinyanga Regions. Data from 1992 suggest that an estimated 199,000 people, or 10.5% of the total Regional population, had benefited from the work of the RWSP and (presumably) those installations of previous projects that were still in operation (Matrix Consultants, 1992: 29).

It was argued at the close of the RWSP that women should have been the project's main beneficiaries, but had been largely excluded from participation in the planning, implementation and operation cycle. The project acknowledged in its final report that 'so far little attention has been paid to the involvement of women in the Programme... The lack of attention may be largely related to a general lack of knowledge and skills in community participation issues, and in participatory approaches. Some problems are certainly due to the relatively small number of women Field Team Members.... In the step-by-step approach indications are missing on when and how to take gender differences and socio-economic differences into account, and on how to promote the participation of women and less well-off people in the community' (RWSP, 1993: 110-111). Earlier, the programme evaluation reached similar conclusions:

> 'Women are still very marginally involved. In most VWSCs [Village Water and Sanitation Committees] two women are appointed, but their effective participation is low.'
> (Matrix Consultants, 1991: 27).

The Plan of Operations for the RWSP's successor programme, the DWSP, stated that:

> 'Numerous reasons have been given for the low attainment of targets for community sustained water and sanitation facilities. Topping the list is the lack of adequate funding. However, it is felt that the exclusion of the major beneficiaries (women) from the whole cycle of water and sanitation projects has played a significant role in their failure.'
> (GOT and GON, 1993: 11-12).

2.5.4 Cost and funding

Although various sources of budget and expenditure data for the RWSP give somewhat conflicting figures, total estimated expenditure by the project from 1990 to 1992, inclusive in Shinyanga Region, was EUR 1,637,972. It is difficult to calculate the cost of the RWSP per water point or per beneficiary. The funds were used not only for physical rehabilitation or construction of water points, but also for institutional development. In fact, the development of 'a functional village-based, District-supported system for the operation and maintenance of rural water supplies' and related capacity-building tasks were the main focus of the project. It has not been possible to obtain data on the number of community institutions that were created or strengthened in this way, and therefore no cost per unit of institutional achievement can be estimated.

The problems in ascertaining the exact cost of the RWSP in Shinyanga Region, or its cost per unit of achievement, are symptomatic of the general difficulty that this study has faced in obtaining cost data. The inadequacy of these cost data across the history of the Netherlands-supported programmes in Shinyanga is regrettable. One technical reason for the problem is that two of the three programmes during the study period covered Morogoro Region as well as Shinyanga, and expenditure data do not always offer a breakdown by region.
The principle applied in the RWSP was that donor funds should cover half the implementation costs of the programme, while the other half 'should be covered by the various Tanzanian parties involved' (RWSP, 1993: 79). At first there were numerous accounting problems: additional donor funds could not be released until previous transfers had been accounted for by the recipients at district and regional levels.

Although available documentation is not very explicit on the subject, it appears that water users were expected to shoulder the responsibility for operation and maintenance under the RWSP. Village Water and Sanitation Committees collected

funds for this purpose, but there were insufficient data in 1990 as to how much maintenance could be expected to cost. 'The actual maintenance costs of a hand pump - even after some twelve years of intervention - are still unknown' (Matrix Consultants, 1991: 23). The evaluation just quoted feared that the funding strategy emphasised the reduction of installation costs rather than ensuring that future maintenance costs would be kept at a minimum. It concluded that:

> 'In view of the lack of data, no definite conclusions can be drawn on affordability. Estimates on annual spare part requirements suggest, however, that the cash O&M expenses may considerably exceed the typical contributions that so far have been collected on village level... financial sustainability could... partly be assured still with financial support from the Government.'
> (Matrix Consultants, 1991: 28).

2.5.5 Achievements

The RWSP appears to have fallen short of its 1988-1993 output targets. Its final report gives contradictory information about its delivery of water supplies. Text and a bar chart suggest that 289 existing wells were rehabilitated and 71 new ones constructed over the full project period between 1988 and 1993. A table shows that only 109 wells, or 79% of the planned total, were rehabilitated, and 44 (62% of the planned number) were constructed (RWSP, 1993: 88-90). The best scenario seems to be that an increment of 71 new wells was achieved over and above the rehabilitation of existing ones. The reported breakdown of systems since the 1970s had been high, about 50% (IOB, 1994: 246).

The programme built 58 (72%) of its intended 80 demonstration VIP latrines. 'The response by the villagers to start making their private latrines [on the basis of these demonstrations] was disappointingly low' (RWSP, 1993: 92).
The RWSP's institutional outputs are not clearly stated in the available reporting, but were embodied in the System Design that it inherited and developed. This structure linked Village Water and Sanitation Committees to counterpart bodies at district and regional levels, and was acknowledged by the project to be somewhat cumbersome and top-heavy, with the intended transfer of technical co-ordination responsibility to district level being only partially accomplished.

Like its institutional outputs, the RWSP's human resource outputs are not clearly stated in the available reports. There are no data on the numbers of people trained. It would appear that personnel at all levels in the System Design hierarchy

received some training, including village mechanics, caretakers, Village Health Workers, Health Assistants, members of Village, District and Regional Water and Sanitation Committees and other government personnel.
Despite (or because of?) its observation that 'almost anything that could go wrong, has gone wrong', a 1991 evaluation mission proposed an extension of the RWSP to the end of that year (it was subsequently extended further, to February 1993) and recommended that a new phase of five years be formulated, on the grounds that:

- The O&M concept has proven to be sound
- Water is considered among the most essential village level facilities
- Present distribution of water supply facilities is very uneven
- Replicability, which is not yet achieved, should be the final objective for donor intervention.

(Matrix Consultants, 1991: ii).

2.6 The Domestic Water Supply Program, 1993-2002

2.6.1 Objectives

The DWSP was the longest running programme in the 35 years of Netherlands support to water and sanitation in Shinyanga, and its approach and achievements underpin much of the work that has been done since. Like its predecessor, this project supported work in both Morogoro and Shinyanga Regions. Its design picked up on the conclusions from the RWSP just quoted above, emphasising the low coverage of safe water supplies so far achieved in Shinyanga Region. With distinct echoes of its predecessor, it emphasised in particular that it was time to develop 'sustainable systems for management and operation and maintenance at the village level'. This should be achieved through localised approaches in which 'the construction and rehabilitation of water supply facilities will be realised through, either public or private, local parties' (GOT and GON, 1993: 13).
Whereas the RWSP's long-term objectives emphasised systems, approaches and capacity, the DWSP's long-term objective focused more directly on water supply:

> '...to improve the living conditions and the health situation of people by providing access to an adequate - i.e. sufficient in quantity and safe in quality - water supply or sanitary facilities within a reasonable distance of the homesteads in a sustainable and environmentally viable way.
> Initiatives to improve or construct a water supply system or sanitary facility must come from the users. The implementation of these field activities will

be carried out along the lines of the step-by-step approach. The planning of the programme will follow a process oriented approach.'

2.6.2 Approach

The Plan of Operations for the DWSP was formulated as the principles of decentralisation and subsidiarity were gaining currency in many countries' development and governance strategies. It stressed 'stimulating community participation' as a key 'gender-specific' strategy, 'in order to support user group management, that is taking full responsibility for planning, implementation, operation and maintenance and ownership of their water supply system or sanitary facilities' (GOT and GON, 1993: 16).

The 'step-by-step' approach developed by the previous RWSP was the core strategy for the DWSP's extension of water supply work, and was endorsed by the Mid Term Review (MTR), 'though still not perfect', as 'a valuable tool for community mobilisation. It appears to be within reach of all actors and is becoming 'common property'' (Chaligha et al., 1996: 39). As explained in Chapter 4, a key DWSP innovation was the Water User Group as the basic community level institution for the installation and operation of water supplies. By the end of the DWSP, two additional institutional steps had gained in importance: the issue of a water right to a duly registered Water User Group, and the issue of a land right to the Water User Group. By the end of the project, the concept of User Level Operation and Maintenance (ULOM) had been adopted, and community level facilitators were training Water User Group members and local technicians in various technical, administrative and accounting skills (DHV, 1999a).

A 2005 review described the DWSP as 'a water supply programme with sanitation added on half way through', since the sanitation component was only developed in 1997 (McCubbin, 2005: i). DWSP's initial sanitation approach was to build communal latrines and washing slabs. School hygiene and sanitation training packages, and school latrines, were a further intervention. Overall, however, the project found that its progress was unsatisfactory. It therefore adopted the Participatory Hygiene and Sanitation Transformation (PHAST) approach in consultation with the Regional Health Authority and Regional Health Management Team. PHAST was to be implemented through Water User Groups, with Community Owned Resource Persons (CORPs) trained for a specific facilitation role in this regard (DHV, 2002: 13-14).

The MTR noted that the sanitation and health component of the project 'appears to lack 'roots'' and was unlikely to achieve its modest targets, 'let alone to contribute substantially towards a sustained drive for sanitation and health education' (ibid.: 25). The review adduced four reasons for this unconvincing performance: the continuing dominance of the water supply component of the project; lower demand for sanitation services; lack of participation by the Ministry of Health; and lack of sanitation engineering skills in the consultant team. In 1998 the DWSP stopped its environmental hygiene and sanitation activities (ibid.: 38). In water supply, the DWSP continued to focus mainly on the construction or rehabilitation of shallow wells fitted with hand pumps. Like the RWSP, it made a limited contribution to the rehabilitation of pumped piped schemes for larger settlements. The Plan of Operations also referred to dams and charcos [4], but the MTR said that these technologies were not being seriously considered due to water quality and livestock access problems (Chaligha et al., 1996: 7).

Paradoxically, the high quality of the hand pumps used by the DWSP was said by the 1999 external evaluation to cause maintenance problems. Because they were not often needed, there was low turnover of spare parts, which discouraged private traders from stocking them. The ultimate solution was for the Community Based Resource Centre (CBRC) to stock parts in Shinyanga town (Section 4.3.4).
The DWSP completed installation of a new database for completed wells, WADATA, in 1998. However, the external evaluation of 1999 stated that 'DWSTs have no data collection system on the performance of the created systems' (Kapande et al., 1999: 8). It complained that it did not receive systematically collected data on water system functioning (or breakdowns) because these data were not regularly collected. Nor were data collected on a key outcome: the actual use of the water systems installed. 'DWSP works on the premise that the full capacity of a well will be used by the users' (Kapande et al., 1999: 30).

The 1999 external evaluation found that DWSP (and the Royal Netherlands Embassy) were not monitoring sustainability issues carefully enough. Whereas their monitoring of 'linear implementation' issues was adequate, 'sustainability was not considered from a more than incidental, ad hoc point of view, and the efforts required to achieve sustainability were underrated' (ibid.: 42).

4 A charco is a small natural depression in which water collects - the reservoir function can be enhanced by construction of a dam or retaining wall.

2.6.3 Participation and beneficiaries

In its first year, the DWSP commissioned a gender impact study (Hauli et al., 1993). Predictably, it identified an 'imbalance in the socio-cultural relations between men and women in the villages in favour of men... women have been affected more than men considering the distribution of roles, workload and scanty presence in leadership positions' (ibid.: 40). It found that women formed the majority in Water User Groups but were 'marginalised at the decision making levels'. However, the study found that women animators and staff were highly effective at community level, and that women were fully and effectively involved in all community water development and management activities, including construction and security. One of the most significant findings was that water collection distances were often not reduced for women when improved water points were constructed, as communities often chose to improve existing sources that were at some distance from people's homes (ibid.: 43). It should be pointed out that this finding has not been validated by the survey undertaken as part of this impact evaluation, reference Chapter 3.

The 1996 MTR of the DWSP expressed satisfaction with the project's vigorous community mobilisation work, which was carried out by Community Development Assistants, Health Assistants or, in some cases, private mobilisers such as retrenched Health Assistants or teachers. It found that most user group executives comprised three men and three women, with women sometimes holding key positions within the groups - although 74% of chairpersons, 65% of secretaries and 73% of treasurers were still men (Chaligha et al., 1996: 22). The 1999 external evaluation pointed out that little was known about the actual extent or nature of women's participation in committee debates and decision making (Kapande et al., 1999: 46).

2.6.4 Cost and funding

As for the RWSP, considerable detective work was needed in order to estimate how much money the Netherlands contributed to the DWSP. The records are unclear on various points, not least the way in which expenditures were divided between Morogoro and Shinyanga Regions. Making a number of assumptions about data presented in the internal DGIS terminal report on the project, an estimated total of EUR 9,558,750 was spent by DWSP in or for Shinyanga between 1993 and 2002.

The MTR of the DWSP estimated that the project's water supplies would cost EUR 20 per person. But it pointed out that these costs were based on bulk purchases of materials and benefited from the project's tax exemptions. 'This artificially keeps the

price down' (Chaligha et al., 1996: 13). It also noted that about half the investment costs comprised consultancy inputs and regional operational support (ibid.: 32).

The 1999 external evaluation of the DWSP considered that, despite inadequate O&M, the water systems installed by the project would continue to function for 'possibly' ten years, working out at 'a reasonable per cubic metre cost for water of possibly [EUR 0.31]' (Kapande et al., 1999: 8).
The Dublin Statement of the 1992 International Conference on Water and the Environment closed the era of free water for all and emphasised that water is an economic good - while also describing access to clean water and sanitation at an affordable price as a basic human right (Chaligha et al., 1996: 1). DWSP's design clearly emphasised water users' financial responsibility:

> 'The user groups are expected to pay the rehabilitation/construction costs. The material (e.g. cement, sand) the labour (either fundi [technician] or part of the Departmental services and casual labour, or providing the latter in kind). As well, part of the costs of the pump, the pipes or what is applicable, is to be paid by the user group. The amount will partly depend on the prevailing socio-economic circumstances. (The donor will pay activities of the departments, lease out necessary equipment for the private sector and subsidise the pumps and some other materials for the users.)
> Besides that it is the aim of the programme that the costs of O&M are fully covered and taken care of by the user groups. The user group shall apply for the rehabilitation or construction of their own water supply.'
> (GOT and GON, 1993: 38).

The DWSP MTR found that Water User Groups 'do actively participate in the mobilisation and collection of contributions (cash and kind) in their communities for construction and repairs of shallow wells. The cash contributions are deposited into a bank account and administered by the treasurer, often a woman' (Chaligha et al., 1996: 14). It took time, however, to alter the public expectation that Government should provide water free of charge.

> 'The GOT has for a long time convinced the rural people that it was a government responsibility to provide water and it would do so free of charge. Naturally, this historical fact has been deeply entrenched in the minds of the rural people despite the government's failure to maintain the rural water schemes. The concept of Water User Group which essentially demands users to pay for full O&M costs has, to some extent met with some resistance.'
> (van Miert and Binamungu, 2001: 24).

The DWSP external evaluation of 1999 found a higher user willingness to pay O&M charges in Shinyanga than in Morogoro, perhaps because there was a more established tradition of paying water vendors in Shinyanga (Kapande et al., 1999: 34). It reported that cost sharing was introduced in Shinyanga in 1997/98, with users 'in the DWSP Districts' required to contribute Tsh 100,000 as a down payment towards the cost of the hand pump. Another Tsh 260,000 was to be contributed by users in kind, as labour and materials, and district councils were required to contribute Tsh 50,000 for each well. The general cost sharing formula was: donor, 80%; users, 18%; council, 2%.

2.6.5 Achievements

The DWSP's water supply objectives had been set through local planning processes and were acknowledged to be ambitious. Performance over the first two years of the programme was 'very disappointing' (Chaligha et al., 1996: 6). Three years into the planned five year implementation period, the MTR found that 38% of the overall target for rehabilitated wells, and 24% of the target for new wells, had been completed. There had been minimal progress (4%) with the planned piped water supply projects.

There must have been a major acceleration of performance in the following two years. The project reported that, by the end of 1998, it had rehabilitated a total of 285 shallow wells (52% of the target) and constructed 1,258 new shallow wells (152% of the target) (DHV, 1999a: 2). 'With funding through the DWSP and DRDP programmes', seven piped water schemes were reported in 1998, although progress with these schemes was mixed: two were not operational, there were no data on a third, and the pumping unit was planned to be withdrawn at a fourth, where the 'Water Company approach has proved a failure' (ibid.: 4). In total, only four of the planned 29 piped water schemes were installed (Kapande et al., 1999: 7).

The external evaluation of 1999 'found that the water supply facilities made under DWSP are largely functioning properly (over 90%), and are also used (say 20 l/pcd), though possibly by less than the design population' (ibid.: 8). By the end of the DWSP extension period in June 2002, as shown below, the project was reporting a total of 2,497 operational wells.

Table 2 *Operational wells and institutional development achieved by DWSP, 2002*

	District Council							
	Bariadi	Bukombe	Kahama	Maswa	Meatu	Shinyanga District	Shinyanga Municipality	Total
Total operational wells	666	208	422	381	307	308	205	2,497
								% of all operational wells
Water User Group registration complete	472	74	218	148	225	250	162	62
Land right issued	337	7	171	57	101	218	122	41
Water right issued	-	-	-	-	-	87	-	3
ULOM training completed: Water User Group Committee	498	85	316	225	211	276	175	72
ULOM training completed: Water User Group Treasurer	498	85	317	213	208	271	175	71
ULOM training completed: Fundi	498	85	317	213	203	267	175	70
Transfer of ownership formalised	85	-	5	28	99	87	83	15

Source: DWSP, 2002: 10.

In sanitation, DWSP's most important output was the introduction of the PHAST approach. Conventional sanitation and hygiene education programmes undertaken by DWSP were proving unproductive, which led the Regional Health Authority and DWSP to adopt PHAST (DHV, 2002: 13). Community level PHAST training was provided in 20 villages, involving 175 Water User Groups and the training of 350 Community Owned Resource Persons. One of the major constraints identified during this early PHAST experience was poor follow-up by district council staff, due partly to transport constraints and partly to inadequate training at that level (ibid.: 15).

The primary institutional output of the DWSP was the Water User Group, which it developed on the basis of the earlier Village Water Supply Committees. A second major institutional output of the DWSP was the stronger role of the private sector, as private contractors and plumbers became active in the construction and maintenance of rural water supplies. This linked to the establishment of three private sector institutions: the Water and Environmental Development Company (WEDECO), the Regional Development and Training Centre (RDTC) and the Community Based Resource Centre (CBRC).

The internal termination report (*slotdocument*) by the Netherlands Government concluded in 2002 that:

> 'The implementation of the programme was satisfactory. Much effort has been spent on the contribution to the development of the national policy for rural water and the framework concept. During this phase the creation of autonomous districts came into operation, which had major consequences for the implementing partners on district level.
> The weak point is therefore the lack of capacity at the end of the DWSP program on district level. This is not only to blame on the consultants as the national authority had difficulties to accept the changing role of the central level (losing power) and the new system of decision taking. Another weak point was the fact that DWSP was not operational in all the districts of the region. The (Dutch funded) District Rural Development Programme was active in the field of water supply, using different methods.
>
> These weak points have been translated into objectives of the Rural Water Supply and Sanitation Program for the whole of the Region of Shinyanga.' (GON, 2002a: 3).

2.7 The Rural Water Supply and Sanitation Programme, 2002-2006

2.7.1 Objectives

Unlike its predecessors, the RWSSP did not work in Morogoro Region. But it did cover all the rural areas of Shinyanga Region, including the rural areas within the boundaries of Shinyanga Municipality. Its **overall objective** was:

> 'sustained water supply and sanitation service for the people living in Shinyanga Region.'
> (GOT and GON, 2002b: 2).

The RWSSP's **overall purpose** was:

> 'the development of a sustainable expansion of rural water supply and sanitation facilities and equitable services in Shinyanga Region with appropriate involvement and participation of all stakeholders.'
> (Ibid.: 2).

The project's **main targets** were:

- Institutional development realised at all levels and stakeholders adapted to and trained for new roles and responsibilities for sustainable rural water supply and sanitation services.
- Strengthened community-based management systems and legal ownership of water supply facilities.
- Capacity built at community level to plan, budget, implement and supervise their own water supply development projects in collaboration with the district councils and private sector providers.
- Strengthened and sustainable private sector.
- Strengthened public sector management.
- A successful incorporation of the programme into the existing institutional regional/district framework.
- A sustainable expansion of coverage of water supply and sanitation services, including health and hygiene education, using a demand responsive approach.
- A feasible financial and economic structure for the rural water supply and sanitation sub-sector in Shinyanga implemented and accepted.

(Ibid.: 2).

2.7.2 Approach

The RWSSP compared its approach with that of its predecessor as follows.

Table 3 *Comparison of DWSP and RWSSP approaches*

	DWSP (1993-2002)	RWSSP (2002-2006)
Planning	Project approach	Programme approach: activities are abstracted from the consolidated district plans, that are based on sector wide approach
Private sector involvement	Facilitated creation of a private company (WEDECO) and an NGO known as Community Based Resource Centre (CBRC)	Promotes private sector involvement in RWSSP through advertisement, training and workshops
Management and ownership options	Mainly Water User Groups	Combined options including Water User Groups, Water User Associations and Water Authorities
Flow of funds	From the donor directly to the Council's programme account. Disbursement was on monthly basis and in accordance with actual requirement	Follows the normal government channels, i.e. flows from the donor to the Ministry of Finance and Ministry of Water to the councils and Regional Secretariat. Disbursement is on quarterly basis and in line with action plans of councils and Regional Secretariat
Control of funds	Mainly by the consulting firm	Under the control of the government at respective levels
Hygiene and sanitation education	Promoted through school hygiene and sanitation education and construction of institutional demonstration latrines at schools and health units	Integration of water supply, sanitation, hygiene education, HIV/AIDS awareness and gender. The Water User Groups are supported to improve the health impact of water intervention through PHAST
Management at district level	Small team composed of contracted and government staff	Team work (DWST/MWST) that is multi-sector and embedded in the LGRP

Source: Adapted from RWSSP, 2006c: 3.

At community level, the role and status of the Water User Groups, and the procedures through which they must attain full legal status, water rights and land rights, are now well understood. RWSSP also promoted the creation of Water User Associations for the management of piped schemes and dams. The programme's institutional approach is discussed further in Chapter 4 below.

In the sanitation sub-sector, the RWSSP continued to implement the PHAST approach with selected Water User Groups. Training covered malaria control as well as water management, environmental sanitation and hygiene issues. As District Health Departments have generally lacked the capacity to facilitate PHAST, the project contracted community-based organisations for this purpose (RWSSP, 2006b: 22). The RWSSP worked on a number of small town water supplies. But it pointed out that sanitation in the Region's towns is becoming an increasingly urgent issue to which it was not possible to devote any project resources (RWSSP, 2006a: 9).

The RWSSP largely continued with the water supply technologies developed and tested by earlier projects, focusing on the rehabilitation and construction of shallow wells. However, it experimented with various additional technologies, notably rainwater harvesting tanks and the installation of treatment units at water sources that can reduce fluoride content (RWSSP, 2006c: 3). Other technologies included construction and rehabilitation of (charco) dams, drilling of boreholes and piped water supply schemes. Taking into account the importance of livestock in the local economy, the project worked with users to review the technical options and economic feasibility of developing livestock watering facilities (RWSSP, 2006b: 14).

This programme worked to upgrade the WADATA database, but in an analysis of the RWSSP's compliance with the 2002 National Water Policy, the project's MTR found it wanting with regard to monitoring. It stated that 'monitoring by communities is not evident, and at district level is principally focused on program activities. Monitoring the water supply situation in each district, e.g. water point functionality, is partial at best' (MDF and MWLD, 2004: np). These monitoring concerns are explored further in Chapter 4.

The Ministry of Water has only 13 water quality analysis facilities around Tanzania. The one in Shinyanga thus serves other regions as well. Regular monitoring of water quality in shallow wells and at other water points is not possible. Recurrent budgets are far too small, and the Shinyanga laboratory has no transport. When a

new water point is proposed, the Shinyanga laboratory carries out physical and chemical analysis of the water. If the quality is approved and construction proceeds, the well is disinfected before use and a complete bacteriological analysis is carried out. Thereafter, no regular bacteriological or other monitoring takes place, although the Shinyanga laboratory is now trying to introduce a programme of biannual disinfection of shallow wells to strengthen existing, usually irregular arrangements by some Water User Groups to do this.

2.7.3 Participation and beneficiaries

The strategy of RWSSP and its predecessors has started at the easy end of the water supply task. Shallow wells are both technically and institutionally easy compared with the challenges of developing more complex systems for potentially larger groups of consumers in places where shallow well technology is inappropriate and/or population densities are higher. As gradual urbanisation of the Region's population occurs, it will become more important to develop and deliver alternative supply technologies and to tackle the institutional complexities of larger settlements. RWSSP's experience with small town supplies was not encouraging in this regard (see Section 2.7.5).

The RWSSP built on the participatory approaches developed by its predecessor, the DWSP. It emphasised community ownership of and responsibility for rural

Locking the pump, Mwandutu Water User Group, Shinyanga District

water facilities, as well as a strong role for the private sector and NGOs in the facilitation, installation and maintenance of water systems. As shown in Chapter 4 it continued to promote and embed the concept of the Water User Group, taking these groups through the now standard procedures of sensitisation, formation, registration and, where possible, acquisition of land rights over the sites of their water points followed by water rights. Chapter 4 also assesses the progress that the programme made in promoting gender equity in water supply management.

It should be noted that, despite allegedly blanket coverage of all districts in Shinyanga Region with information about water development opportunities, some communities living along river courses did not apply to participate in the RWSSP, even though disease problems persist there. In other places, the water is too deep or salty for development to be feasible, and people are reluctant to move elsewhere. There are also communities that were keen to join the programme but live in areas where no water can be found. In such cases, participation in the programme was not feasible.

2.7.4 Cost and funding

The total approved budget for the RWSSP was EUR 10.8m. This included committed amounts of EUR 8.5m for the Tanzania Ministry of Finance, for transfer to regional and district authorities; and EUR 1.2m for disbursement to DHV. Up to December 2006 the amounts disbursed, assuming an exchange rate of EUR 1 = USD 1.2, were EUR 7,711,549 to the Ministry of Finance and EUR 1,119,514 to DHV - a total of EUR 8,831,063.

According to RWSSP personnel, the average cost of installing shallow wells in Shinyanga Region was EUR 7.85 (USD 10) per capita in 2006. WaterAid estimated the cost of this technology at EUR 1,950 (USD 2,500) per well. These are very low costs, but it is important to remember that the cost of providing safe water to the significant proportion of the Region's population not yet served will be significantly higher. Most of these people will have to be served with more expensive technologies, either because they live in rural areas where shallow wells are inappropriate, or because they live in (peri-)urban areas where piped schemes are necessary.

As pointed out earlier, data on water points achieved do not always differentiate clearly between new facilities installed and old ones rehabilitated. It is therefore difficult to be sure what a programme's incremental achievement has been, over and above rehabilitation of what previous projects left behind. As will be shown in

Section 2.6.5, 3,643 wells were recorded in April 2006, of which 93% or 3,388 were working. If, for the sake of argument, it is assumed that two thirds of the total gross cost of the programmes since 1990, or EUR 13,351,857, can be allocated to the shallow wells (the major component of all these programmes), this suggests a less impressive average cost of EUR 3,941 per water point.[5]

The RWSSP introduced significantly different structures to channel funding from the Royal Netherlands Embassy to water using communities. The project's cash flow arrangements were meant to reflect the 'principles of mainstreaming and community empowerment as advocated through the Public Sector Reform Programme... and the Local Government Reform Programme' (RWSSP, 2006b: 18). While coming a step closer to full Tanzanian control of funding processes through standard government procedures and channels, these arrangements were still criticised for remaining under a parallel supervision structure and for sending funds from the Ministry of Finance to district councils via the Ministry of Water instead of directly.

At local level, each district was required to produce an annual District Comprehensive Water Supply and Sanitation Plan and accompanying budget. Funds were released quarterly against these plans and budgets, but only if disbursements two quarters earlier had been fully accounted for. The potential for delay is clear. District councils were required to contribute 5% of the cost of construction of each domestic water point and 30% of the costs of construction of dams that would supply livestock (RWSSP, 2002: 7). At community level, the programme emphasised the principles of a user contribution to construction and full user responsibility for funding operation and maintenance. These funding arrangements and their implications for sustainability are discussed further in Chapter 4 below.

2.7.5 Achievements

Data provided by the RWSSP in April 2006 show delivery of water supply facilities as follows.

5 This may be compared with a cost of investment estimate for deep well hand pumps of USD 3,500 by C. Fonseca, IRC Water and Sanitation, Delft.

Table 4 *RWSSP: installation of water supplies*

Type of technology	Completed by December 2005	To be completed by December 2006
Shallow well/medium deep well fitted with hand pump	803	256
Wells fitted with windmill	2	0
Rainwater harvesting tanks	57	51
Rural piped water schemes (No. of DWP)	22	0
Dams/charco	2	3
Construction of small town water supplies (Bariadi/Mwanhuzi)	0	2
Rehabilitation of small town water supplies (Maswa)	0	1

Source: RWSSP, 2006a: 8.

Data recently received from programme personnel suggest that, up to September 2006, a total of 1,015 water facilities had been achieved over and above the 2,497 in place at the end of the DWSP.

The wells shown in Table 4. are the project's incremental achievement, over and above the 2,497 reported as constructed or rehabilitated at the close of the DWSP in 2002. The data provided do not differentiate rehabilitation of existing wells and construction of new ones. This is a general difficulty with successive reports on water supply achievements over the study period, as is the lack of accurate information about the number that were actually functioning at any one time. Certainly not all the 2,497 wells reported at the end of the DWSP are still working. WADATA recorded a total of 3,643 wells in April 2006. Of these, 93% were recorded as working. A slightly less rosy picture was painted by the Shinyanga Rural District Council during a meeting on 5 April 2006. Council staff reported that eight out of about 60 boreholes (13%) in the district were out of action, while 46 out of 322 shallow wells (14%) were not working. Furthermore, other data supplied by the regional office of MOW suggest that more than 7% of the wells in the Region may be out of order.

The RWSSP was originally meant to construct four urban piped schemes. The small towns of the Region (and Shinyanga itself) badly need upgraded water and sanitation arrangements. Funding of the four schemes under this rural programme was justified with reference to the towns in question being classified

as rural settlements in local government and planning terms. The progress of the schemes was slow, partly caused by funding constraints - RWSSP staff reported that the project was told by its Steering Committee to go as far as it could with these schemes even though it was clear that it would not have the funds to complete them all. Design, capacity and technical problems also played a part in delaying progress with the small town schemes.

The RWSSP built a piped water supply system in Mwanhuzi. Limited resources meant that in the town of Bariadi, only the water treatment plant was built, although design and tender procedures had been completed for the distribution system. A system was designed and tender documents prepared for Ushirombo, and a storage tank was built for the town of Maswa (RWSSP, 2006a: 9).
In terms of institutional outputs at water user level, the RWSSP reported the following performance up to the end of 2005.

Table 5 *RWSSP institutional outputs to December 2005*

WUG reg-istration	WUA reg-istration	Land right	Water right	ULOM training	WUA members trained	District TOTs trained	Ward TOTs trained	CORPs trained	PHAST at WUG level
987	6	723	364	1,077	228	28	145	1,252	697

Source: RWWSP, 2006b.

From the water database that was provided by the project in April 2006, the following data can be derived on institutional performance. The table does not show other institutions such as Water User Associations for piped schemes.

Table 6 *Operational wells and institutional development achieved by RWSSP, April 2006*

	District Council								
	Bariadi	Bukombe	Kahama	Kishapu	Maswa	Meatu	Shinyanga Municipality	Shinyanga Rural	Total
Total wells	862	471	607	103	521	442	222	415	3643
Total operational wells	809	447	577	69	493	438	206	346	3385
% of wells operational	93.9	94.9	95.1	67.0	94.6	99.1	92.8	88.4	92.9
Water User Groups	845	471	607	97	521	442	222	415	3620
Water User Group registration complete	669	221	603	44	431	378	181	247	2774
Land right issued	384	9	159	14	137	248	122	166	1239
Water right issued	-	-	-	-	-	50	136	29	215

Source: WADATA database, RWSSP.

The RWSSP constructed four wetlands for sewage treatment purposes. But, as explained in Section 2.7.2 most of its sanitation output was delivery of the PHAST approach of sensitisation and training, which is an initial activity in the 'entry package' for any Water User Group. RWSSP trained four PHAST trainers at regional level. These trained 28 district level trainers, who in turn trained 145 at ward level. Ultimately 1,252 community promoters were trained to carry out hygiene and sanitation education at village and household levels. (The intention was that there should be two PHAST trainers per Water User Group.) A total of 687 Water User Groups were reported by the project to be implementing hygiene and sanitation action plans. RWSSP also carried out a situational analysis of HIV/AIDS in Shinyanga (RWSSP, 2006c).

2.8 Coverage

The chapter is concluded by considering the extent of coverage of the population with improved water sources that has been achieved relative to the Region's steadily growing population. It is also worth comparing these achievements with the shifting national coverage targets recorded in Section 2.2.4 above.

As the **RWSP** came to an end in 1992, designers of the next intervention made the following estimate of coverage and projected demand.

Table 7 *Estimated coverage and projected demand, 1992-2002*

District	Existing water points	Population served	Coverage %	No. of water points needed to serve population in	
				1992	2002
Bariadi	120	45,250	10.7	1,503	1,982
Maswa	143	52,000	21.4	765	1,027
Meatu	39	13,000	7.4	654	887
Kahama	99	34,500	5.5	2,352	4,099
Shinyanga	113	54,250	12.8	1,478	1,674
Shinyanga Region	**514**	**199,000**	**10.5**	**6,752**	**9,669**

Source: Matrix Consultants, 1992: 29.

The designers of the RWSP calculated that in Shinyanga Region an additional 220 water points were needed annually just to keep up with population growth. 'In view of this achievement of the Water Policy objective (i.e. full coverage (100%) by the year 2002, hardly seems to be a realistic operational target for the Shinyanga Region' (Chaligha et al., 1996: 6). Although some rather different data and/or calculation approaches appear to have been used in these various assessments, it is clear that, even on the more optimistic estimates of coverage, reviewers in the early 1990s felt that the project was running just in order to stand still.

The table below shows water supply data for Shinyanga collected by the national census in 2002, the year in which the DWSP closed.

Table 8 *Shinyanga Region: sources of drinking water for rural and urban households by District*

	Rural households - main source of drinking water						Urban households - main source of drinking water					
			Breakdown by type of source						Breakdown by type of source			
District	**Population**	**% using improved**	Piped	Protected	Unprotected	Other	**Population**	**% using improved**	Piped	Protected	Unprotected	Other
Bariadi	**572,929**	**50.4**	6.9	43.5	49.5	0.0	**30,675**	**90.6**	27.8	62.8	8.6	0.8
Maswa	**279,466**	**31.7**	12.7	19.0	68.3	0.0	**24,936**	**73.6**	68.9	4.7	26.3	0.2
Shinyanga Rural	**275,357**	**26.5**	0.6	26.0	69.1	4.3	**1,036**	**-**	-	-	-	-
Kahama	**528,840**	**32.6**	3.0	29.6	67.3	0.1	**66,051**	**41.3**	2.1	39.2	9.9	48.8
Bukombe	**355,706**	**27.4**	8.2	19.1	72.5	0.1	**39,592**	**59.8**	2.4	57.4	34.0	6.2
Meatu	**241,389**	**36.1**	5.4	30.6	63.8	0.2	**6,825**	**-**	-	-	-	-
Shinyanga Urban	**60,755**	**60.6**	19.3	41.3	36.9	2.5	**73,768**	**73.9**	65.4	8.4	2.8	23.4
Kishapu	**226,136**	**9.6**	3.2	6.4	90.3	0.1	**13,169**	**-**	-	-	-	-
Total	**2,540,578**	**33.7**	**6.0**	**27.6**	**65.7**	**0.6**	**256,052**	**63.9**	**32.8**	**31.1**	**12.9**	**23.2**

Source: WaterAid, 2005: 11.

As the **RWSSP** drew to a close in 2006, it reported that coverage in Shinyanga Region had increased from 39% of rural households in 2002 (not 34% as shown in Table 8) to 43% in 2006 - based on the number of working facilities achieved and the estimated growth of the population since the last census in 2002.
At the end of many years of support, the proportion of Shinyanga's rural population that has access to improved water sources has risen to about 43%, up from a reported 10.5% in 1992. The increase equals about 1.1 million people in a period of fifteen years. Taking into account the scarce water resources, scattered population in Shinyanga Region, and the approximate total costs of the programmes since 1990 of approximately EUR 20 million, this is a major achievement.

However the coverage is still below the national average, which in 2006 was stated to be 53.7% (Anonymous, 2006: 1). Rapid population growth (3.3% p.a. between the 1988 and 2002 censuses), increasing pressures on the scarce water resources, and the necessity of more expensive technologies in areas where shallow wells are inappropriate or population densities are higher, mean that the achievement of national targets for access to an improved water source (a coverage of 65% in 2010 and 90% in 2025) is still a major challenge.

2.9 Summary

Netherlands-supported rural water supply and sanitation programmes have been ongoing since 1971 up to the end of 2006. This study evaluates the programmes implemented since 1990: the Rural Water Supply and Sanitation Programme (RWSP), which began in 1988 and ended in 1993; the Domestic Water Supply Programme (DWSP, 1993-2002) and the Rural Water Supply and Sanitation Programme (RWSSP, 2002-2006).

The natural environment of Shinyanga is not conducive to the provision of safe water supplies for a scattered rural population, nor for a growing and often crowded urban one. The Region has no perennial rivers or streams. Most watercourses flow for only a few days per year. Traditionally, people used standing pools of rainwater for most human and livestock needs during the wet season, and dug shallow pits in the river beds during the dry season. Because of the instability and bacteriological unsuitability of surface water resources, the water supply programmes of recent decades have had to depend on limited supplies of groundwater. However, in many areas this groundwater is available close to the surface. Successive Netherlands-funded programmes since the 1970s have therefore been able to focus much of their effort on the installation of shallow wells.

The programmes have been undertaken against a Tanzanian and Netherlands policy that shows an increasing emphasis on user participation, gender equity and sustainability of facilities and a move away from the project-based approach to a sector-wide approach to development. Programme implementation has become increasingly in line with the policy of both the Government of Tanzania and the donor.

It is hard to be precise about the costs against which potential benefits of these programmes in Shinyanga can be compared - partly because the first two also operated in Morogoro Region, and partly because available data are incomplete or sometimes contradict each other. This impact evaluation estimates that the total cost of the three programmes in Shinyanga since 1990 has been EUR 20m. The most recent available records show that these programmes' cumulative physical achievement was 3,643 shallow wells in April 2006, of which 93% were working. In addition, a few dozen boreholes and piped water schemes for larger settlements have been installed; the RWSSP has also constructed five small dams. Sanitation work has focused on the training of community trainers.

There is clear evidence that the Netherlands-funded programmes have developed low cost technical approaches, using shallow well technology, that can be used in many (but not all) parts of Shinyanga Region. In the sense of cost per person served by each new well, cost-effectiveness has certainly been achieved. However, the historical data on the incremental achievements of each successive programme in Shinyanga are confusing. It is not always clear how much of each programme's total expenditure was on rehabilitating previous programmes' work, and how much on installing additional new facilities. It would appear that major investment had to be sunk into achieving the comparatively cheap and simple technologies and approaches that are now in use. From this point of view, it is not possible to give a clear answer as to the overall cost-effectiveness of the Dutch funded programmes.

Alongside their steady technical emphasis on shallow wells, the successive programmes have gradually evolved their institutional approach. In rural areas, Water User Groups emerged during the DWSP as the key institution at community level, and much effort has been expended in supporting the formation and training of these structures (there were 3,620 in April 2006). From a gender perspective, the programmes made significant progress in promoting women's representation and voice, so that it is now common for them to hold office in Water User Group executive committees. Public and private sector has been capacitated to support communities to own and manage their improved water

source. As from 2002 the programme was harmonised with district planning cycles, in line with ongoing local government reform.

At the end of these many years of programme support, the proportion of Shinyanga's rural population using 'improved' water sources (piped systems or protected sources like covered wells) had risen to 43% - still less than the estimated national average of 54%. The increase in coverage equals a population of about 1.1 million, which as such is a major achievement. However, considering that decades of intensive and innovative effort in Shinyanga have not yet brought coverage in the Region up to the national average, the high population growth, scarce water sources and more expensive technologies required where shallow wells are inappropriate or population densities are higher, the ambition of the Water Sector Development Programme to achieve 90% coverage in 18 years appears a major challenge.

3 Survey results and impact analysis

3.1 Introduction

This chapter addresses the key evaluation questions on outcome and impact of the programmes in Shinyanga Region.

As mentioned in Chapter 1, the impact analysis is based on three data sources: a purpose-built survey in a sample of communities; data on water quality in the sample communities; and the diagnosis data recorded in dispensaries. Results are reported in the next section. An important feature of the well construction programme in Shinyanga was that the quality of the well water was tested before these were put to use. After this initial test no further tests were conducted. In order to get data on water quality, well water (and, in communities without a well, water from the main source of drinking water) was tested as part of this survey. This involved seven simple tests, including one for fluoride.

For health outcomes, self-reported changes in the incidence of a number of diseases and the (presumably more objective) data recorded in health dispensaries were used. For each of the approximately 100 communities in this study, sample data was collected at the nearest dispensary. For a large number of diseases, the dispensaries maintain monthly records of the number of cases diagnosed. These records go far back and are kept with great care[6]. A number of water-related diseases (such as cholera and diarrhoea) were selected and the monthly data aggregated to annual totals. To keep this task manageable, data collection was restricted to odd years (2005, 2003, ..). It should be noted that the dispensary data give underestimates of incidence since an illness will be recorded only if the person affected seeks treatment in the dispensary. The records also

6 The monthly data have been compiled on the basis of dispensary records which must be kept by law. During the pilot, it was established that records are indeed kept with great care. During the actual fieldwork data could be found for all periods selected.

include the patient's village which makes it possible to link the dispensary data to the village of the survey communities.

However, the communities covered by the survey are smaller than a village. In particular, a village may have one or more Water User Groups and, in addition, several communities not served by a well (and hence without a Water User Group). An important implication is that the health effects of the well are diluted in the dispensary data: the health of members of the Water User Group (WUG) may have improved substantially, but as long as the health of other households in the catchment area of the dispensary is not affected, the dispensary data will show only a limited improvement. This obviously affects the statistical analysis. In particular, it greatly increases the number of cases where the outcome of the statistical analysis is undecided.[7] Fortunately, a variable from the latest census - the percentage of households in a village using improved water sources - could be linked to about 40 of the villages visited in the survey. Using this extra information, results based on self-reported health changes and on more objective dispensary data appear to be very similar.

The three data sources have been used to analyse the effect of the programmes on the time use of household members (Section 3.3); on the access to and the quantity and quality of the well water (Section 3.4); and on health (Section 3.5). A mixture of descriptive statistics and regression analysis is used. Section 3.6 presents the conclusions.

3.2 The Survey

Part of the survey covered Water User Groups. A sample of such groups was randomly selected (without further stratification) from a list of 3420 Water User Groups maintained by DHV.[8] This sample is representative for households belonging to Water User Groups. The intended sample size was 50 but a sample of 53 groups was drawn in order to ensure a sufficient sample size in case some of the data could not be used. As it turned out, the data for 51 Groups could be used.

The survey instrument covered a wide range of topics including the history of the Group, its size and management structure, its finances, experiences with

7 Technically, the consistency of the analysis is not affected since health outcomes are used only as dependent variables in the regressions below. That the sample covers only part of a dispensary's catchment area amounts to measurement error for the dependent variable, and does not affect consistency. However, any effects are more difficult to detect.

8 This number is lower than the 3,643 Water User Groups in April 2006 reported in Section 2.7.5, the latter being based on the WADATA database which involved some double counting.

breakdowns of the well, water use from the well and from alternative sources, perceived effects of the well on health outcomes, and on the time spent by members fetching water. It should be noted that the survey instrument was administered at the level of the community and not at the level of the household. Instead, a small number of respondents[9] was asked to describe the behaviour of households in the community. Understandably they could not be expected to give precise answers. They were therefore asked, for example, to indicate how many households in the community used a particular source of water, not in terms of exact numbers (which would be unrealistic) but in terms of quarters, i.e. zero, about a quarter, half, three quarters, or all households. These data were used as approximations of the distribution of variables across households. All data were collected at the same time, in September 2006. Data on the past are therefore based on recall and must be treated with caution.

A similar representative sample of communities without a Water User Group was also drawn[10]. Villages were randomly selected from the village list, and subsequently hamlets were randomly selected from within these villages. Within a hamlet, five households were randomly selected from the household list. These households acted as respondents. Where possible the questionnaire was the same as that for the Water User Groups, the key difference being that the questions on the well and the functioning of the Water User Group were omitted.

It would be tempting to compare the two types of communities in terms of households which do or do not use improved water sources. Such a comparison is unfortunately not so straightforward. Members of a Water User Group continue to use sources other than the well, and they do so for various purposes including as a source of drinking water. Conversely, communities without a Water User Group may have access to the well of a Water User Group in addition to using various other sources. It follows that the two groups differ not in whether but in the *extent* to which they use improved water sources.[11]

9 In the case of Water User Groups the respondents were committee members. For non-Water User Groups respondents came from five randomly selected households.

10 In comparing the two types of communities, an implicit assumption is made that they do not differ other than the presence or absence of a well. This is guaranteed only if wells had been randomly assigned to communities. In the absence of such randomization, it is possible that the two communities differ systematically. However, the DHV consultants appear to have selected communities purely on the basis of hydrological suitability, and this does not appear to be correlated with other community characteristics. Moreover, in some cases unobserved variables can be eliminated through differencing, reference Table 21. The conclusion is that selectivity is not an issue.

11 This implies that (in the terminology of epidemiology) the 'effectiveness' rather than the 'efficacy' of the use of well water is assessed. An assessment of efficacy would require an experimental design in which treatment group used only well water and the control group *only* other sources.

As noted above, the representative nature of the sample is assured by the random selection procedure. Another issue is whether the size of a sample is sufficient from which to draw significant information. In practice this depends on the particular question to be addressed. For the purposes of this study, sample sizes turned out to be sufficient to draw conclusions on most but not all questions considered. T-values have been added in the regressions to report the significance of coefficients. Annex 3 provides a brief explanation on how to interpret the results from regressions.

3.3 Water Fetching and time use

A key objective of the well construction programme was to reduce the time spent fetching water. Water fetching is typically a woman's task and, to a lesser extent, a girl's. Most (45) Water User Groups report that women fetch water more often than girls, boys or men (Table 9). Girls rank second when it comes to fetching water in 41 Water User Groups.

Table 9 *Who fetches water most of the time?*

Girls	5
Boys	1
Women	45
Men	0
Missing	0

Source: impact evaluation field survey.

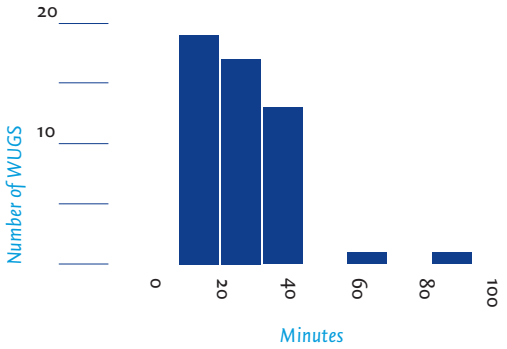
The survey questioned whether the time spent fetching water had changed since the wells were constructed. The vast majority of Water User Groups reported a reduction in the time spent on this task (Table 10).

Table 10 *Have members spent ... time fetching water since the well was created? (number of responding Water User Groups)*

More	1
Less	35
Unchanged	9
Missing	6

Source: impact evaluation field survey.

Figure 3 *Current water fetching time (minutes per trip)*



Source: impact evaluation field survey.

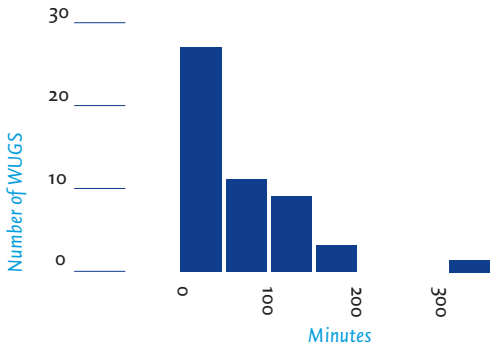
Manganzo, carrying water to the homesteads

The mean reported time per trip to fetch water is now 27 minutes within the Water User Groups. As shown in Figure 3, the vast majority of Groups spend less than 45 minutes per trip fetching water.[12] Due to the fact that no baseline information was

12 Note that the vertical axis measures the density. The area of each bar measures the percentage of households in that category.

collected, it is not known how much time households spent fetching water prior to well construction. However, the survey collected retrospective information and, although this is probably measured inaccurately, the results are striking. Figure 4 indicates that the mean time per trip used to be 66 minutes, and in many locations much more than that. The time spent on this task has therefore substantially fallen - on average by about 60%. By comparison, the average time per trip to fetch water is 48 minutes for non-Water User Groups.

Figure 4 *Time to fetch water prior to well construction (minutes)*



Source : impact evaluation field survey.

The 'extra' time women now have available is spent mainly on housework, firewood collection and field work. Girls spend their extra time partly on other housework and firewood collection but, interestingly, about 40% of the Water User Groups reported that the extra time available for girls is used to go to school.

As previously mentioned, a well need not be the only source of drinking water, even if it is operational. Indeed, about half of the Water User Groups report that their members use other sources for water, mainly because the well does not yield sufficient water.[13] These sources are very heterogeneous: some are covered wells (and therefore are presumably relatively safe) while others are surface sources. If the alternative source is relatively safe it is often reported as the main source of drinking water. This is not the case for the surface sources which are therefore presumably mainly used for purposes other than drinking. The time needed to fetch water from these other sources is about 70 minutes per trip, that is almost the same as the time needed for the main source of drinking water prior to the construction of the well.[14]

13 The survey data do not indicate what use is made of the water from these other sources.
14 The average of those households who report the alternative sources listed in the survey question as their *main* source of drinking water has been calculated.

3.4 Water quality, quantity and access

Water quality

This section initially considers the effect of the wells on the quality of the beneficiaries' drinking water. This involves two questions: firstly whether the households concerned actually used the well as the main or only source of drinking water; and secondly whether the well water was of good quality. Prior to the survey there was anecdotal evidence that, while the wells might have beneficial effects, they were often not used for drinking because of, for example, an unpalatable taste. If true, this would be a very negative result, since a major intended effect of the programme was to provide safe drinking water. This can be addressed with the survey data. Water User Groups were asked to indicate how many households (coded in quarters, e.g. three quarters) used the well for drinking water. The results are shown in Table 11 which demonstrates that, for example, two Water User Groups indicated that 'half' of the households did so in the dry season. The results illustrate that the anecdotal evidence was misleading: the vast majority of the households in the Water User Groups do use the well (possibly in combination with other sources) for drinking water.

Table 11 *Share of households using the well for drinking water, by season (number of responding Water User Groups)*

Share of households	Dry season	Rainy season
None	6	3
One Quarter	0	5
Half	2	7
Three Quarters	7	7
All	36	29
Missing	0	0
Total	**51**	**51**

Source: impact evaluation field survey.

As mentioned earlier, the quality of the water was tested before the well was handed over to the community and thus water safety was initially ensured. However, the quality of the water from the well was not subsequently tested and may well have deteriorated. This is a matter of concern, especially in the case of fluoride content since in the Shinyanga Region this is often so high as to be dangerous.
For this reason, the study included water quality testing in each of the communities

in the representative sample using test kits.[15] The tests performed were quite simple and cannot be considered as a substitute for full chemical and bacteriological testing. The results of the seven tests are summarized in Table 12, and compared to norms obtained from the WHO (2004) and Wilkes University (2006). Water quality appears quite high for ammonia, nitrate, sulphide and iron. However, fluoride content is indeed very high, with only one third of the wells safe in the sense of having water with fluoride content below the WHO norm.[16] In addition, three quarters of the wells yield water contaminated with coliform bacteria.[17] This indicates that the treatment of the well water is insufficiently careful: Water User Groups should have used more chloride to disinfect the water. More generally, the fact that the study's limited water quality testing has revealed some problems (notably high fluoride content) is not inconsistent with the health improvements noted below. Apparently water quality has improved, but partly in dimensions not covered by the study's tests.

Table 12 *Quality of water (from well for Water User Groups, from main source of drinking water otherwise)*

Indicator	Norm	Mean WUG	% ≥ Norm	Mean non-WUG	% ≥ Norm
Fluoride(mg F-/l)	1.5	1.25	65%	1.34	58%
Ammonia (mg NH_4/l)	1.5	0.51	2%	0.35	0%
Nitrate (mg NO_3/l)	50	11.70	0%	8.30	2%
Sulphur ion (mg S-/l)	0.075	0.00	0%	0.02	2%
Iron (mg Fe/l)	0.31	0.090	12%	0.05	0%
Manganese (mg Mn / l)[18]	0.4	0.070	7%	0.01	2%
Coli form bacteria	0	7.23	74%	6.70	90%

Source: water tests during survey.
Note: for nitrate the maximum test result is 45 mg/l. Number of responding Water User Groups is 43, and 53 for non-Water User Groups. WUG: Water User Group.

15 The tests kits used in the survey were provided by the Japanese Government, through Mr Norifumi Yamamoto, team leader of the JICA Study Team for '*The Study on the Groundwater Resources Development and Management in the Internal Drainage Basin in the United Republic of Tanzania*'. For details on these tests see: http://kyoritsu-lab.co.jp/english/index.htm.

16 The distribution of the test readings across the wells is highly concentrated, except for nitrate and coliform bacteria. In Tanzania the fluoride norm is at 8 mg/l, much higher than the WHO norm. This seems excessive given the disagreement on safe fluoride levels in the literature, questioning levels even as low as 0.5 mg/l. The test results are highly concentrated: 29 out of 43 record 1.5 mg/l, 13 a lower reading and 1 a higher one. The testing was done during the dry season and after several years of low rainfall. This may explain the high fluoride level.

17 The test detects general coliform bacteria and does not give specific information on the presence of e.g. E. coli. The mean test outcome was 7.23 with a standard deviation of 8.7. The test value is fully formed spots counted after one night.

18 In this case no WHO norm is available. The value in the table has been obtained from the Wilkes University (2006) website.

A notable feature in the table is that water from locations without an improved water source (indicated by '*non-WUG*') is of very similar quality, at least for the indicators covered by the tests. This might suggest that the main impact of wells is not an improvement in water quality, but convenience (reduced time fetching water) and possibly greater quantity.

In addition, the table compares water quality from Water User Groups' wells with non-Water User Groups' *main source* of water. As it happens, most communities use several sources of water. A more relevant comparison of water quality would therefore have been to sample several sources of water for each type of Group. The actual tests applied could be seen as sampling a community's 'main' water source and therefore mask a difference in *average* water quality between Water User Groups and non-Water User Groups. This interpretation is supported by Figure 5 below which shows that households from Water User Groups resort much less frequently to non-drinking water sources for their drinking water.

Water quantity and use

On the question of the impact of the wells on the quantity of water consumption, the first issue is whether the wells are operational. There is again anecdotal evidence that many of the wells are not operational, either because the pump breaks down or the well runs dry. In the 51 Water User Groups visited, there were 27 reported failures since 2000. The vast majority of these failures lasted only a few days or a week at most. However, there were six incidences where the failure lasted much longer, and had not been rectified at the time of the survey. In other words, about 90% of the wells were operational at the time of the survey.

The survey data can be used to calculate the distribution of the amount of drinking water used per household per day. For Water User Groups, the mean is 30 litres with a standard deviation of 17 litres. There is no correlation with average trip time ($r=0.1$). This indicates that the households' demand for water is highly inelastic with respect to its price in terms of time fetching water. For non-Water User Groups, the mean is 34.5 litres and again the standard deviation is 17 litres. The implication is that the two Groups do not differ significantly in the quantity of drinking water used.

There are three possible explanations of this finding. Firstly, the two types of location do not differ now and did not differ in the past with respect to water use. Secondly, the Water User Groups initially consumed less water but reached the regional average once the well made this feasible. This would be a classic example

of 'vanishing benefits' (Ravallion, 2001): there is an improvement, but it is masked by a relatively poor starting position. In this particular instance this seems unlikely. The locations of the well were determined largely by geological considerations and it seems implausible that these would be correlated with initial water availability. The third possibility is that the starting position was the same, and that the well led to an increase in water use, but that this improvement was eroded by an increase in the number of users, either through migration or natural growth.

This last explanation would imply that older wells have lower per household consumption of drinking water. However, the correlation between water consumption and the age of the well was found to be positive (older wells are associated with *higher* water consumption) so that this explanation must be rejected. This leaves the first explanation as the most likely one: the construction of wells has not led to an increase in consumption of drinking water. As will be seen below, frequent breakdowns of the well is not a likely explanation of low water consumption either.
One of the questions in the survey concerns the amount of water taken from the well.[19] The median value of this is 80 litres per household per day in the dry season and 110 litres in the rainy season, well above the daily households' consumption of drinking water from all sources (about 30 litres). This indicates that only a minor portion of well water is used for drinking, and on average there appears to be enough drinking water in all seasons. On the basis of the data available, it is not possible to say whether there is sufficient water for other uses, especially for hygiene purposes. There is, however, some evidence (see the discussion on Figure 5 below) that productive use of water from the wells is constrained by availability.

The programmes have not resulted in an increase in the consumption of (drinking) water, nor is it evident that water from wells is safer in all respects than water from alternative sources. This is not to say that the programmes have not had health benefits. While the test results indicate that the water often contains too much fluoride and is contaminated by coliform bacteria, it might be safer in terms of other diseases such as schistosomiasis or cholera. This is investigated in the next section. Both the distance benefit and the possible health benefit are limited by the fact that often the wells cannot fully satisfy the households' need for water. They then have to turn to other, more distant and possibly less safe, sources. In this sense the wells have changed household practices less than intended.
It is likely that the introduction of the well encouraged households to make less

19 This is the total amount, not just the amount for drinking water.

use of the unsafe sources they had used before. Table 13 supports this interpretation. The introduction of a well does not apparently eliminate the use of unsafe, *i.e.* open water sources. Comparing the first and the last columns it appears that, prior to the introduction of the well, Water User Groups were quite similar to non-Water User Groups now. This is important, because it allows the interpretation of changes over time for the Water User Groups as the result of the introduction of the well.[20] The obvious conclusion would then be that the introduction of the well has allowed households to switch to safer sources of water which, in turn, appear to be associated with an improvement in the incidence of water-related illnesses (as shown in the next section).

The fact that households continue to use sources other than the well for drinking water came as a surprise, and unfortunately the survey instrument did not pursue the reasons for this phenomenon. Future research could investigate, for example, whether these alternative sources are preferred by some households because they are closer than the well.

Table 13 *Types of water sources used as main source of drinking water for at least half of the group members. (Number of groups reporting the use of open sources and other sources)*

	Water User Groups		Non-Water User Groups
	Before Well	After Well	Current
Not Open sources[21]	14	38	12
Open sources	37	13	42
Total	**51**	**51**	**54**

Source: impact evaluation field survey.

A more favourable picture emerges from Figure 5 which is based on the survey question: 'In how many households do members also drink from non-drinking water sources?'.[22] As the figure shows, a large number of Water User Groups report that no households use non-drinking water sources for drinking; this number is strikingly higher for Water User Groups than for non-Water User Groups.

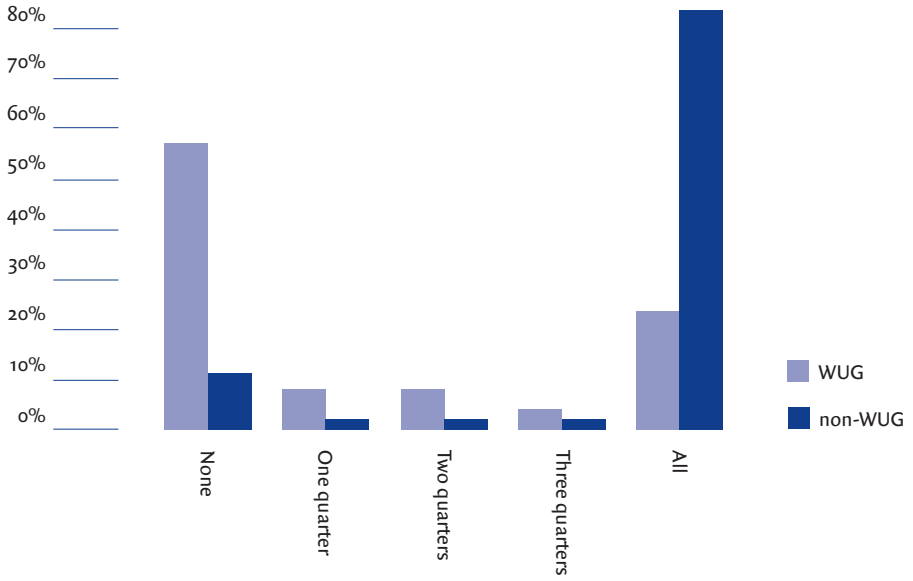
20 There could, however, be differences between Water User Groups and non-Water User Groups in dimensions other than the use of alternative sources of drinking water.

21 Not Open sources mentioned in the survey questionnaire are: i) hand pump or covered well, ii) vendor / private person, iii) piped. (Covered roof catchment is not reported.) Some Groups have not reported use of alternative sources, in particular after the well was established. These are counted as Non Open sources in the Table.

22 In retrospect, the phrasing of this question is not entirely satisfactory since it leaves the interpretation of non-drinking water sources to the respondent.

How this can be reconciled with the evidence discussed earlier is not entirely clear without further research. The most plausible explanation is that wells have encouraged households to substitute well water for the drinking water they previously obtained from non-drinking water sources. Such substitution was obviously an intended effect of the programme.

Figure 5 *Percentage of locations (vertical) reporting share of households (horizontal) drinking from non-improved water sources*



Source: impact evaluation field survey.

The use of the wells' water for agriculture (animals, fields and vegetable gardens) is potentially an important side effect. In the survey only nine Water User Groups reported any of these productive uses. This seems questionable, particularly since other responses indicate that the amount of water taken from the well is much larger than the amount used as drinking water. If the respondents felt that these other uses of the wells' water (e.g. as drinking water for animals) would be considered inappropriate, then the answers might well have been biased. Alternatively, 7 out of the 9 Water User Groups reporting productive uses also report that no households also drink from non-drinking water sources. This suggests that water is used for productive purposes only if sufficient drinking water is available.

Access

It is obvious that the members of a Water User Group have preferential access to the water from the well. An important question is whether they allow non-members to fetch water from the well. This issue was investigated in the survey. While informally it is often suggested that non-members are allowed access, the survey evidence does not confirm this: out of 47 Water User Groups 34 report that they *never* allow non-members to use the well. In 12 out of these 34 Groups this is not an issue since everybody in the community belongs to the Water User Group. However, in the remaining 22 communities this is not the case which raises the possibility of social exclusion. There is indeed some evidence for this, since in 9 of the 22 Water User Groups high contributions are quoted as the main reason for people not joining the Group. The data unfortunately do not allow the interpretation of whether the non-members are particularly poor.

Another aspect of access is whether the distribution of wells favours the better off locations: it could be that poor communities (rather than poor households within a given community) are excluded from the provision of wells.[23] It has been noted that, in one respect, communities with and without wells do not seem to differ systematically, namely in the quantity of drinking water consumed. Another way to investigate the same issue is to compare the two types of villages in terms of wealth. Where households have used iron sheets as roofing material this has been treated as a proxy of wealth. (The survey assesses wealth differences in various dimensions. However, in most of these dimensions households are quite similar. Roofing material is one of the few measures with substantial differences between households.) Table 14 compares the wealth distribution between Water User Groups and non-Water User Groups. While the number of households who do not have iron-sheeted roofs is somewhat higher in the non-Water User Groups, the two distributions are remarkably similar. The conclusion is that access is neutral in the sense that wealth and wells are not correlated (across locations). It appears that there may be some social exclusion at the level of individual households, but not at the level of communities.

23 Note that there may be reversed causality in the sense that the presence of a well may have made the community better off.

Table 14 *Number of groups reporting what share of households have iron-sheeted roofs*

Share with iron-sheeted roof	Water User Groups	non-Water User Groups
None	19	25
One Quarter	12	14
Half	7	3
Three Quarters	6	6
All	6	6
Missing	1	2
Total	**51**	**56**

Source: impact evaluation field survey.

3.5 Impact on Health

In this section regression techniques are used to explore the impact of Water User Groups, and the water and sanitation facilities in the concerned communities, on their health. The importance of safe water and sanitation facilities and hygiene practices for health is well-known from epidemiological research. However, this study's purpose was to establish the impact in the particular situation of Shinyanga Region where many other variables could affect the theoretically expected effects of the facilities and practices. This has guided the choice of explanatory variables: the focus is on variables related to changes in water use and training. It should be noted that the approach is 'reduced form' in the sense that impact variables are directly related to interventions, instead of testing all the intervening individual steps from the interventions to the final impact.

Since some health outcomes depend on sanitation and hygiene practices the survey included a number of questions on this. In both types of locations almost all households were found to use traditional pit latrines. There is also no difference in the extent of hand washing. Children were reported to *not* wash their hands after toilet use, but the vast majority of children were reported to wash their hands before meals.[24] On the first point, hygiene training appear to have had little (or at least little lasting) effect. This point is considered in Table 15 where the results of four regressions are reported. The regressions are run separately for Water User Groups and non-Water User Groups, and in each case the dependent

24 The responses to these questions are not tabulated since the alternatives in the questionnaire are virtually not used. In this respect the Water User Groups and non-Water User Groups are again strikingly similar.

variable is either prevalence of hand washing after toilet use, or hand washing before meals. In all four regressions the sole independent variable is a variable indicating whether or not the community has received hygiene training. The results indicate that there is no effect of hygiene training on hand washing practices. The coefficient is sometimes negative and is never significant.

Table 15 *Regressions of Hand Washing Practices of Children on Hygiene Training Received by the Community*

Hand Washing	Coeff.	t-score
after toilet (WUG)	-0.15	-0.3
before meal WUG)	0.14	0.8
after toilet (non-WUG)	-0.85	-1.1
before meal (non-WUG)	0.20	0.5

Source: impact evaluation field survey.

The survey results surprisingly show that only about a third of the Water User Groups reported to have received such training. The integration of PHAST in the step-by-step approach (reference Chapter 2) to the establishment of community-owned facilities raises the question whether the respondents perceived the PHAST activities as a training activity.

Handwashing after toilet use, Ngovu kazi Water User group, Shinyanga Municipal Council

As mentioned in Section 3.1, two sources of data on health benefits have been used: one self-reported in the survey and the other from the dispensaries. These are considered in turn.

Self-reported health changes

The survey questioned whether members of Water User Groups had experienced changes since the well was created in the incidence of a number of diseases: eye infections, diarrhoea, scabies, intestinal worms and schistosomiasis. Such self-reported changes are perhaps not particularly reliable, but they may give interesting indications of changes in the members' health status.[25] Table 16 summarizes the results to this question.

Table 16 *Self-reported changes in health status in Water User Groups (Percentage of groups reporting improvements since the creation of the well.)*[26]

Disease	Percentage
Eye infections	70%
Diarrhoea	74%
Scabies	66%
Worms	55%
Schistosomiasis	68%

Source: impact evaluation field survey.

The Table shows that the Groups perceive considerable progress. Even if these changes are correctly perceived they need not be caused by the construction of the wells.

The possible determinants of the reported changes have been investigated by a set of regressions. The variables are the same for each of the five diseases:

1. *Open Sources Now.* The survey collected information on the water sources used by the Group, other than the well itself. The questionnaire attempted to establish, for each of the various sources, how many of the households in the

25 The same question was asked of the non-Water User Groups. The differences in responses of the two types of communities may be a more reliable indicator of health changes. See Tables 18 and 21.

26 The percentage is calculated by dividing the number of groups reporting improvements by the total number of groups reporting improvement, deterioration or no change. This excludes the categories '*don't know*' and '*disease does not exist*'.

Group used a particular source as its main source of drinking water. This is the information used to construct the variable. Of the eight types of water sources listed in the questionnaire, three are open or surface sources: 'open well', 'open spring or river bed', and 'surface sources (river/stream/pond/lake/dam/etc.)'. If any of these three sources is the main source of drinking water, the regressor takes the value 1, otherwise 0.

2. *Open Sources Previously.* This variable also records the use of open sources as the main source of drinking water, but now for the period prior to the establishment of the well. As before the variable takes the values 1 and 0.
3. *WUG established after 2001.* This is a dummy variable recording whether the Water User Group was established relatively recently (1) or not (0).
4. *Health-related training received*. The survey recorded what kind of training the Water User Group had received. This variable takes the value 1 if the training included 'hygiene training for WUG', 'other hygiene training', 'latrine building & maintenance training', or 'water handling and storage training', otherwise 0.
5. *Housing quality*. This (as mentioned before) is a proxy for the wealth of the community, measured approximately as the number of quarters of households (0, 1, 2, 3, 4) in the Water User Group with iron sheets as roofing material.
6. *Size of the WUG.* The number of members of the Water User Group.

The first variable ('Open Sources Now') captures the negative effect on health of the continued use of open water sources for drinking purposes. As Water User Groups continue to obtain much of their drinking water from other sources this is potentially an important effect. The second variable ('Open Sources Previously') captures the scope for improvement: one would expect large health improvements if the Water User Group previously used very unsafe water sources. The difference of the first and second variable, $\triangle$Source, was used to capture change of the use of water sources over time as a regressor.

Next, an effort is made to explain perceived improvement for five different water-related illnesses: eye infections, diarrhoea, scabies, worms and schistosomiasis, by running a regression of the perceived improvement (that is a perceived reaction in the incidence of the disease) on four explanatory variables. The most important one is $\triangle$Source. The coefficient on this variable indicates the effect of a change in water use (from unsafe to safe sources) on a change in disease incidence. Three other variables are included which might also explain a change in incidence. The variable HQ. Recent is an 'interaction variable': it measures housing quality, but only for recently established Water User Groups. (If the Water User Group was established in 2001 or earlier this variable takes the value 0.) The idea here is that

one would expect health improvements in relatively wealthy communities, quite apart from any change in water sources. This variable is therefore included to prevent an erroneous attribution of wealth-induced health improvements to a switch in water sources. The variable WUG size captures the idea that in relatively large communities the introduction of a single well may leave a larger percentage of households using unsafe water than in a small community, even if in either case △Source = 1 so that there is a switch in the main source of water. Finally, the variable Training takes the value 1 if the community has received health-related training.

Table 17 shows the results of the five regressions.[27] For each disease two columns are shown. The first one reports the regression coefficient, the second one its statistical significance, measured by the t-score. For example, if a community switched to another water source (so that △Source takes the value 1) and another community did not, then one would, on the basis of the regression coefficient of 0.288, expect the incidence of eye infections to be about 29 percentage points lower in the former community. The t-score of this coefficient is 2.66, indicating that the effect is significant.

Table 17 *Regressions of perceived health improvements on Water User Group characteristics*

	Eye Infections		Diarrhoea		Scabies		Worms		Schistosomiasis	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
△Source	0.288	2.66	0.111	0.92	0.301	2.10	0.128	0.87	0.155	1.16
HQ.Recent	0.087	1.62	0.050	0.88	0.073	0.97	0.039	0.57	0.081	1.23
WUG size	-0.002	-1.73	-0.002	-1.48	-0.002	-1.11	-0.001	-0.89	-0.000	-0.30
Training	0.100	0.71	-0.157	-1.08	0.095	0.54	-0.112	-0.65	-0.003	-0.02
Constant	0.584	5.07	0.779	6.48	0.505	3.59	0.550	3.77	0.570	3.92

The fit of the regressions is reasonable but the R-squared never exceeds 0.28. This may reflect that several of the regressors are dummy variables. The first point to note is the positive and significant value of the constant. This indicates that in general (irrespective of their individual characteristics) Water User Groups perceive an improvement in health since the establishment of the well. Secondly, the regression coefficient on △Source in all cases has the expected sign, although

27 These are ordinary least squares (OLS) regressions. The results of the corresponding logit or probit regressions (which in this context are more appropriate) are very similar. These have not been reported here because the results are somewhat more difficult to interpret than those of OLS regressions.

it is only significant for eye infections and scabies. Note that the estimated size of the coefficients is large. In the case of eye infections, the result suggests that a switch from open to non-open other sources of drinking water raises the probability that a community will report a reduction in eye infections by 29 percentage points. Thirdly, the positive coefficients on the interaction of housing quality and recent establishment of the Water User Group perhaps capture recent improvements in community wealth. In this case the reported improvement in health status should not be attributed to the establishment of the well. Of course one cannot be sure whether the *current* housing quality reflects an improvement over time. Fourthly, the size of Water User Groups seems to affect perceived health improvement negatively. A likely explanation is that in relatively large communities the effect of the establishment of a single well is to a large extent diluted by the continued use of other sources.

Dispensary data on health

Dispensaries have been linked to the sample communities. In principle this enables an analysis of whether changes in community characteristics, notably the introduction of a well, are associated with health changes. However, an important drawback of this method was noted: since the sample communities are only part of a dispensary's catchment area the effect may be difficult to detect amongst the dispensary's many patients from various communities. This problem could be partially solved by including the percentage of households in a village using improved water sources (i.e. mainly wells) in the analysis. This variable is based on Tanzania's latest census and could be linked to 41 villages in this sample.
Data was analysed in two steps. In the first, a 'level regression' was used to explain the level of incidence of a particular disease from the characteristics of the sample community in its catchment area. In the second, this regression 'in first differences' was repeated to explain changes in incidences from changes in community characteristics.

Table 18 *Regressions explaining incidence (dispensary data) of nine water related diseases from water use in the sample community in its catchment area*

	Malaria		Typhoid		Dysentery		Schistosomiasis		
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	
%improved	-2.69	-2.0	-0.03	-0.1	-0.03	-1.0	-0.004	-0.01	
Constant	3.19	4.0	0.04	2.3	0.05	3.1	0.07	1.23	
	Diarrhoea		**Worms**		**Cholera**		**Eye Infections**		**Scabies**	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
%improved	-0.44	-1.8	-0.21	-1.9	0.00	1.2	-0.17	-1.3	-0.24	-1.8
Constant	0.59	4.5	0.25	4.0	-0.00	-0.2	0.27	3.7	0.27	3.7

The level regressions are reported in Table 18. The specification is extremely parsimonious here due to the small number of observations[28]: the incidence in a particular year (2003) as recorded at the dispensary (corrected for population size) is related to the percentage of households in the community using the well as the main source for drinking water. In Table 18 this is denoted as %improved. As noted these data were obtained for a limited number of communities.

The regression coefficient indicates by how much the incidence of a particular disease would fall if the percentage of the population which primarily uses the well for its drinking water, increases.

No effect was found for cholera. This is not surprising: the incidence of cholera in Shinyanga Region is extremely low (Table 18) so there are very few observations to work with. The correct (negative sign) was consistently found for the eight other diseases: the higher the percentage of households using relatively safe water sources the lower the number of cases (on a per household basis) recorded in the dispensaries. The effect is statistically significant for four diseases: malaria, diarrhoea, worms and scabies. The incidence of these diseases is relatively high in Shinyanga Region (Table 19) Figure 6 displays the result for malaria in graphic form.

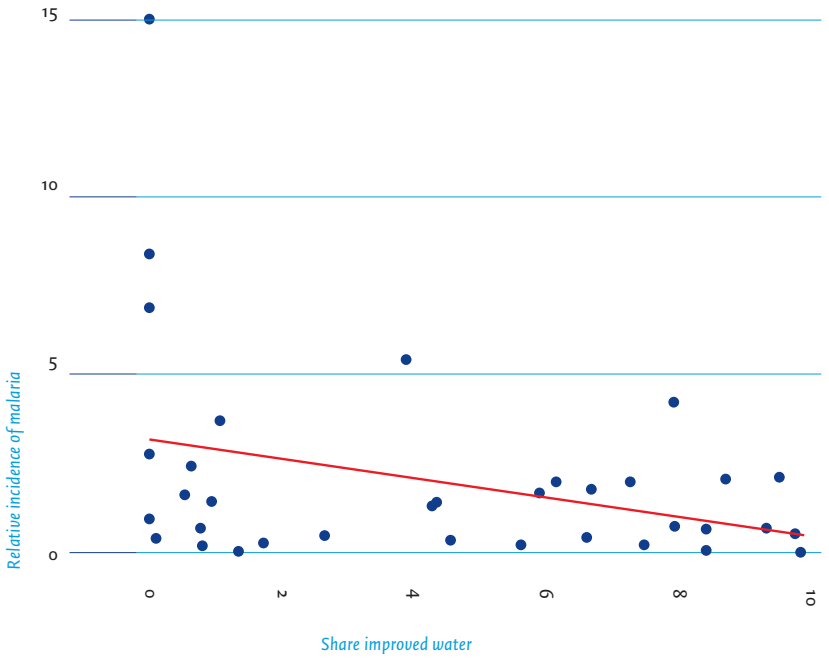
28 A larger sample would be required to investigate, for example, whether the operational status of the well makes a difference.

Table 19 *Mean relative incidence reported at dispensaries, 2003*
(Mean over dispensaries of the number of cases reported per capita)

Disease	Relative Incidence
Malaria	2.04
Typhoid	0.03
Dysentery	0.04
Schistosomiasis	0.07
Diarrhoea	0.41
Worms	0.16
Cholera	0.00
Eye infections	0.19
Scabies	0.17

Source: dispensary records.

Figure 6 *Incidence of malaria and share of households using improved water*

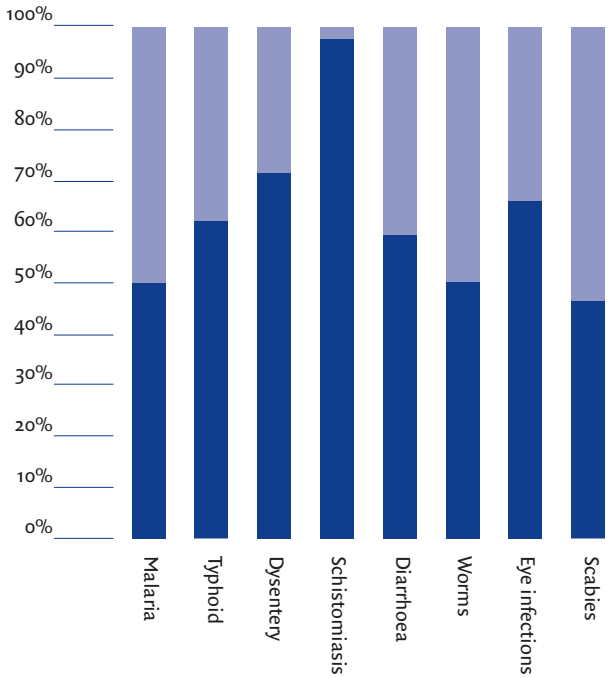


The significant result for malaria might seem puzzling since households continue to use other sources, and may therefore still visit areas where they are likely to be bitten by malaria mosquitoes. Conversely, non-members have some access to

wells owned by Water User Groups. The interpretation is that the members of Water User Groups spend much less time in areas with high mosquito concentrations and get bitten less often (see also footnote 11). In addition, the incidence may be lower due to a lower incidence of other more directly water-borne and washed diseases. The effect found is quite strong. For example, an increase in the percentage of the population using improved water by 20 percentage points would reduce malaria by (2.69)(0.2) = 0.54 or by about 25%. Taking into account that the percentage increase applies only to the sample community (rather than to the whole catchment area) this is a strong effect indeed. The same change in the use of improved water would lead to reductions of incidence at the dispensary level of 21% for diarrhoea, 26% for worms and 28% for scabies. Hence, the predicted percentage changes in incidence are quite similar for these four diseases. These estimates suggest that the well programme yielded very substantial health benefits.

An alternative way to present these results is shown in Figure 7 where the incidence of each disease is normalised at 100%. The Figure indicates the reduction in incidence which would occur if the percentage of households using improved water sources would increase by one standard deviation. The upper part of each bar is the estimated reduction.

Figure 7 *Effect of access to improved water sources on incidence of selected diseases*



The upper part of the bar is the relative reduction in incidence of a disease corresponding to an increase of one standard deviation in the percentage of households with access to improved water.

The regression results in Table 18 are interesting but a number of technical points should be noted.
Firstly, the number of observations is quite small (36 for most regressions) because for many villages the share of households with access to improved water is not available.
Secondly, it might well be objected that the regressor ('%improved') is endogenous, i.e. that it is itself determined in a way which produces a correlation with the health impact variable without, in fact, there being a relation from water use to health impact. One way in which this can arise is if wells were not randomly assigned to locations but, for example, on the basis of community wealth. If, as is likely, community wealth is correlated with health outcomes this would make the regressor endogenous and the regression coefficient biased. This possibility cannot be excluded. However, it should be noted that the two types of communities were already found to be quite similar in a number of respects, including in wealth (at least as measured by roofing quality) and in water use practices (other than the use of well water). This is not a sufficient defence against the endogeneity critique, but it gives some confidence in the results.
Thirdly, no 'controls' i.e. measures of community characteristics (other than the variable of interest), were introduced that might affect health impact. This may introduce 'omitted variable bias', a particular form of endogeneity. Such omitted variables may well be unobservable, so that introducing controls is not a solution. However, if, as is likely, such unobservables are 'time invariant' i.e. unchanging community characteristics, there is a simple solution: by estimating the relation in 'first differences' (changes over time rather than levels) the effect of time invariant omitted variables (observable or not) can be eliminated. The results of this alternative estimation method are presented below.

Table 20 shows the results of the application of this method to the same regressions as in Table 18, and uses the intervention histories from the survey. A dummy variable is created which takes the value 1 starting in the year a Water User Group is formed and 0 otherwise. Taking first differences this means that the regression picks up the effect of the *creation* of a Water User Group on the *change* in

health outcomes in that year.[29] As noted above, this eliminates the effect of time invariant omitted variables, and therefore provides a better test of the programme's health effects.

Table 20 *Fixed-effect regressions explaining incidence (dispensary data) of 9 water-related diseases from water use in the sample community in its catchment area*

	Malaria		Typhoid		Dysentery		Schistosomiasis		
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	
WUG	0.01	0.2	0.08	0.15	**-0.46**	**-2.3**	-0.14	-0.88	
	Diarrhoea		**Worms**		**Cholera**		**Eye Infections**		**Scabies**	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
WUG	**-0.26**	**-2.2**	-0.09	-0.6	-0.53	-0.7	0.1	0.8	-0.11	-1.0

A similarly strong and significant effect is found for two diseases, dysentery and diarrhoea.[30] However, if a time trend in this regression is included, the significance of these coefficients disappears. A plausible reason is that there is a general trend of improvement in health at the same time as the programme of well construction. It might then be difficult to disentangle these two effects, particularly with the dispensary data which, as noted before, are diluted measures of the incidence in the communities being investigated. A way to test this is to return to the survey data on self-reported health changes. These were collected not only for the Water User Groups but also for the other communities. As a next step, a simple version of the Table 18 regression (but now for all communities) regressing perceived health changes on training, and a dummy for Water User Groups was repeated. If the effects found were simply due to a time trend, then these dummy variables should not be significant. In fact, the effect of being a Water User Group was found to be significant for all the reported diseases (Table 21). This is the most convincing of the statistical findings.[31]

29 Since dispensaries differ in the size of their catchment area, the dependent variable by the average incidence has been scaled over the period.

30 Using robust standard errors the t-scores become 1.7, 1.8 respectively; the coefficients remain significant at the 10% level.

31 Note that in the case of diarrhoea the effect of trainingis significant but of the wrong sign. In the absence of further information this result has been interpreted as a chance outcome of the sample. In Table 18 the effect does have the correct sign and is (borderline) significant.

Table 21 *Regressions of perceived health improvements on hygiene training and Water User Group status.*

	Eye Infections		Diarrhoea		Scabies		Worms		Schistosomiasis	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
Water User Group	0.27	2.6	0.49	5.3	0.25	2.3	0.34	3.3	0.32	2.9
Training	0.03	0.2	-0.24	-2.0	0.01	0.1	-0.10	-0.8	-0.06	-0.5
Constant	0.41	6.1	0.30	4.9	0.38	5.2	0.23	3.3	0.36	5.3

In addition, a strong time trend (picked up by the constant) is found: a very encouraging indication that health is improving for other reasons as well.

A final word of caution in interpreting these results is in order. Some of these results are not easily explained from established epidemiological knowledge. For instance, an improvement in diarrhoea and worms could be explained from a switch to safer water sources also for non-drinking purposes and an improvement of sanitary and hygiene practices, but there is not much evidence for that in the survey. It is apparent that more research is needed to understand better some of the findings.

3.6 Conclusions

This chapter presents evidence from three sources: the survey held in a sample of about 100 communities (half of which had Water User Groups); the water tests performed in each of these communities; and the data collected at nearby dispensaries on the incidence of water-related diseases. Some of the evidence was descriptive; some involved regression analysis.

Data analysis shows that the wells have led to very large time savings: they reduced the time for a single water fetching trip by 60% on average. The time thus released appears to have been used by women (who do most of the water fetching) predominantly for housework and, to a lesser extent, for agricultural work on their own *shambas* (fields). In the case of girls, 20 Water User Groups reported that the main activity for which the time savings were used was to 'go to school'.

The time savings have not been used to make more water fetching trips and thereby to increase the amount of water consumed: water consumption has remained remarkably stable on a per household basis. However, households have

changed their reliance on different water sources, switching from open sources (as intended) to water from the wells.

There is some evidence of social exclusion in water access: many Water User Groups do not allow non-members access to the well. At the level of locations there is no evidence of social exclusion: in terms of wealth (proxied by households' use of iron sheets as roofing material) the two groups of locations in the survey (those with and without wells) are remarkably similar. Hence the choice of locations of wells has not favoured wealthier communities.

The effect of the wells on water quality is mixed. The test performed as part of the survey showed little difference in the results between well water and the water used for drinking water in non-Water User Groups. Fluoride content is very high, and the water typically contains coliform bacteria. These are disturbing findings. The presence of coliform bacteria indicates that communities do not treat the water sufficiently with chloride. The high fluoride content is most worrying, indicating that the water from a large number of wells presents a health hazard. Given the slow effect of fluoride on the human skeleton, water users are probably not sufficiently aware of this danger.

The self-reported changes in health showed that members of Water User Groups reported substantial improvements regarding the incidence of a limited number of diseases. The regression analysis indicated that the switch from unsafe (open) water sources to the well is an important factor in explaining these health improvements: communities which made such a switch perceived a large reduction in those diseases. These coefficients were statistically significant for eye infections and scabies, the first clear evidence of the health benefits of the well programme. Few communities reported to have received health-related training (only about a third of the Water User Group in this sample), and that such training is not perceived by the communities as having health benefits: in the regression no evidence was found of an effect of training on the perceived health improvements. However, there is a possibility that the respondents did not perceive the programmes' participatory hygiene and sanitation transformation approach as a training activity, which makes the evidence on the effectiveness of this approach unclear.

A similar analysis was performed using data on the incidence of diseases collected from records that are kept at local dispensaries. The regression results indicated that the percentage of the population in the sample communities using improved

water sources is an important determinant of the incidence of a number of water-related diseases. The effect is statistically significant and remarkably strong for four diseases: malaria, diarrhoea, intestinal worms and scabies. To investigate whether the differences in incidence could perhaps be due to other differences than improved water sources, 'fixed effects' regressions were run that can eliminate the effect of such differences - at least to the extent that they do not change over time. In this case significant (and strong) effects were found for dysentery and diarrhoea. However, the fixed-effects results could still be due to the confounding effect of a trend (a variable that *does* change over time!): health is generally improving over time, even in communities without Water User Groups. The survey data were used to test this hypothesis and found that in addition to a positive general trend in health (which in itself is a very encouraging finding) there is a strong and significant effect of a community's status as a Water User Group.

Chapter 1 listed five impact evaluation questions:

2.1 What has been the change in time used to collect water?
2.2 Has there been productive use of time savings and/or greater water availability?
2.3 Have the time savings affected girls' education?
2.4 Has the prevalence of water and sanitation-related diseases changed?
2.5 To what extent can the identified changes be attributed to the Netherlands-supported programme?

Evidence on these questions was presented in this chapter: the water supply and sanitation programmes have resulted in time savings and productive use of time savings, and have led to increased use of time by girls for attending schools. There is strong evidence that the incidence of water-related diseases has fallen. The methodology used made it possible to attribute these changes to the Netherlands-supported programmes, thereby answering the fifth question. In particular, it was possible to isolate the health effects of the programmes from the general health improvement over the period considered. The programme supported hygiene and sanitation promotion. We could not demonstrate a (statistically significant) effect of this component. It should be noted that in siting the wells, great care was taken to ensure a sufficient distance from latrines. Quite possibly this had already had a major impact on sanitation-related diseases. Moreover, since the 1970s simple pit latrines had been promoted and introduced, and most households use such latrines, made of local materials. Only a few households use improved latrines

introduced by the programmes, which makes it impossible to estimate the effect of such improved facilities from the survey data.

4 Institutional strategy and sustainable results

4.1 Introduction

4.1.1 Institutions, impact and sustainability in rural water and sanitation

The concept of sustainability is closely linked to that of positive impact. Impacts are long-term effects (OECD DAC, 2002: 24). The contribution of the concerned institutions to the sustainability of the interventions helps to explain the long-term effects. The beneficial change that was introduced must remain in place after the intervention has been completed. In assessing how far institutional conditions explain the impact of water and sanitation programmes, it is useful to consider how sustainable the institutional changes introduced by those programmes have proved to be, and what the impact of those changes is on environmental and technical sustainability in the sector.

4.1.2 Approach to the assessment

This chapter reviews the institutional outcomes of rural water and sanitation programmes over the last 16 years in Shinyanga Region, in order to help explain the findings of the impact evaluation. It is guided for this purpose by the terms of reference of the impact evaluation, which were influenced by the TOR earlier prepared for a final evaluation of the 2002-2006 RWSSP. These original TOR placed considerable emphasis on organisational and institutional issues. This emphasis was carried forward in the design of the impact evaluation. One of the eight key evaluation questions posed for the study is:
To what extent has the policy and institutional strategy adopted in 2002 contributed to sustainable results in drinking water supply and sanitation?
The specific questions are:

1. Is the set up at regional level and council level in line with the Local Government Reform Programme? Have roles and responsibilities been clearly defined? Are these definitions of roles and responsibilities known and practised?

2. Has the planning of the RWSSP been harmonised with and integrated in the Council planning cycle?
3. Are the concerned institutions sufficiently capacitated for the respective (new) functions and responsibilities for implementing the Water policy with respect to rural water supply and sanitation?
4. Has the backstopping and monitoring at regional and district level been results-based and to what extent is monitoring information used to keep on track and address bottlenecks?

Section 4.2 below addresses question 1 and 2 and Section 4.3 questions 3 and 4. The questionnaire survey included a number of enquiries about the structure and operations of institutions at user level. A separate short field investigation was subsequently undertaken to gather more information and understanding about institutional issues that have affected the impact of rural water and sanitation programmes in Shinyanga. It focused mainly on the district and user levels, as evolving approaches in the sector have come to emphasise their importance. In addition to interviews of a series of informants in Dar es Salaam, the institutions team was able to meet ten Water User Groups, one Village Water Committee and one Water User Association in Shinyanga. The team also met regional and district authorities and staff - notably the Regional Monitoring Team and six of the eight District/Municipal Water and Sanitation Teams. In addition, it held discussions with various NGO, CBO and private sector representatives in the Region. It was also able to take advantage of analysis of programme experience being produced as the RWSSP comes to an end (see, in particular, RWSSP (2006d)).

4.2 Institutional setting and approach

4.2.1 Background

Against a background of continuing political stability, two major national trends have influenced institutional developments in rural water and sanitation. The first has been a gradual economic recovery. The second trend has been a change in political philosophy about the role of government. In 1990, the image of government as universal provider of free social services was still strong in Tanzania. A decade and a half later, official policy is clear. Users must pay for the operation and maintenance of these services and, in many instances, must also contribute separately for their installation. This is a fundamental shift of mindset for citizens, and for civil servants at all levels. In both cases, old habits die hard. It takes time for people to accept that the government will not simply provide them with basic services. It takes time for officials to adapt to new modes of service, in

which they must facilitate and react to local people's decision making rather than just decide and deliver everything themselves.
Linked to these changes are evolving expectations about the role of the private sector. While capacity building for the public sector is a well established priority, capacity building for the private sector is now also recognised as being important.

4.2.2 Local government reform

In recent years, Tanzania has been undertaking two major reform programmes: the Public Service Reform Programme and the Local Government Reform Programme (LGRP). The first of these programmes is implementing wide-ranging restructuring of the public service in order to improve performance and accountability (MOW, 2006: 2-1). The overall objective of the second, the LGRP, is to improve the delivery of services to the people by making local authorities more democratic and autonomous within the framework established by central government, and under conditions of severe resource constraints. It aims to strengthen local government authorities (LGAs) so as to improve their efficiency and effectiveness, and to strengthen their governance - including financial management.
Under the LGRP, the role of central ministries is confined to policy making, regulation, monitoring, performance assessment and interventions to ensure that public service provision conforms to legal standards. Actual implementation is transferred to LGAs, executive agencies, NGOs and the private sector. LGAs comprise district councils; municipal, town and city councils; ward committees (each supported by a Ward Executive Officer); and village councils (each supported by a Village Executive Officer). The main agency for co-ordinating the implementation of service delivery policies in rural areas is the district council.
The Local Government Capital Development Grant (LGCDG) system is a kind of uniform direct funding mechanism for LGAs. The LGCDG is funded by the Government of Tanzania, the World Bank and other development partners that have been supporting the LGRP. Introduction of this system is meant to preclude further discretionary funding to LGAs by development partners.

4.2.3 Water policy reform

The evolution of national policy for water and sanitation since 1990 is outlined in Section 2.2 above. The steady trend since 1990 has been to strengthen the role and responsibilities of users in the installation, operation and maintenance of water supplies. The current Policy emphasises the principle of user ownership and responsibility - 'the beneficiaries themselves establishing, owning and managing their water schemes; ensuring full cost-recovery for operation and maintenance,

and replacement'. While recognising that water is a basic human need, that poor water supply and sanitation are prominent features of poverty, and that investment priority should be given to water scarce areas, it also emphasises that rural water is an economic good: 'development of water for productive purposes will... be treated as an economic undertaking requiring efficient management of the resource and financed by water users themselves'. The NAWAPO also stresses the principles of subsidiarity ('adopting the principle of managing water schemes at the lowest appropriate level') and gender equity ('recognising women as being among the principal actors in the provision of rural water supply services') (GOT, 2002: 52-54).
For the rural water sector, this brings district councils to centre stage, and repositions the Ministry of Water as a technical agency that supports the design and delivery of these local authorities' water programmes.

4.2.4 Approach of earlier programmes

The idea of delegating responsibility for rural water and sanitation programmes to local government has a long history in Shinyanga Region. At the start of the study period, the **Rural Water and Sanitation Programme** had already adopted an amended 'systems design' approach that assigned overall project management control to district councils and, specifically, their District Water and Sanitation Teams (DWSTs), each chaired by the District Executive Director (DED).
The RWSP operated a 'step-by-step' approach that had evolved during the 1980s and was piloted by the previous Rural Water Supply Programme (1985-1987). By 1993 it comprised 17 steps, starting with village information and sensitisation and moving through survey, design and costing, construction, training, hand over, follow up at village level on issues like health projects and O&M (operation and maintenance), and finally evaluation.

The **Domestic Water Supply Programme** (DWSP 1993-2002) worked from the premise that:

> 'The rural community, as the intended beneficiaries of the program, are in principle responsible for their own water supply and sanitation... The community is expected to take initiatives, to organise themselves, to generate most of the required funds for the realisation of one or more community projects... The public sector is to service the community. The departments concerned... are to mobilise the community, to stimulate and enhance a demand for improved water supply and sanitation, to facilitate the formation of user groups and VWSCs [Village Water and Sanitation

> Committees] and to support them in the realisation of one or more community projects.'
> (GOT and GON, 1993: 43).

A key DWSP innovation was to move beyond the often moribund VWSCs to promote the stronger institutional concept of the Water User Group, an autonomous legal entity under which:

> '...users were required to organise themselves into a group of between 25 and 50 families or households... Socio-economic youth and or women groups as well as public institutions such as schools, religious institutions, dispensaries and health centres could also form a Water User Group. Each of these Water User Groups normally focused on a single water source, which in Shinyanga refers mainly to a shallow or medium deep well, fitted with a hand pump.'

> 'A Water User Group is a group of individuals, usually households, who voluntarily join together to participate in improving and maintaining their water point source and/or sanitary facility on a sustainable basis.'
> (van Miert and Binamungu, 2001: 5).

The DWSP emphasised the legal status of Water User Groups and the principle that they should be legal owners of their water supply schemes. Legally registered in terms of by-laws passed by each district council, Water User Groups were helped to acquire land rights to well sites and water rights to the resources they used. The programme promoted Water User Groups' responsibility for User Level Operation and Maintenance (ULOM). All these measures had important benefits in stimulating a sense of community ownership of the facilities.
Much like the RWSP, the DWSP expected district council water departments to provide services in response to water users' stated needs, with back-up where required from the Regional department. However, another turning point during the DWSP period was the recognition that district councils could not implement enough rural water and sanitation projects directly: 'the objective of DWSP to develop district government for implementation was not reached' (ibid: 7). The alternative was to turn to the private sector. In 1999 the DWSP facilitated the establishment of the Water and Environmental Development Company (WEDECO) Ltd., staffed by former Rural Water Supply Engineers. Partly to facilitate a stronger role for the private sector, the DWSP also established a Regional Development and Training Centre (RDTC) in Shinyanga town in 1996, providing free training to

community members, technicians and contractors. It also established a related Community Based Resource Centre (CBRC), an NGO that was intended to serve as an umbrella body for Water User Groups (van Miert and Binamungu, 2001: 18-19). In 2002 the CBRC took over the assets and facilities of the RDTC.

4.2.5 Approach of the RWSSP

Much of the RWSSP's institutional approach has been a further consolidation of the principles, structures and systems introduced by the DWSP. In some areas, however, the RWSSP has achieved important innovations.

The central strategy of the RWSSP is to establish strong community ownership and a management system that would enable user communities to run the improved facilities sustainably. This strategy is rooted in the 'step-by-step' approach which has been evolving since the 1980s. This approach emphasizes the self-formation of Water User Groups. The idea is that the Group should not exceed 50 families in order to guarantee a common understanding and the will to work together as a manageable unit. The size of the Groups is also expected to help guarantee that the maximum walking distance of 400 metres to the water point that is stipulated by the NAWAPO will not be exceeded - although this is difficult, especially in areas where the availability of appropriate groundwater is a problem.

The approach starts with the promotion of the NAWAPO concept of demand responsiveness and the requirement of up front contributions, and leads into mobilisation of the community, formation of a Water User Group, application by the Water User Group for assistance, construction and installation of wells and pumps, training on operation and maintenance and facilitation of the conferment to the Water User Group of land and water rights and a registered legal status as owner of the facility. Participatory Hygiene and Sanitation Transformation (PHAST) training, and later HIV/AIDS awareness creation, were built into the 'step-by-step' approach during the RWSSP period.

Shallow well technology is not feasible or appropriate in all parts of Shinyanga Region, either because the groundwater is too deep or because populations in larger settlements need piped systems. The RWSSP therefore promoted other technologies as well, including charco dams and piped schemes fitted with pumps, for larger beneficiary groups. For these larger schemes, the programme has facilitated the formation of Water User Associations (WUAs), although there are still only six WUAs in the Region.

The legal framework for the Water User Groups in Shinyanga Region is provided by the national Water Utilisation (Control and Regulation) Act of 1974, as amended. It is further specified in the by-laws of each district council and in Memoranda of Understanding (MOUs) that Water User Group members adopt as their constitutions. The by-laws and MOUs define the purpose, working arrangements and financing of the water user entities. Two key legal provisions are that a Water User Group should obtain a water right for the resources that it uses, and that it should obtain formal title to the land on which the facility stands. In practice, one water right is normally issued (by the district council) per village area, within which several Water User Groups may be operating. However, only a provisional water right can be issued until the Water User Group has title to the land in question. Major procedural difficulties have arisen since the Land Acts of 1999 transferred authority over the issue of title to village governments but also required that villages' boundaries be surveyed and registered before they could allocate land. In most areas of Shinyanga Region this means that the issue of land title to Water User Groups, and the formalisation of their water rights, are now at a standstill. This makes little or no difference to the daily operation of the water facilities, but does pose long-term questions about Water User Groups' legal rights.

In line with the principles of the Local Government Reform Programme (Section 4.2.2 above), the district council has overall responsibility for the management and co-ordination of RWSSP activities. This task is assigned to the DWST, which is preferably composed of heads of Council departments involved in the water and sanitation sector. The main responsibilities of the DWST are the planning and management of programme implementation; awareness raising and mobilisation of communities; appraisal of community applications for support; procurement of services; day-to-day management of the programme and support to communities; review and/or amendment of by-laws related to water and sanitation and monitoring of the programme. The role of the Regional Secretariat is to oversee, co-ordinate and monitor programmes across all sectors in the region. With regard to water and sanitation, it has therefore been expected to provide guidance and backstopping to the RWSSP. It performs these roles through a Regional Monitoring Team, comprising selected sectoral advisers on the staff of the Secretariat.

A Regional Consulting Unit (RCU) of the Ministry of Water had been retained in Shinyanga to provide additional support to the RWSSP, although these Units have been withdrawn elsewhere in the country as part of the Ministry's restructuring into Basin Water Offices (BWOs), responsible for integrated water resource

management. The former Regional office of the Ministry in Shinyanga is now a Sub Basin Office, reporting to the Basin Office for the Inland Drainage Basin in Singida. However, some parts of Shinyanga Region fall under two other Basin Offices - Lake Victoria and Lake Tanganyika.

The advisory consultants, separately contracted by the Royal Netherlands Embassy, made up a final institutional element in the RWSSP. Teams of consultants have played key roles in Netherlands-funded water and sanitation programmes in Shinyanga since the 1970s, but their role has evolved from one of direct management and implementation to one of advice and support. During the last phase of Netherlands support, the consultants were primarily responsible for capacity building, working in close collaboration with the Regional Consulting Unit, the Regional Secretariat and the DWSTs. In this last phase the intention was that the consultants' role would gradually be taken over by the Regional Secretariat. At the end of 2006 the RCU ceased its operations.
Based on the Rural and Urban Local Government Authorities Acts of 1982, the LGRP and the NAWAPO (2002) mandated Local Government Authorities to take responsibility for the development and management of service delivery. To expand the coverage of local services like water supplies, district councils can submit budget applications to the Local Government Capital Development Fund. However, they are subject to an annual assessment by the Prime Minister's Office - Regional Administration and Local Government (PMO-RALG). If they fail the assessment - as two districts did in Shinyanga Region in 2005 - they are not eligible for Local Government Capital Development Grants (LGCDGs) but are provided with additional capacity building support.

In line with the Netherlands development co-operation policy to move away from a project-based approach to a sector-wide approach, the MOU for the RWSSP stipulated that the Netherlands grant was to be integrated in the plans and budgets of the Government of Tanzania. Programme ownership was to be at the level of the district councils, which were to be responsible for the management of the funds. By implementing these arrangements, which were meant to create ownership, awareness and commitment, the RWSSP has largely conformed to the systems and structures of the Local Government Reform Programme.

The planning of the RWSSP was thus harmonised with and integrated in the council planning cycle. However, the normal funding channels of the LGCDG were not followed - not surprisingly, since the LGCDG system only began in 2004. Instead, approved disbursements for district councils' water and sanitation

activities were made to the councils by the Ministry of Water after the latter had received the funds from the Ministry of Finance. These transfers, in turn, required the approval of a National Steering Committee (NSC) for the RWSSP, which was responsible for approval of annual plans and budgets and review of programme performance. Meeting in Dar es Salaam, the NSC comprised the Ministry of Water and other relevant line Ministries; the Royal Netherlands Embassy; the Shinyanga Regional Secretariat; the RCU and the advisory consultants. In Shinyanga, a Regional Steering Committee reviewed RWSSP performance against its objectives and budget, and endorsed and submitted annual and quarterly reports and plans to the NSC.

These additional structures and alternative funding channels mean that the RWSSP was not fully in line with the Local Government Reform Programme. Indeed, if it had been, its capital funding to water projects in the two districts that failed their assessments in 2005 would have been suspended. Instead, that funding went on as normal. There is still some sense at regional and district levels in Shinyanga that the RWSSP is a 'Dutch' programme.
The RWSSP was admirably thorough in its institutional and administrative arrangements. It compiled a Programme Management Manual that provides a detailed guide for key players at the different levels for the implementation of the programme. The Manual contains a programme overview; sets out roles and responsibilities in organisation and management, planning and budgeting; specifies procurement procedures, options for water and sanitation facilities, legal options, monitoring, evaluation and reporting arrangements; and provides process facilitation instruments and formats.

Partly as a result of this thorough approach, roles and responsibilities in water and sanitation development in Shinyanga Region are clearly defined and are generally well known and appropriately practised. However, the RWSSP has operated against a dynamic background of ongoing policy and programme development in local government reform and the water sector. Roles and responsibilities within the Regional Secretariat have recently been revised, for example, and there is still scope for more specification of contributions to water sector management at ward and village levels. Much has been achieved in developing capacity at all levels, as indicated by the increase in implementation capacity and the percentage of operational wells (reference Chapter 2). Developments at national level, meanwhile, mean that there will still be a consultant presence in Shinyanga water programmes after the end of the RWSSP. Under the Water Sector Development Programme, each district council is to

appoint two sets of consultants - Technical Service Providers and Facilitation Service Providers. Overall, however, the approach of the WSDP owes much to that developed by the RWSSP and its predecessors. It is therefore important to assess what contribution the Shinyanga institutional approach has made to the sustainability of water and sanitation interventions.

4.3 Institutions and sustainability

4.3.1 Sustainability in the water and sanitation sector

Sustainability

> *The continuation of benefits from a development intervention after major development assistance has been completed.*
> *The probability of continued long-term benefits. The resilience to risk of the net benefit flows over time.*
> *(OECD DAC, 2002: 36).*

As mentioned in Section 4.1.2 above, one of the key questions for this impact evaluation is whether the policy and institutional strategy adopted in 2002 have contributed to sustainable results in drinking water supply and sanitation. To assess 'sustainable results' in water and sanitation we have considered three broad sets of issues.

- First, there are the environmental dimensions of sustainability. Is water use within renewable limits - the replenishment of water sources by rainfall - or does it risk exacerbating the periodic water shortages that drought-prone areas like Shinyanga suffer?
- The second set of issues concerns technical capacity and renewal. All hardware such as pumps, pipes and tanks has a design life. Within the limits of affordability, more durable infrastructure is obviously preferable, but technical sustainability ultimately depends on arrangements to repair and replace it.
- The third component is the sustainability of institutions and their human resources. Water and sanitation systems cannot last if their governance and management are not assured. The structures and staff responsible for these functions must have the economic, political and human resources to operate effectively in the long term.

This analysis focuses on the third set of issues, but in fact there are institutional dimensions to the first two as well. Are water resource management institutions functioning appropriately at the relevant levels of society? Are the institutional arrangements in place to ensure technical sustainability?

The detailed institutional questions posed to this evaluation all link to the sustainability of the water and sanitation programmes. Those concerning integration with the Local Government Reform Programme and the council planning cycle have been answered in Section 4.2.5 above. In addressing institutional sustainability below, the questions whether the institutions concerned have adequate capacity, and whether the quality and use of backstopping and monitoring are appropriate are addressed.

In answering these questions and helping to explain the impact of water and sanitation programmes in Shinyanga, the various levels and elements in the complex institutional map of the sector are considered. This part starts with what, in many ways, is the most important level of all: that of user institutions.

4.3.2 User institutions

Water User Groups (WUGs) are the main water user institution that the Netherlands-funded programmes have helped to establish in Shinyanga Region. In April 2006, according to the RWSSP database, there were 3,620 of these bodies across the Region. Most manage shallow wells to whose construction they contributed labour and cash; smaller numbers operate other infrastructure such as boreholes. Most WUGs conform to the standard model, comprising a few dozen member households with a gender-balanced management committee of chairperson, secretary, treasurer and three other members.

Significant numbers of Water User Group committees are chaired by women, some of them young. The RWSSP and its predecessors have helped women in Shinyanga Region make important institutional progress in a society where it was traditionally rare for them to speak publicly in front of men, or to hold positions of authority (Pallangyo, 2006: 8). Of 271 Water User Group members interviewed by the impact evaluation field survey, 105 were women. Thirteen of the 37 Water User Group chairpersons met during the field survey were women, as were nine of the 34 secretaries and four of the 24 treasurers. However, some women office bearers in WUGs are still dominated by their male colleagues or by other senior men in the community, and most water collection continues to be done by women - while men are more prominent in commercial water selling. When water supply problems

Water collection, Muhunzu, Kishapu District

arise, for example when a well dries up or a pump breaks down, there may be less urgency among men than among women to tackle the problem - because it is the women who must usually obtain water from alternative, usually more distant and difficult, sources.

The WUGs have largely succeeded in fostering a sense of user ownership of water facilities. Most guard their pumps and other facilities zealously. Management arrangements and regulations are broadly similar across the Region. One or more committee members (or sometimes other nominated group members) hold the key(s) to the pump or tap(s) and unlock and lock them at agreed times of day, which may vary with the season and the corresponding abundance of water in the well.

Maelewano Water User Group, Kishapu District

The survey collected data on contributions by members of Water User Groups. The vast majority of members contributed equally to the establishment of the well, through a required initial payment (on average about TShs. 4,000 per household) and by means of contributions of labour and material inputs. Members in many cases do not pay to draw water or contribute monthly fees; this was the case in 44 of the 51 WUGs visited during the field survey, with members of the other groups paying between TShs. 100 and TShs. 2,000 per month in dry and rainy seasons alike. Non-members typically do pay, at a rate of about TShs. 1 per litre. However, one third of the 48 surveyed WUGs that discussed the issue said that there were no non-members in the village. Nor do WUGs consistently charge non-members all the time for water - they sometimes use their discretion, especially for the poor or destitute. Eleven of these 48 WUGs said that the cost of membership was the main reason why non-members had not joined. For 3 WUGs the main reason was that the well was remote from non-members' homes; for another 3 that the non-members were new in the village.

Most Water User Groups reported that they hold regular meetings for all members (28 out of 51 responding groups), or when necessary. Of the latter, 12 reported a meeting within one year of the survey date. Meetings involving only the leaders are

also quite common. They do not appear to replace meetings for all members: typically, if member meetings are regular, so are leader meetings. The vast majority of groups (41 out of 48) reported that decisions were made by 'discuss and agree'. In discussions men and women are reported to participate equally actively in 25 out of 46 groups, while women are more vocal in 12 groups.

Most WUGs apply the same set of rules that forbid the watering of livestock or the washing of clothes, utensils or human bodies at the water point; they also require people to remove their shoes before stepping on the concrete slab around the well. It is usual, too, to impose fines on those who infringe these rules, although the amounts vary and there are reportedly few contraventions.

WUGs have undergone a standard process of sensitisation, formation and training, facilitated by the RWSSP and its predecessors. In recent years, District Water and Sanitation Teams have taken the lead in arranging this process, although much of the work is contracted out to service providers who may also be responsible for the technical tasks of well design and construction. As noted above, the Group formation process culminates in the signature of a Memorandum of Understanding, which serves as the Water User Group constitution, and the registration of the group by the relevant district council in terms of its by-laws. A key part of the pre-construction process is the collection of a contribution of TShs. 100,000 towards the construction costs, and a further TShs. 60,000 for future maintenance expenses. The latter fund has to be deposited in a bank account that the group must open - often in a remote town - for the purpose.

Confidence in the future: Mkombozi Water User Group

This Group, at Seseko village in the Shinyanga Municipal Council area, has been in existence for ten years and comprises 32 member households (including some members of the village government - although technically, being in a municipal area, they can no longer have a village government). The current chairperson is a young woman, but her predecessor, an older woman, clearly retains a strong role in the Water User Group's affairs. The Group, which holds land and water rights, charges members TShs. 100 per month for maintenance purposes. In 2004 it withdrew TShs. 100,000 from its maintenance account in order to set up an ifogong'ho scheme, charging 20% per annum on loans. The Group would like to raise the funds to participate in TASAF projects such as chicken rearing.

In November 2006 the Group was suffering from a drop in the water level of their well: the second time they have had this problem. They do not boil the water they get from the well, but their fundi does carry out chlorination every three months with chemicals provided by the Municipality's Department of Health.
This Water User Group holds elections for a new committee every two years and reports that outgoing office holders train the new ones. So they believe they would survive if there were no training. They see no need for Water User Groups to federate into any kind of umbrella structure.

Mkombozi Water User Group, Shinyanga Municipal Council

Not all WUGs are started from scratch. Some have their roots in traditional rotational savings and credit schemes known in Shinyanga Region as *ifogong'ho*. These groups already had capital that they could use to make the user contribution to well construction, and did not have to collect it specially. Other groups, which formed for the first time as WUGs, have since used their capital to start rotational credit schemes, at interest rates of up to 50% per annum which, if they succeed in enforcing repayment, is a quick way to build up their resources. Fifteen of 39 surveyed WUGs that gave data on this issue said that they were using their funds for lending out. A few WUGs are clearly endowed with a broader purpose and use their growing confidence and institutional capacity to start other development activities to benefit their membership.

The age of WUGs in Shinyanga Region varies considerably. The principle of periodically electing new leadership is widely understood and accepted, although the frequency of elections varies and some groups seem apathetic or disorganised about replacing their leaders. Elsewhere, new elections have been held, but it is clear that the natural or existing leaders in the community were put into office the first time around and remain highly influential in WUGs' affairs after they have stepped down. The second or third generation of office bearers rely heavily upon, or may be unduly influenced by, these more capable, more experienced or better resourced individuals.

WUGs are highly localised institutions. The most local structure of formal local government is the village council. There may be many WUGs in a single village area. WUGs generally report good working relations with village governments and with Village Executive Officers, many of whom have been recently appointed in a new drive by PMO-RALG to strengthen this tier of local government. It is common for members of village councils to belong to WUGs. They are not supposed to hold office in Water User Group committees, although this does occasionally happen. WUGs make little or no contribution to the **environmental sustainability** of the water and sanitation sector. They are much affected by the semi-arid character of the Region. Many experience periods during the dry season when their wells run dry and they have to resort to other, more distant and dirty, sources of water. Most groups do not restrict the amounts of water members can draw, as long as they do it at the appointed times. As the level in the well drops, however, they may impose seasonal restrictions. WUGs are not otherwise involved in water resource management, which is in its institutional infancy at all levels in Shinyanga Region. Members are aware of water quality issues and have been advised to boil the water before drinking. However the majority of users do not do that. Many also refer to the supposedly standard procedure of chlorinating wells quarterly, but report that in practice this happens infrequently and irregularly, if at all.

Part of the Water User Group sensitisation and formation process concerns the policy that users are fully responsible for **technical sustainability**: the maintenance and repair of their systems. This is why they are required to deposit money in a maintenance account before construction proceeds, and why they are advised to levy monthly charges on members to increase this fund. A Group member is trained as *fundi* or maintenance man (the usual gender), and there is generally an acceptable level of competence with regard to minor repairs of pumps and pipes. The pumps are highly reliable and mostly well cared for, but faults and breakdowns do occur. Twenty-four of 51 surveyed WUGs said that they had

experienced a breakdown at some point. Among 48 groups replying to a question about servicing, 19 reported regular servicing; 18 servicing after breakdown; and 11 no servicing at all. Two sets of problems arise when repairs are needed.
First, few WUGs have enough money in the bank to pay for spare parts (and, in some cases, a visit by a commercial repair service). Data on the size of groups' bank accounts are available for only 31 of the surveyed WUGs.

Table 22 *Amounts held in WUGs' bank accounts*

Amount held by WUGs			
TShs.	EUR	No. of groups	%
<50,000	<30	8	26
50,000 - 99,999	30 - 60	18	58
100,000 - 149,999	61 - 90	1	3
150,000 - 199,999	91 - 120	3	10
200,000 -	121 -	1	3

Source: impact evaluation field survey.

The banks in which WUGs are required to open their maintenance accounts are often many hours' arduous and expensive travel from the village. They levy substantial charges to keep accounts open. If a Group only tries to access the account some years later when a fault first needs repair, it may find that much or all of the original money has disappeared in this way, and/or that the bank has declared the account dormant. Again, partly because the banks are so distant, it is common for incoming Water User Group committees not to register the new set of authorising signatures with the bank, so that if they do ultimately go to withdraw funds they may find themselves unable to do so. Twenty-seven of 37 surveyed WUGs that answered the question said that they had not deposited or withdrawn funds in their bank accounts since they were opened. Furthermore, 11 of 46 surveyed WUGs said that they did not have bank accounts.

Meanwhile, and more significantly, only a minority of WUGs are systematically collecting monthly maintenance levies from their members. Most WUGs therefore do not have the funds in the bank to pay for anything more than the smallest repair. Even those that can pay for repairs will not be able to buy a replacement pump - which currently costs about TShs. 500,000 - when their current one reaches the inevitable end of its useful life and policy requires them to meet the full cost of new equipment.

Living happily ever after? - Ujamaa Water User Group

This Group, at Masabi village in Kahama District, seems to be blessed with abundant groundwater. Their well, built in 1999 with the support of World Vision (in collaboration with the district council), always produces plenty of water for all 80 member households and a local school. The Water User Group has never experienced any technical problems, which is just as well since they have never opened a bank account for maintenance purposes. At the time of construction they contributed a total of TShs. 150,000. Since then, they say, they have been involved in various other local development projects which have tended to use up available community funds. Although their Water User Group is officially registered with the council it has no land or water rights.

Ujamaa Water User Group, Kahama District

The 51 surveyed WUGs were asked about the 'group funds' at their disposal as well as the funds in their formal bank accounts, if any. Fund management clearly extends beyond formal bank accounts. Thirty-three groups reported they held 'group funds', although two of these said that there was currently no money in the funds. Overall, the 'group funds' (Table 23) were reported to contain more money than the bank accounts (Table 22).

Table 23 *Amounts held in Water User Groups' funds*

Amount held by WUGs TShs.	EUR	No. of groups	%
<100,000	<61	17	52
100,000 - 199,999	61 - 121	6	18
200,000 - 299,999	121 - 182	3	9
300,000 - 399,999	182 - 243	1	3
400,000 - 499,999	243 - 303	1	3
500,000 -	303 -	5	15

Source: impact evaluation field survey.

In practice, many WUGs make informal arrangements to draw on their members' limited resources to meet maintenance costs as and when they arise. With such problematic access to the maintenance account in the bank, they may collect whatever funds they can in a special appeal to all members. Alternatively, they may borrow the money from one or more richer people in the area. As noted above, many of the 'group funds' are used to operate savings and credit schemes, and may also be able to provide money for repairs when the need arises.

The second set of problems for technical sustainability concerns the availability of spare parts. Because the pumps are reliable and parts are therefore not often needed, it has proved unprofitable for the sparse retail sector in Shinyanga Region to stock these parts. The main stockist so far has been the Community Based Resource Centre (CBRC - see Section 4.3.4. below) in Shinyanga town, which is remote from most WUGs. The easiest arrangement a Water User Group can hope for is that its District Water Engineer - who may him/herself be several hours away - will help it to procure the parts from the CBRC or elsewhere. It has been suggested that the umbrella structures for WUGs that were mentioned above could help in this regard, although there would clearly be major institutional challenges in establishing such arrangements.

In conclusion, the current institutional arrangements at user level are an important contribution to the technical sustainability of water supply schemes, but are far from assuring it.

Technical and institutional problems: Upendo Water User Group

This group, at Igegu Village in Bariadi District, used to operate two wells. When it started in 1994, each member contributed TShs. 2,500. Later, with the wells in good working order, the maintenance fund was used as capital for an ifogong'ho savings and credit scheme. The scheme was subsequently closed amidst allegations of mismanagement, and the remaining capital was distributed to the members. One of the two wells broke down in 2005, but the Water User Group - in power for seven years without re-election - took no action because the approximately 100 member households could draw water from the second well. Now that well's pump has failed too, and the Water User Group has no maintenance funds. Men in the group reported that there was no problem in walking to a nearby well in Mwanza Region to get water. Women denied this, saying that the owners of that well sometimes chase them away. Now the Water User Group must find the funds to repair at least one of its wells, but it is unlikely that this will happen under the widely distrusted current leadership, which has met only once since the 2005 breakdown. A new committee will have to be elected first.

Ongoing enhancements to hygiene and sanitation are key elements in any positive impact and sustainability of the Netherlands-funded programmes in Shinyanga Region. Once again, WUGs are meant to take the lead in achieving this. PHAST training focused on Water User Group leadership and Community Owned Resource Persons (CORPs), with the intention that these individuals would sensitise the rest of the local population and promote better hygiene and sanitation practice.

> 'It was the conviction of [RWSSP] actors that the hygiene education strategy through the PHAST methodology, which focused on smaller groups of people within the community such as WUGs, would stimulate dialogue among them to identify, analyse their health problems and look for joint solutions.' (RWSSP, 2006d: 28).

This strategy has only been partially effective. Visits to WUGs clearly reveal general awareness about the importance of good hygiene and sanitation. But there is little evidence that Water User Group leadership, CORPs or DWSTs follow up systematically to promote and sustain these approaches as was intended:

'...the methodology has not added a significant impact on the improvement of either sanitation coverage or people's habits such as washing of hands especially at critical times... PHAST... was yet to be fully institutionalised in water supply interventions. The important lesson here is that for any methodology to be effective it requires first to be directly linked to practical exhibitions or demonstrations and secondly users - districts and regions - should make sure that it is legitimately institutionalised in all water supply interventions.'
(Ibid.: 39-40).

Good foundations are laid for the **institutional sustainability** of WUGs themselves. As explained above, there is a thorough process of awareness raising, training and facilitation before the founding members of a WUG sign their MOU. Once the WUG is operating its water point, however, it is largely on its own. In theory, DWSTs monitor WUGs' performance and concerns, and are available to provide ongoing institutional support. In practice this does not happen: partly because DWSTs are not adequately organised for the task, and partly because the task is far too big. In some districts, the DWST would need to visit several WUGs per day in order to meet each once a year. Typically, a DWST only learns of a WUG's problems if those problems are somehow reported to it. The original intention, that WUGs would federate under the CBRC in order to build the capacity to support each other, has not been fulfilled.

According to the Water User Group by-laws Water User Group committee members have a term of office of not more than three years after which new members might be elected. This implies that ULOM training for new members is called for. But training activities for newly elected Water User Group committee members do not normally appear in the LGAs' annual plans and budgets. This is indeed a sustainability concern for Water User Groups...
...it is crucial that community mobilization should not be a one-off event but rather a continuous process through which communities are helped out by competent community-based facilitators to discuss and make informed decisions at each level of the program. Due to lack of such continuous professional mobilization, communities have tended to relapse to old ways of doing things. For the time being the present capacity of the districts cannot provide such follow up support hence, a need for private social mobilisers.

The assumption of programmes to date has been that, if thoroughly trained and carefully established, a WUG will be able to operate into the indefinite future. This assumption is questionable. Those elected to lead the Group at the start do not stay in office for ever, although the length of time they do remain before new leadership elections varies considerably. There are no systems in place for the formal notification of election results to higher authorities or DWSTs, nor for new WUG committees to receive any form of training. Instead, it is assumed that the new leaders will learn what they need to know from the old ones – which in turn implies an assumption of good relations between those standing down and those taking their place. Visits to WUGs during this evaluation suggest that some transfer of knowledge does indeed take place and that relations between old and new leaders are often good. They also suggest that the second generation of leaders may sometimes, in practice, be dominated by the first. Overall, there is no sign that the spirit of user responsibility and ownership fostered by these programmes is diminishing - although significant elements of dependence on higher authority can still be seen. But there is insufficient evidence that user institutions will be able to maintain - or, better still, build - their leadership and management capacity into the future. Additional turnover of WUG membership due to deaths from AIDS will be a further challenge to institutional sustainability in the coming years. It will increase the need for DWSTs and previous office holders, where still available, to provide back-up support.

The institutional strategy of the RWSSP (which builds on the strategy developed earlier in the study period) has made a major contribution to sustainable results. However, the conclusion has to be that the current condition of user institutions in Shinyanga Region is inadequate to assure the environmental, technical or institutional sustainability of the undoubted advances that have been made in rural water supply and sanitation.

4.3.3 Government institutions

Four tiers of government institutions have a potential influence on the sustainability and impact of water supply and sanitation interventions in Shinyanga Region. At national level, the Ministry of Water is the key player, in association with other agencies such as the Ministry of Health, the Ministry of Community Development, Gender and Children, the Ministry of Finance and the Prime Minister's Office - Regional and Local Government. The role of structures at regional level has been cut back, but the Regional Monitoring Team remains important. The most important tier of government for rural water supply and sanitation at present is the district level: specifically, district councils and their

Muungano Water User Group, Bariada District

District Water and Sanitation Teams. Finally, there are more local institutions at two levels: the ward and the village. So far, these structures have played a more minor role. The contribution being made at each of these four tiers of government to the three kinds of sustainability identified in Section 4.2.5 above, is considered below.

At **national level**, the Ministry of Water (MOW) has played a key role in developing policy for rural water and sanitation (Section 4.2.3). Significantly for the sustainability of water and sanitation achievements in rural Shinyanga Region, the approach taken by the RWSSP closely matches that policy - so that those achievements will not be undermined in the longer term by divergent systems and structures. However, beyond setting national policy and standards, the MOW makes little direct contribution to the **technical and institutional sustainability** of rural water and sanitation activities. It creates a framework for potential positive impact, but does not directly help to achieve it. Arguably, it has a more immediate role in determining the **environmental sustainability** of these initiatives, through the new structure of Basin Water Offices that it has established in the interests of integrated water resource management. With the several tiers of water user representation that the new Basin system proposes, the Ministry should ultimately

facilitate the required linkages between demand and supply in water resource governance. But the number of new structures proposed implies heavy institutional costs that Tanzania will not be able to meet in full for a long time to come. In the short to medium-term, the institutional linkages to environmental sustainability will remain more theoretical than practical - particularly at the local level in poor rural areas like Shinyanga. In the short-term, the practical consequence of MOW restructuring appears to be a withdrawal of technical expertise that might previously have been available in regional centres like Shinyanga. This expertise is meant to be correspondingly increased at district level (see below). It is too soon to say how effective this rearrangement will be.

Structures at the **regional level** play a background role with regard to the sustainability of rural water and sanitation interventions in Shinyanga Region. They are not designed for a lead role in implementation. Rather, they are meant to ensure compliance with national standards and policies, and to provide technical support to lower levels if required. As has been noted, technical expertise has been largely withdrawn from the water and sanitation sector at this level, although the Regional Secretariat retains a group of advisers. Until recently these advisers worked in clusters, each under an Assistant Secretary - water fell under the Social Services cluster. These clusters have now been disaggregated. More significantly, the Regional Monitoring Team remains in place, comprising the Water Adviser, the Health Adviser, the Livestock Adviser and other sector specialists. (Since November 2006 every Regional Secretariat has been provided with a Water Engineer.) This Team is meant to undertake multi-sectoral monitoring of the water and sanitation programme, alongside other development initiatives in the Region. As such it plays a valuable role in checking on performance and delivery by district councils and user groups, through review of reporting and periodic field visits. It can also promote synergy and check on cross-sectoral clashes or duplication, for example between the livestock, water and sanitation sectors. However, its resources are limited, and it will lose some of its mobility in the field now that the RWSSP has come to an end. Through its reporting it may be able to offer periodic commentary on issues of environmental, technical or institutional sustainability, but it is not able to make a major contribution towards the achievement of sustainable results.

Under the RWSSP approach (now reflected in national policy), the **district council** is the lead agency in the design, budgeting and implementation of rural water and sanitation programmes - alongside the users and beneficiaries of these programmes, who are meant to contribute to their installation and take full

responsibility for their operation and maintenance. The key agency of the council is the District Water and Sanitation Team, and its key officer is the District Water Engineer (DWE) - a cadre currently being reinforced across Tanzania. However, neither the DWST nor the DWE can undertake much direct implementation. Instead their roles are monitoring, co-ordination and supervision. The technical and facilitation work in the field must largely be contracted out to private sector service providers.

Although the DWE is responsible for ensuring, through these service providers, that groundwater availability and other environmental parameters are taken into account during the design and implementation of water and sanitation programmes, district level institutions are so far unable to play much of a direct role in water resource management or in ensuring the **environmental sustainability** of these programmes. Nor can they make much contribution to **technical sustainability** - a responsibility that current policy assigns to user groups. If their monitoring were more comprehensive and systematic, DWSTs would be able to enhance technical sustainability by identifying more maintenance problems before they happen. With their current resources, they have little choice but to be reactive rather than proactive.

The key issues at district level concern **institutional sustainability**. They take two forms. First, there are the issues of the district councils' and DWSTs' own institutional sustainability. Given that they are meant to play key roles in implementation and monitoring, do these structures have the necessary capacity, and is that capacity assured for the future? Secondly, are DWSTs making the necessary contribution to institutional sustainability at user level?

District structures' own institutional sustainability remains questionable. With the help of the RWSSP, district councils and DWSTs in Shinyanga Region have made real progress in building their capacity and competence. But there are still significant challenges. The quality of budget management remains uneven. As mentioned in Chapter 2 two district councils in Shinyanga Region failed the 2005 local government capacity assessment. RWSSP auditors' reports for the same period raise a number of serious questions about accounting competence. More broadly, it is clear that district councils lack the time and other resources to monitor user level implementation of water and sanitation programmes adequately. Field travel is expensive, and although councils' recurrent budgets are growing, they cannot cover the cost of the sort of comprehensive field monitoring that these rural programmes need. Nor are there enough days in the year. DWSTs do valuable

cross-sectoral monitoring work when they do go to the field, but they lack the capacity to monitor rural water and sanitation adequately, and they are unlikely to develop that capacity in the foreseeable future. Backstopping and monitoring are results based (i.e., focusing on performance and the achievement of outputs, outcomes and impacts (OECD DAC, 2002: 34)) only with regard to the implementation of new projects and expenditure versus budgets. There is no systematic monitoring in terms of overall plans for communities or districts at outcome or impact level. Implementation of the RWSSP itself has been guided by a logical framework, but this has not translated into the broader use of results-based monitoring across the sector in Shinyanga.

The most fundamental question, however, concerns the DWSTs' own training and skill, and that of the more junior staff within the respective technical departments of the councils who do much of the work in the field. The RWSSP has made a major contribution to training the individuals currently in post in the councils - although much of that training has gone to the senior staff, with probably not enough received at more junior technical levels. But, as in the WUGs, the question is how that capacity will be renewed over time. District councils do have human resource policies, co-ordinators and budgets, and PMO-RALG is steadily increasing the training funds at their disposal. But there is as yet no clear or co-ordinated strategy for the maintenance of DWST capacity over time, or for building and sustaining the skills of the more junior staff within councils' technical departments. Without such strategies, the institutional sustainability of councils, as key agencies in support of rural water and sanitation, is not assured. As in other aspects of the water and sanitation programmes, the emphasis at council level has been on implementation - the creation of competent DWSTs - rather than on sustainability.

In these circumstances, the answer to the second sustainability concern raised above can only be negative. DWSTs are not making an adequate contribution to institutional sustainability at user level. They should ideally operate a monitoring system that routinely checks on basic user institutional data such as frequency of meetings, scheduling of elections, financial reporting and gender balance, and periodically checks too on user satisfaction, disputes and other performance indicators. Despite the sterling efforts of the RWSSP to introduce the WADATA database, monitoring remains weak and WADATA does not cover all the required institutional variables anyway. (Indeed, the sustainability of WADATA after RWSSP termination is far from assured.) Nor are there clear plans yet for contracting out such monitoring to other service providers. District level structures and systems for nurturing local institutional sustainability are not yet in place.

At **local levels**, the potential contribution of government institutions to sustainability is largely unrealised. The Ward Development Committee (WDC), comprising the chairpersons of all village governments and all Village Executive Officers, has an important co-ordinating role to play and could help village governments link their monitoring of WUGs and sanitation issues into the structures of district councils. In practice, however, few WDCs have performed this function so far. Village governments, with their newly appointed Village Executive Officers, could also help to monitor the performance of WUGs in their respective jurisdictions and report issues upwards. Although such tasks are within the general terms of reference of these structures and officers at ward and village levels, their performance in support of water and sanitation programmes remains irregular and haphazard - although this should change as the new Water Sector Development Programme trains Ward Executive Officers in monitoring.

To optimise the contribution of this hierarchy of institutions to environmental, technical and institutional sustainability in rural water and sanitation, a dual challenge must be addressed. First, detailed work needs to be done, and procedures and modest capacity developed, for the ward and village levels of local government to help monitor these three sets of sustainability issues within their respective constituencies. Secondly, given the provision of the national Water Sector Development Programme for the appointment of Technical and Facilitation Service Providers, policy and strategy are needed for the allocation of monitoring roles between these commercial contractors and the local government agencies. Until these steps are taken, the contribution of government institutions to sustainability and positive impact in the sector will remain incomplete.

4.3.4 Non-governmental organisations

NGOs play two roles in water and sanitation programmes in Shinyanga Region. First, various organisations operate programmes for the sector. Secondly, NGOs can facilitate linkages and support within the sector, particularly to reinforce user institutions.

NGOs are not prominent in the development landscape of Shinyanga Region. However, a number of international and domestic NGOs have operated water and/or sanitation programmes there during the study period. Oxfam works mainly in the education sector, but responded to the drought emergencies of 1998-2000 with a programme to improve water supplies in Shinyanga town from 2000 to 2004. World Vision's focus is on children, but this also leads them into a small number of water projects around the Region. Both organisations report good co-

operation with government authorities and believe that local government reform has led to better relations with NGOs. World Vision has adopted the WUG concept, and uses district council expertise for most aspects of design, construction supervision and training in its water projects. Costs are also sometimes shared with councils, and World Vision may tackle elements of district councils' plans that the councils are unable to fund themselves. Despite reportedly enhanced collaboration, however, there have been instances during the study period when NGOs were less thorough than the Netherlands-supported programmes in fostering user ownership of the water facilities they were installing. Subsequent maintenance is believed to have suffered as a result. World Vision sometimes works under time constraints and is unable to wait for user groups to collect the required maintenance fund of TShs. 60,000. It gets around this policy requirement by simply helping the WUG to open a bank account, and then goes ahead with construction before the full amount has been deposited.

NGOs have a formal status under Tanzanian law, and are required to register with the authorities. A Shinyanga NGO network has been established and has reportedly been welcomed by government as a means of liaison and information. There is no formal mechanism for NGO-government co-ordination, however, and NGOs are playing no structured role in promoting the environmental, technical or institutional sustainability of water and sanitation initiatives in the Region. Whereas it might be expected that these civil society organisations could help the public to improve their awareness of water and sanitation issues and to monitor the performance of facilities in the sector, stimulating government to better performance, no such role has emerged among the few NGOs that operate in Shinyanga Region. Nor have any effective federal or umbrella bodies emerged to link user institutions, to help them share resources and ideas or to communicate their concerns to the authorities. The DWSP did launch an organisation for this purpose in 2000 - the Community Based Resource Centre (CBRC). This was intended to 'contribute practically towards the sustainability of community-based water supply and environmental sanitation systems through skill development and institutional capacity building as well as providing other after sales services such as supply of spare parts and major repairs of the systems' (RWSSP, 2006d: 43). But the CBRC (which considers itself a community-based organisation rather than an NGO) has not managed to become the umbrella body that it was meant to be. It provides various technical services to WUGs on demand - notably the quality assessment of newly completed wells before they are handed over by the contractor - and runs a spare parts store in Shinyanga town. It has explored the possibility of holding WUGs' maintenance funds on their behalf, but has not achieved clarity on

the legal aspects. Despite the major questions about user groups' institutional sustainability that such a federal structure ought to help answer, neither the CBRC nor any other NGO in Shinyanga Region is able to offer the necessary capacity. Nor is there any plan at present to redress the situation.

4.3.5 The private sector

Current policy for rural water and sanitation puts great emphasis on the role of the private sector, which is expected to do most of the awareness raising, facilitation, training and technical construction/installation work at user level. In principle, this is an important contribution towards institutional sustainability, since it is and will remain unrealistic to suppose that government agencies have the capacity to work on this scale. Whereas the public sector can be expected to take the lead in water resource monitoring and management, private businesses should over time be able to do most of the technical maintenance work and to undertake much of the ongoing institutional support to user groups and other structures. In practice, the private sector is not yet in a condition to assure any kind of sustainability for the sector.

One firm that has done well since it was established by the DWSP in 1999 is the Water and Environmental Development Company (WEDECO). Founded with support from the Netherlands-funded programme and initially comprising a group of former Rural Water Supply Engineers from the public sector, WEDECO has made the most of these institutional advantages and become a relatively large and thriving business that undertakes sensitisation, facilitation and training as well as the engineering work involved in rural water supplies. With 47 permanent staff, it now works in many other parts of the country as well as bidding successfully for much of the water project business tendered out by the municipal and district councils in Shinyanga Region. Even with its early advantages and continuing strong management, however, WEDECO suffers problems of liquidity and access to large equipment like drilling rigs that it cannot afford to own.

Smaller companies are increasingly active in the Shinyanga water and sanitation sector, but these face much more serious problems of capacity and liquidity. There are special challenges in the fields of awareness raising, training and facilitation, which the private sector is meant to supply alongside its technical and construction work. Public procurement regulations require councils to secure at least three tenders for each advertised contract, but sometimes one or more rounds of re-advertisement are necessary before enough bids are received. Emerging firms need support not only in developing

technical and financial capacity, but also in building social and facilitation skills.

The growing demands being placed on the private sector must be viewed in the context of Tanzania's political and economic history. Until recently, national policy and public institutions viewed business with suspicion. It has taken time to build the trust and understanding between civil servants and entrepreneurs that are needed for the private sector to play the role now demanded of it by water and sanitation policy. While these conditions are now partly in place within the municipal and district councils of Shinyanga Region, both sides need to build more capacity in this regard. Civil servants need more skill in procurement, and better understanding of the private sector's constraints. Businesses need better resources with which to cope with the exigencies of publicly funded contracts, and more skill in tender preparation and contract management. To date, there is no structure (such as a professional association or branch of the Chamber of Commerce) that links water sector companies together for these purposes.

So far, the private sector has done a significant part of the implementation in the water and sanitation programmes under review, but has contributed little to their sustainability or longer term positive impact. To make that contribution, firms must not only have the technical and social facilitation capacities; they must also be invited to tender for post-implementation programmes of monitoring and support that help users to assure technical and institutional sustainability. The new contracts for technical and facilitation service providers under the national Water Sector Development Programme will again focus on implementation of new facilities rather than the maintenance of existing capacity, although the Programme does also make provision for communities and private firms to draw up maintenance contracts.

4.4 Conclusions

This chapter of the impact evaluation addresses one of the eight key questions set for the study:

> 'To what extent has the policy and institutional strategy adopted in 2002 contributed to sustainable results in drinking water supply and sanitation?'

Assessment of sustainability from an institutional perspective helps to explain the impact of the interventions. Three dimensions of sustainability are reviewed: the

environmental dimensions concerned with sustainable water resource management; the technical aspects of sustaining water supply infrastructure; and the core institutional concerns about maintaining capacity to sustain water and sanitation supplies and programmes - notably at user and district council levels, but with reference also to village, ward, region and national levels of government, as well as non-governmental organisations and the private sector.
Current arrangements at regional and district council levels are in line with the Local Government Reform Programme. Roles and responsibilities have been clearly defined and are generally well known, understood and practised - although roles and capacity at regional level have recently been reviewed, and roles at ward and village level could be specified and developed further. These arrangements represent a significant step forward. So too does the harmonisation of RWSSP planning with council planning cycles, although complete integration with standard local government structures and systems will only occur after termination of the final Netherlands-supported programme in December 2006.
Much progress has also been made in developing capacity at all levels, notably among WUGs and District Water and Sanitation Teams, as indicated by the increase in implementation capacity and in the percentage of operational wells (currently about 90%). NGOs and the private sector have increasingly important roles to play, but still lack the capacity to fulfil them adequately or at all.
WUGs generally conform to the standard of a gender-balanced management committee. However, gender sensitivity in water supply management leaves room for improvement. Some women office bearers are still dominated by male colleagues or by other senior men in the community, and most water collection continues to be done by women while men are more prominent in commercial water selling. When water supply problems arise there is less urgency for men than for women to tackle the problem - because it is the women who must obtain water from alternative usually more distant and difficult-to-draw sources.

At all levels, the emphasis so far has been on implementation: installing technical and institutional capacity without necessarily ensuring that they will function in the long term. The failure so far to ensure the sustainability of institutional capacity is the principal reason why the overall sustainability of the achievements in rural water and sanitation in Shinyanga Region must remain in doubt. There is growing awareness of environmental sustainability issues, but little capacity so far to address them, despite the recent restructuring of the Ministry of Water around the concept of integrated water management. Technical sustainability is not assured because it is not clear that users will have the financial or institutional resources for the future maintenance and replacement of infrastructure. Most

fundamentally, more needs to be done to secure the institutional sustainability on which positive impact in the sector ultimately depends. Current backstopping and monitoring arrangements are inadequate for this purpose. Results-based monitoring is largely restricted to outputs, and monitoring information is only partially used to keep programmes on track and address bottlenecks.

Annex 1 About the Policy and Operations Evaluation Department

Objectives

The objective of the Policy and Operations Evaluation Department (IOB) is to increase insight into the implementation and effects of Dutch foreign policy. IOB meets the need for independent evaluation of policy and operations in all policy fields falling under the Homogenous Budget for International Cooperation (HGIS). IOB also advises on the planning and implementation of the evaluations for which policy departments and embassies are responsible.

Its evaluations enable the ministers to account to parliament for policy and the allocation of resources. In addition, the evaluations aim to derive lessons for the future. Efforts are accordingly made to incorporate the findings of evaluations into the Ministry of Foreign Affairs' policy cycle. Evaluation reports are used to provide targeted feedback, with a view to improving both policy intentions and implementation. Insight into the outcome of implemented policy allows policymakers to devise measures that are more effective and focused.

Approach and methodology

IOB has a staff of experienced evaluators and its own budget. When carrying out evaluations, it calls on the assistance of external experts with specialised knowledge of the topic under investigation. To monitor its own quality, it sets up a reference group for each evaluation, which includes not only external experts but also interested parties from within the Ministry.

Programme

IOB evaluations form part of the Ministry's evaluation programme (set annually by the Senior Management Board) that appears in the Explanatory Memorandum to the Ministry of Foreign Affairs' budget.

An organisation in development

Since IOB's establishment in 1977, major shifts have taken place in its approach, areas of focus and responsibilities. In its early years, its activities took the form of separate project evaluations for the Minister for Development Cooperation. Around 1985, evaluations became more comprehensive, taking in sectors, themes and countries. Moreover, IOB's reports were submitted to parliament, thus entering the public domain.

1996 saw a review of foreign policy and a reorganisation of the Ministry of Foreign Affairs. As a result, IOB's mandate was extended to the Dutch government's entire foreign policy. In recent years, it has extended its partnerships with similar departments in other countries, for instance through joint evaluations.

Finally, IOB also aims to expand its methodological repertoire. This includes greater emphasis on statistical methods of impact evaluation.

Annex 2 Terms of Reference

Water is Life

1. Rationale, purpose and scope of the evaluation

Water is essential for human life and dignity. Netherlands development co-operation has been active in water supply for over 30 years. The Policy and Operations Evaluation Department (IOB) of the Ministry of Foreign Affairs has initiated a series of impact evaluations of support to water supply and sanitation activities. The first in this series concerns the Netherlands-supported programmes in Tanzania, Shinyanga region, where the Netherlands involvement started as long ago as 1971. The evaluation coincides with a planned final Review of the 2002-2006 Shinyanga Rural Water Supply and Sanitation Programme, a joint activity of the Ministry of Water and the Royal Netherlands Embassy. It has been decided to merge the impact evaluation and the final review.

The purpose of the impact evaluation is both to account for the long-term support provided to rural drinking water supply and sanitation in Shinyanga region as well as to draw lessons that will be useful for policy formulation. The impact evaluation is expected to contribute to methodological knowledge on impact evaluation in water supply and sanitation.

Tanzania and the Netherlands are signatories to the Millennium Development Goals that include the targets of halving the proportion of people without access to safe drinking water and without access to hygienic sanitation. The ultimate purpose of support to water supply and sanitary facilities goes well beyond access: this support is intended to improve health, reduce mortality, reduce women's workload, raise school enrolment and attendance and enable increased productivity. There is consensus on the importance of such ultimate impacts on human welfare but conventional evaluation studies do not usually quantify them. Quantification is a key characteristic of the proposed impact study which is therefore in two parts.

The first part describes the problem, context and key inputs, outputs and outcomes of the programmes since 1990. The second part attempts to estimate impacts such as health improvements and to attribute these where appropriate to the programme activities. Stakeholders (including government agencies, donor agencies and NGOs) have indicated their interest in both parts.

2. Background of the Programmes

Shinyanga Region is one of the twenty one regions of Tanzania mainland and located in the northern part of Tanzania. The region occupies an area of 50.780 square km. The current population is about 3 million, of which 90% is living in rural areas. The average household size is 6.3. The major economic activity on which the population depends is subsistence farming. Food crops are maize, millet, paddy, sweet potatoes and cassava. The main cash crop in the region is cotton for which about 10% of the arable land is cultivated. Livestock keeping is the second dominant economic activity in the region.

Surface water is the most commonly used source of water, but neither its availability nor its quality is very good. Most surface water is seasonal and contaminated by cattle, human beings and insects. All rivers and streams in the region are seasonal. Groundwater does not occur in abundance. Yields of wells and boreholes are generally low and quality is variable, from excellent to extremely poor; high salinity and/or fluoride being the major quality problems. Rapid increase of the human and livestock population puts an increasing strain on the relatively scarce water resources of the region. Water for drinking and cooking is usually carried by women or hauled on to a bicycle by men, while there is a tendency to bathe and wash clothes and dishes at the water point itself.[32]

Evolution of the Tanzanian National Water Policy dates back to 1971 when the Government of Tanzania declared a 20-year water supply programme (1971-1991) whereby it was envisaged that all inhabitants would have access to safe and reliable water sources by 1991. Ten years later it was clear that the target was far from being achieved. Among the key reasons for poor coverage were the top-down approach from the central government and inappropriate technologies that were beyond the capability of the communities to operate and maintain, and which the government could not sustain. In 1991 the Government approved the first National Water Policy with community participation through village water committees, establishment of village water funds and adoption of technologies that are both

32 Source: Characteristics of Shinyanga region environment, 1997.

affordable and easy to operate and maintain, as key features. The Government retained the role of investor and would be partly responsible for operational and maintenance costs. With the advancement of time it became apparent that the Government could not continue meeting operational and maintenance costs, and communities were encouraged to manage the schemes and establish their own water entities.

In the new National Water Policy (NAWAPO) of 2002, rural water supply service delivery aims at improving health and alleviating poverty of the rural population through improved access to adequate and safe water. Specific objectives are to:

- provide adequate, safe, affordable and sustainable water supply services to the rural population;
- define the roles and responsibilities of the various stakeholders;
- place emphasis on communities paying for part of the capital costs, and on full cost-recovery for operation and maintenance as opposed to the previous concept of cost-sharing;
- evolve from a traditional supply-driven to a demand-responsive approach;
- manage water supplies at the lowest possible level of the community;
- promote the participation of the private sector in the delivery of goods, services and works; and
- promote health through integration of water supply, sanitation and hygiene education.[33]

The National Strategy for Growth and Poverty Reduction (MKUKUTA) calls for improving Tanzanian water supply to 65% coverage by 2010. Water supply is identified as one of the seven priority poverty reduction strategies. The MDG target translates into a target of 74% water supply coverage by the 2015 deadline. The Shinyanga Region water service coverage rate was estimated in 1992 at 10.5% and by December 2005 at 43% of the population. Data on coverage rate for improved sanitary facilities based on definitions used by the UN are not available.

In 1989 the Netherlands produced a sector memorandum on drinking water supply, sanitary facilities, drainage and waste disposal that strongly endorsed an integrated approach in which improvements in water supply are linked to improvements in sanitation, drainage, solid waste disposal and hygiene

33 Source: Rural Water Supply and Sanitation Program in Shinyanga region, background and program status 2006.

behaviour. Furthermore, it emphasized the need for user participation, which was seen as an essential element in ensuring more appropriate technological choices, a greater sense of responsibility among users and, in the long run, the devolution of operational and maintenance tasks. The memorandum underlined the importance of economic and social sustainability. In 1989 the Ministry also published the policy document 'Women, water and sanitation' that specified the role of women in user participation with a view to arrive at better management and maintenance of facilities, safer hygiene behaviour and reduction of women's workload. In 1998 the policy document 'Drinking water supply and sanitation' was published. The central principle for drinking water and sanitation laid down in this document is to ensure the sustainability of water supply and sanitation facilities by designing, implementing and operating facilities which are desired by and can be managed or co-managed by the users themselves. The construction of capital-intensive infrastructure was to be left to commercial banks and international financing institutions. Since the end of the 1990s the Netherlands has been promoting a sector wide approach to development co-operation, including for water supply and sanitation.[34] In 2004 the Minister for Development Co-operation made a commitment to contribute to Millennium Development Goal 7 - to ensure environmental sustainability, by providing sustainable access to safe drinking water and basic sanitation with an additional 50 million people by 2015.[35]

The selection of Shinyanga Region for Netherlands support was rather arbitrary. Tanzania had no explicit regional priorities. A crucial criterion in the selection was the focus on target-group orientation, as Shinyanga was one of the poorer regions of Tanzania. The Tanzania-Netherlands Co-operation Programme for Rural Water and Sanitation Development in Shinyanga Region included the following:

1. Shinyanga Region Water Resources Survey (1971-73)
2. Shinyanga Shallow Wells Project (1974-78)
3. Shinyanga Wells Rehabilitation Project (1980-82)
4. Shinyanga Rural Water Supply Programme (1985-87)
5. Shinyanga Rural Water Supply and Sanitation Programme (1988-93)
6. Shinyanga Domestic Water Supply Programme (1993-2002)
7. Shinyanga Rural Water Supply and Sanitation Programme (2002-2006)

34 Reference to the document: Sector-wide Approach for Water and Sanitation Development, 2002.
35 Source: Progress of the Water Program 2004, letter to Parliament, May 2005.

The current evaluation proposal roughly covers the last three programmes in the Shinyanga Region. The period covered follows the period for the MDG targets. Exact figures on budgets and expenditures on the programmes between 1990 and 2005 are not readily available, which is partly explained by the fact that the Domestic Water Supply and Sanitation Project covered two regions, Shinyanga and Morogoro. The programme expenditures for Shinyanga Region as from 1990 are estimated at approximately EUR 25 million.

Water supply surveys undertaken between 1971 and 1973 formed the basis of the Shinyanga Master Plan. The Master Plan stressed the importance of shallow wells which were deemed to be least expensive in serving the rural population, to provide good quality water, and to be easily manageable at the community level. Accordingly, a large number of shallow wells were constructed in the 1974-78 period. Shallow wells have remained a key element ever since. Some of the Shinyanga experience has served as a basis for national policies for the sector.

Prior to 1993, wells were handed over to village governments but water users had no role in site selection, construction, operation and maintenance. This was changed in 1993 when Water User Groups were established to manage water facilities. This element of the Shinyanga programme is generally considered a successful innovation and has attracted much attention.

With a view to integrate the Rural Water Supply and Sanitation Programme (RWSSP) Shinyanga Region into government policies and structures, a new institutional strategy was adopted n 2002. The current programme falls within the Tanzanian local government system, which is based on political devolution and decentralisation of functions and finances to district councils and lower local government/communities. A big difference from the former Domestic Water Supply Programme (DWSP), whereby the project approach was practiced, is that the current programme bases its activities on prepared district plans as a main element of a sector-wide approach. Other innovative elements of the new strategy include the changing functions of government institutions towards a more regulating and facilitating one and the technical backstopping, capacity building and monitoring role of the Regional Secretariat. The National Rural Water Supply and Sanitation Programme concept document that was recently presented by the

Ministry of Water refers to the programme for Shinyanga as one of the implementation models that show the NAWAPO's policies in practice.[36]

This evaluation will be mainly concerned with shallow wells, and will pay special attention to the institutional innovation of the water user groups. The evaluation will also pay special attention to the new institutional strategy adopted in 2002.

3. Evaluation questions

In this evaluation the following key questions will be addressed, in order to meet the combined objectives of the impact evaluation and the final review of the 2002-2006 Shinyanga RWSSP:

1. What have been the key aspects of the problem and the context for water and sanitation activities in Shinyanga Region since 1990?
2. What have been the objectives and stated target groups and key targets of the successive Netherlands-supported programmes for rural water supply and sanitation in Shinyanga region since 1990?
3. What have been the key inputs provided, the strategies adopted, types of activities undertaken and what key results (output, outcome) have been achieved as compared to targets?
4. To what extent has the policy and institutional strategy adopted in 2002 contributed to sustainable results in drinking water supply and sanitation?
5. To what extent have the programmes been effective?
6. To what extent have the programmes been cost-effective?
7. What has been the impact of the programme on target groups?
8. Which lessons can be drawn from the findings?

Effectiveness is defined as the extent to which the key direct results of the programmes (outputs) have contributed to the (sustainable) realisation of the objectives and overall purpose (outcomes/impact).

For an overview of indicators for key inputs, outputs, outcomes and impacts, reference is made to the attached evaluation matrix.

36 Reference the Ministry of Water, National Rural Water Supply and Sanitation Programme concept document, February 2006

Cost-effectiveness refers to the relation between the costs and the outcomes/ impacts (costs per capita, change in impact variables). Could the same outcomes/ impacts have been achieved against less costs?

Impact is defined as the effects of the Netherlands-supported Rural Water Supply and Sanitation Programmes on the target groups (male and female). The impact assessment should help to understand better to what extent activities have reached the poor, and the magnitude of the effects on people's welfare. The study will attempt to relate the findings on impact to programme strategies, outputs and outcomes.

4. Methodology

The methodology will be a combination of qualitative and statistical methods. Data collection will be through the study of existing data and documentation, sample-based village level data collection, interviews of members of selected households and interviews of key players.

The study will comprise two parts.

The first part addresses questions 1 to 4 and establishes the facts concerning the problem, context, key inputs, outputs and (partly) outcomes.
To address question 4 a short mission will be organized towards the end of the study to assess the new institutional strategy adopted in 2002 (in light of relevant policies). This mission will benefit from the data collection undertaken on inputs etc.

The second and major part of the study is concerned with impact variables and addresses questions 5 to 7, focusing on impact at target group level. Here the central issue is to what extent observed changes in impact variables (such as under-five mortality) can be attributed to the programmes. This requires a careful consideration of other factors which may have affected the impact variables, e.g. the occurrence of a drought or interventions supported by other donors or NGOs. This widens the scope of the investigation considerably: not only the inputs and outputs under the programme have to be considered but in principle also all other influences on outcomes and impact variables. As a result, the study will require a major effort of collecting both existing and new data. The first part of the study will obviously also benefit from this data collection.

The study will end with a workshop involving researchers and stakeholders during which the findings of the two parts of the study will be presented and discussed. Both parts will help answer question 8 on lessons that can be drawn, which will be the major theme of the workshop.

Part 1

Context

The study will outline key aspects of the context for the water supply and sanitation initiatives in Shinyanga Region since 1990:

- natural environment, including;
- climatic events and trends;
- trends in groundwater quality and availability;
- demography;
- economic opportunities, constraints and trends over the study period;
- poverty variation in the region;
- HIV/AIDS prevalence;
- social and cultural trends, including gender;
- problems in water supply, sanitation and hygiene as experienced by the authorities;
- water and sanitation initiatives supported by the Netherlands before 1990;
- water and sanitation initiatives supported by other agencies since 1990;
- relevant developments in the policy and institutional context;
- water supply and sanitation;
- local government;
- health;
- primary education;
- land ownership.

Input and output

Drawing on available data and documentation, the study will outline the content of the water and sanitation programmes supported by the Netherlands in Shinyanga Region since 1990, focusing on:

- the financial inputs provided;
- the technical and institutional strategies adopted (with reference to national policy), including types of water technology supported, approaches to design, planning and delivery, monitoring and evaluation, strategies for water user

participation and for addressing gender issues, and funding and cost recovery arrangements;
- strategies to involve the poor/ marginalized groups;
- the types of activities undertaken;
- the outputs achieved;
- number and coverage of functioning water supply facilities;
- number and coverage of improved sanitation facilities;
- special provisions, such as for washing, bathing, vegetable gardening;
- functioning operation and maintenance arrangements;
- functioning water management and support institutions, with related registration and tenure arrangements;
- water users and CBO (m/f), government and NGO personnel who have received training and on what;
- hygiene awareness;
- comparison of key planned and actual outputs and targeting;
- trends in the costs per facility and per capita that were incurred over the study period;
- trends in the estimated proportion of the region's population served by improved water sources and sanitation facilities.

This list is not exhaustive. Before or during the study, other variables may be identified for inclusion.

Outcomes

It will be necessary to clarify what the outcomes of these programmes have been. Have the activities and outputs (such as training and shallow well construction) led to the intended increased access to improved water sources, consumption of safe water, sanitation practice and institutional performance? Key issues are identified below. Before or during implementation, the study team may decide to address additional outcome variables:

- the technical sustainability of the wells and hand pumps;
- access to and use of water: who collects the water, who uses the water and for what purpose; what is the nature of the user group; what happened to the traditional water sources and who benefited from the improved supplementary source in what ways; inclusion or exclusion of the poor/marginalized groups in access to improved water sources. Although some estimates are available, there are no measured data on the amounts of water that are used per person from the improved sources installed by the programmes under review. The

study will undertake a limited programme of observations at sample water points to generate indicative data on this key issue, and will determine how to adjust the observed quantities for seasonal variation, based partly on community reports;

- quality of water: the physical, chemical and biological quality of water from improved sources is measured during installation, but not systematically thereafter. The study will measure these attributes at sample points in order to estimate the aggregate water quality;
- access to and use of sanitation facilities: although detailed data are available on households' ownership of latrines and other toilet facilities, the categories used are too broad and there is uncertainty as to the proportion of the population who actually have access to latrines or toilets of adequate quality. It is also known that access to such facilities does not guarantee that they are used. In sample communities, the study will survey the types of latrine or toilet facility that households and members within the household (men and women) prefer, have and use, as well as the latrine upkeep;
- hygiene practices: much of the potential health impact of improved water supply is conditional on the adoption of the hygiene practices that the water supply facilitates, such as bathing, the cleaning of food, the washing of hands by all household members at all critical times, and washing and hygiene during childbirth and in care of the sick. The study will also assess hygiene practices in storage and drawing of drinking water;
- use of special provisions such as for washing, bathing and vegetable gardening;
- functioning of water user groups: broader institutional impacts for communities are conditional on the institutional quality of water user groups. In sample villages the study will record objective institutional variables such as WUG membership, assets, frequency of meetings, who of the members attend the meeting (all or only better of men and/or women), who makes the decisions, who have been trained on what? It will also undertake participatory reviews with Water User Groups (WUGs) and village governments of WUGs' institutional capacity and performance, including their management of physical and monetary assets and their effectiveness in ensuring sustainability of the improved water supply and in solving possible conflicts between different user groups; and
- the study will explore how HIV/AIDS affects water use.

The short mission for the assessment of the effectiveness of the institutional strategy adopted will address the following questions:

- Is the set-up at regional level and council level in line with the Local Government Reform Programme? Have roles and responsibilities been clearly defined? Are these definitions of roles and responsibilities known and practiced?
- Are the concerned institutions sufficiently capacitated for the respective (new) functions and responsibilities for implementing the Water Policy with respect to rural water supply and sanitation?
- Has the planning of the RWSSP been harmonised with and integrated in the council planning cycle?
- Has the backstopping and monitoring at regional and district level been results based and to what extent is monitoring information used to keep on track and address bottlenecks?
- To what extent has the new institutional strategy enhanced and contributed to sustainable results? How is sustainability of the strategy perceived by authorities and by different user groups?

The short mission will be undertaken by two, maximum three experts with broad expertise in the rural drinking water and supply sector in Tanzania and expertise in institutional development. This assessment will make use of the findings from other parts of the study and will at the same time inform the study, in particular in respect to the sustainability of results.

Part 2

Impact Analysis

The second part of the study is concerned with impact and its attribution. This will involve a statistical analysis of existing and newly collected data. Three domains of impact will be considered, in line with programme documents:

- Health improvements: reduced incidence of water- and sanitation-related diseases (where recorded); reduced mortality
- Gender equality: -changes in time taken to collect water by women and girls -girls' school enrolment and attendance
- Livelihood: changes in economic activities, poverty reduction

In poverty analysis the unit of analysis is typically the household. This is not appropriate in the present context since water and sanitation activities are likely to have effects which are highly correlated across households in the same location. It is therefore more efficient to sample locations than households. The study will use

the village as the primary sampling unit. A representative sample (probably about 100 locations) will be drawn in such a way that the probability of a location to be sampled is proportional to its size in terms of population. Stratification will be used to ensure an adequate coverage of rural towns. Some of the data will be collected at the level of a water user group or association. If a location has more than one of these then one will be selected randomly.

The choice of the impact variables is partly based on practical considerations. In principle one would like to include as many impact variables as possible: missing impact, positive or negative, biases the overall assessment. The three categories of impact variables above reflect government priorities in Tanzania. Within these categories key variables are chosen that can be expected to be observable by means of the survey instrument or are available from existing sources such as census information, or records from dispensaries and Water User Groups. While it is clear that no impact variables can be used for which there are no data available, or which can only be observed at excessive cost, the ultimate set of impact variables will be decided in a brief pilot data collection effort in close consultation with the Ministry of Water (Tanzania) and a sector specialist.

Although the focus is at the group (rather than the household) level, part of the impact is still likely to depend on changes at household level. For instance, for sanitary practices to be effective they must be shared by *all* household members. Therefore, to validate the information collected from the survey additional qualitative interviews at household level are planned at a limited number of locations.

In impact evaluations one usually compares an indicator variable for a treatment group and a control group. For example, one may compare mortality in a village which has benefited from hygiene training with mortality in one that has not. Many variables other than the training programme obviously affect mortality. While the nature of treatment is binary in this example (the village did or did not receive training) 'treatment' in the Shinyanga programmes takes many forms. This introduces heterogeneity in the treatment group: villages differ not only in *whether* they have a well but, if so, also in when that well was installed, what type it is, whether it was rehabilitated, how far away it is located, whether they received training in hygiene, the proximity of latrines and in many other ways. This rules out a standard statistical impact evaluation design. Instead the study will largely rely on a multiple regression approach which can capture heterogeneity of treatment, and can also control for many (but not all) non-treatment influences.

Implications for data collection

Village level data on construction and rehabilitation of wells, dams and boreholes are available in the water database. These data need to be supplemented with data collection in the village to establish a 'complete' event history: did the well run dry? When? Did it stop functioning? Did people continue to use alternative water sources? Was there a drought? How much did the population grow? How did water use change over time? (Note that this covers some of the outcome variables needed for part 1.)

This data collection will be a major effort since a large number of villages will need to be visited.

Statistical approach

Impacts can be identified on the basis of observed differences: differences between communities and differences over time. The study will use both.

For some impact variables there are observations for different points in time. For example, monthly data on incidences of various diseases are available at dispensaries. Changes over time in the impact variable can then be related (in a regression) to changes in explanatory variables which will include the treatment variables for water and sanitation and also non-programme variables which may have affected the impact variable. In this way unobserved (and time-invariant) differences between villages will be filtered out.

In cases the impact variable is not measured at the village level. Consider the incidence of diarrhoea. This is a variable which is recorded at dispensaries (usually since the early 1990s). It is a noisy indicator of diarrhoea incidence at the village level since a dispensary serves a number of different villages and, in addition, because those seeking help are a subset of those affected. This makes it more difficult to find significant changes in the impact variable. However, it may be possible to obtain village level data for some of the health impact variables, notably for relatively rare events such as cholera outbreaks where questions on recall can be relied upon.

Furthermore, in some cases there are no direct observations on the impact variable concerned, e.g. poverty or welfare more generally. However, the census provides variables which can be used as proxies. This can apply either at the household orat

the community level. As before, these estimates can be related in a regression to treatment and non-programme variables.[37]

A two-pronged approach will be followed. Firstly, reduced form estimation will provide estimates of the effect of inputs (e.g. shallow well construction) on impact variables. Such estimates are very useful in themselves since they allow an assessment of the effectiveness of the intervention, the main objective of the evaluation. It can be objected that this is a black box approach which does not explain *why* cholera, for instance, responded to the construction of the well. Therefore, secondly, whether outcome variables which are known to intermediate the effect of water availability on cholera incidence (e.g. the amount of safe water consumed) have indeed improved as well, will be assessed. This would make an estimated effect of the well on cholera incidence all the more credible.

3. Organization and Timing

The impact evaluation will be a joint effort of the Policy and Operations Evaluation Department of the Netherlands' Ministry of Foreign Affairs (IOB), the Tanzanian Ministry of Water, the Amsterdam Institute for International Development (AIID) and the Tanzanian institute REPOA. IOB will be responsible for overall supervision and funding of the study. AIID is the main implementing consultant for the study for which AIID has established collaboration with REPOA.

The major activity of the study will be the village level data collection. This requires sophisticated quantitative and qualitative data collection techniques. A very substantial involvement of Tanzanian researchers and students is envisaged, both in the data collection and in the subsequent analysis.
The tentative planning of the study is as follows:

- May-June: study of existing data and documentation for first part of the study, preparatory activities for the field survey; recruitment of a sector specialist;
- July-August: field survey (i.e. post-harvest);
- October/November: assessment of institutional strategy;
- End of October: first draft of the study report, to be discussed in a workshop in November.

37 Since the dependent variable has been conditioned on the census variables, care has to be taken with respect to the same interpretation of the estimated impact effects.

A reference group will be appointed for the impact evaluation. It will include three members who will also serve on reference groups for other impact evaluations of Netherlands support to the water supply and sanitation sector:

- a representative of the Netherlands' Ministry of Foreign Affairs Department for Environment and Water (Mr J Bijlmer);
- a representative of the Netherlands Ministry's Department of Effectiveness and Quality of Development Co-operation (Mr P. Bastiaenen); and
- and expert of the IRC International Water and Sanitation Centre (Ms C. Sijbesma).

The reference group will also include two members who can offer specific expertise for this Tanzanian impact evaluation:

- a representative of the Ministry of Water of Tanzania (Mr J. Mukumwa); and
- a representative of the organisation Water Aid, Tanzania Office (Mr D. de Waal).

This reference group will comment and advice on the main draft documents for the impact evaluation, notably the draft terms of reference for the studies, draft interim reports and the draft final reports.

The draft final Terms of Reference and report for the study of the programmes for Shinyanga Region will be shared with the Ministry of Water of Tanzania, for its concurrence. The final responsibility for these documents is with IOB.

Evaluation matrix Annex

Objective-means	Indicators/ variables	Sources
Input Operationalisation of activities	• Financial inputs • Technical and institutional strategies (with reference to policies): - Types of technologies supported; - Approaches to design, planning, delivery, M&E - Attention for water user participation, gender issues - Funding and cost recovery • Strategies to involve the poor / marginalized groups • Types of activities undertaken	Policy documents Project documents Year plan/report MIDAS/Piramide
Output		
Water and Sanitation systems Operational facilities Quality and quantity of water consumed Linkages between drinking water, sanitation, hygiene practices	• Use of appropriate technologies that can be managed or co-managed by users • Number and coverage of functioning water supply and sanitation facilities • Special provisions such as for bathing, washing, vegetable gardening • Functioning operation and maintenance arrangements • Functioning water management and support institutions with related registration and tenure arrangements • Hygiene awareness • Trend in costs per facility and litre of water • Trend in cost recovery	Regional water database Project documentation Results of village level data collection Results of interviews of key players

Outcome		
Increase in number of beneficiaries of improved facilities Increase in access (time, distance) to safe water Increase in use of basic sanitation facilities Improvement of hygiene practices	• Technical sustainability of wells and hand pumps • Number of users/beneficiaries (m/f) and purpose of use • Increase in water consumption • Quality of drinking water • Access to and use of sanitation facilities • Changes in hygiene practices • Inclusion/exclusion of poor/ marginalised groups (m/f) • Functioning water user groups: - Male/female membership - Frequency of meetings - Assets - Effectiveness in ensuring sustainable water supply - Levels of conflict and conflict resolution • Trend in costs per capita	National and local statistical data Regional water data bank Results of village level data collection and interviews of key players
Impact		
Health, gender equality and poverty impact	• Incidence of water and sanitation related diseases • Mortality • Gender equality: - time taken to collect water - girls' school enrolment and attendance • Livelihood: economic activities, poverty reduction (m/f)	National and local statistical data Results of village level data collection

Annex 3 Brief guide to understanding regression results

This annex is intended to help the reader interpret the results in Chapter 3 which uses regression techniques to assess the impact of improved water facilities.

Regression is a tool for studying how a variable of interest (e.g. health outcome) is related to one or more other variables (e.g. the access to safe sources of water). Regression is a quantitative technique so all variables must be represented by quantities, including numbers and categories. The results of a regression include 'coefficients', i.e. numbers indicating how in the sample the variable of interest responds to changes in the other variables; in addition, the precision by which the coefficients have been estimated is always reported, either as t-value (as in this report), or equivalently in the form of standard errors. High t-values (or low standard errors) are a sign that the estimated coefficients reflect a true relationship and are not just the fluke outcome of the particular sample that has been drawn. The normal benchmark for t-values in the analysis of social data is an absolute value of 2 or higher. With t-values so high one would only rarely (one sample out of every 20 samples) be mistaken in concluding that a true relationship exists. On the other hand, lower t-values do not show that a relationship does *not* exist, only that one can be less sure about it.

Take the following regression which is taken from Table 15 in the report.

Hand Washing	Coeff.	t-score
after toilet (WUG)	-0.15	-0.3

Here the variable of interest, the so-called dependent variable, is 'hand washing after toilet': the share of children in a Water User Group (WUG) washing their

hands after toilet use.[38] In the regression, children's hand washing is related to a variable indicating whether the corresponding Water User Groups report to have received hygiene training or not. This variable is called an explanatory variable. In this case it is a categorical variable with a value of 1 for groups which did, and a value of 0 for groups that did not receive hygiene training. The negative coefficient value (-0.15) shows that in the sample a *lower* share of children wash their hands in groups that reported to have received training, which of course is a disappointing result. On the other hand the t-score has an absolute value of 0.3, far below the benchmark of 2, showing that no conclusion can be drawn on the particular relationship between hand washing and hygiene training. Based on the regression above, statisticians would conclude that the true value of the coefficient[39] could be as high as 0.85 (indicating a strong positive effect of training), or as low as -1.15 (indicating a strong negative effect). The bottom line is that regression coefficients only become interesting as the corresponding t-values approach the benchmark value of 2 or higher.

One of the reasons that the regression result above is indecisive could be that other factors determine hand washing practice than hygiene training alone. One would like to 'control' for such other differences between groups. This is demonstrated in Table 17, from which the regression for eye infections is reproduced below.

	Eye Infections	
	Coeff.	t
△Source	0.288	2.66
HQ.Recent	0.087	1.62
WUG size	-0.002	-1.73
Training	0.100	0.71
Constant	0.584	5.07

The dependent variable in this regression is 'reported lower incidence of eye infections' in the Water User Group. The regression addresses the question whether the reduced incidence of eye infections (as reported in Table 16 of the report) could perhaps be attributed to a switch to safer water sources (△Source in the table above). Some potential other factors that could have contributed to a

38 The share is measured in quarters on a scale from 0 (nobody) to 4 (all children in the group).
39 The true coefficient value would be the outcome of a regression involving all Water User Groups, not just the ones sampled.

perceived reduction in eye infections are also included among the explanatory variables: HQ.Recent (see the text surrounding Table 17) is included to control for the relative wealth of Water User Groups, WUG size to account for potential size effects, and training for the impact that hygiene training could have. The high t-value associated with the coefficient for △Source strongly indicates a significant positive effect of a switch to safer sources of water on eye diseases. Note that the wealth of WUGs and their size do seem to have an effect, with their t-values approaching the benchmark value of 2. Training has a positive effect now, although as before the low t-value indicates that it is insignificant.

The last regression also illustrates another point. It is relating a *change* in health to a *change* in water sources. Generally, a significant coefficient in regressions of changes on changes is considered more convincing evidence that the relationship between dependent and explanatory variable is a causal one, not just a correlation that could arise from deeper underlying determinants. This method of relating changes to changes is at the heart of so-called 'fixed-effect' regressions, an example of which is shown in Table 20 of the main report.

Annex 4 Institutional assessment: list of interviews

Water User Groups:

Mwandutu Water User Group, Igolola Village, Shinyanga District Council
Imalasabo Water User Group, Shinyanga District Council
Maelewano Water User Group, Maganzo, Kishapu District Council
Mhunze Piped Water Scheme, Water Committee, Kishapu District Council
Mbuyuni Windmill Water User Group, Bugayambelele, Shinyanga Municipal Council
Ngovu kazi Water User Group, Uzogole Village, Shinyanga Municipal Council
Mkombozi Water User Group, Seseko Village, Shinyanga Municipal Council
Maendeleo-A Water User Group, Bukingwaminzi, Mwambiti Village, Meatu District Council
Mwandoya Water User Association, Meatu District Council
Muungano Water User Group, Mwakibuga Village, Bariadi District Council
Upendo Water User Group, Igegu Village, Bariadi District Council
Mkuyuni Water User Group, Masabi Village, Kahama District Council
Ujamaa Water User Group, Masabi Village, Kahama District Council

District Water and Sanitation Teams:

Shinyanga District Council (DWST)
Kishapu District Council (DWST)
Shinyanga Municipal Council (MWST)
Meatu District Council (DWST)
Bariadi District Council (DWST)
Kahama District Council (DWST)

Shinyanga Regional Secretariat

Eng. Yohana Monjesa (Mr)	Assistant Administrative Secretary	Shinyanga Regional Secretariat
Mr A Kabeya	Health Adviser	
Mr A Likoko	Community Development Advisor	Shinyanga Regional Secretariat
Mr A Mahuyemba	Livestock Development Adviser	Shinyanga Regional Secretariat

Shinyanga NGOs and Private Sector

Mrs Nafikahedi Kimambo	Zonal Co-ordinator (HIV/Malaria)	World Vision Shinyanga
Mrs Mwanasha Ally	General Manager	WEDECO
Eng. Godfrey Kawa (Mr)	Resource Engineer	CBRC
Audifax L Matina	Chairman	CBRC
Mr Sixbert Mbaya	Program Manager	OXFAM GB Shinyanga
Mr Dunstan Manjolo	In charge of WATSAN	OXFAM GB Shinyanga

DHV Consultants at Shinyanga

Mr Lucas Bakker		DHV, Shinyanga
Eng. K J B Bwire		DHV, Shinyanga
Mr I M Lyimo		DHV, Shinyanga

Ministry of Water, Dar es Salaam

Mr Christopher N Sayi	Director, Rural Water Supply	Ministry of Water
Mr John Mukumwa	Assistant Director, Rural Water Supply	Ministry of Water
Mr. Washington Mutayoba	Director, Water Resource	Ministry of Water
Dr Hassan Mjengera (Mr.)	Director, Water Laboratory	Ministry of Water
Mr. Enock Robert	Economist	Ministry of Water
Eng. Rita F Kilua	Rural Water Supply Engineer	Ministry of Water

Eng. Abubakar Kigingi (Mr)	Snr. Rural Water Supply Engineer	Ministry of Water

Dar es Salaam, NGOs and private sector

Mr Donald Mmari	Consultancy Co-ordinator	REPOA
Ms Blandina Kilama	Survey Co-ordinator	REPOA
Mr Robert Rimisho	Survey Supervisor	REPOA
Mr Dominic De Waal	Policy and Advocacy Team Leader	Water Aid Tanzania
Mr Richard Musingi	Director of Sector Co-ordination	PMO-RALG
Ms M Pallangyo	Gender and Community Development Consultant	Don Consult

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