

Community Participation in Water Resources and Sanitation Management in Tanzania: A case Study of Lindi Region

G.M. Naimani & V. I. Ngomuo***

Abstract

Community participation in water scheme's management through village committee has significant influence on the functioning of water schemes that promote sustainable water supply within the community. Proper maintenance of water schemes in terms of trained technicians and availability of facilities ensures the provision of safe water for domestic purposes. However, activities near water sources may contaminate the water supply, leading to water-borne diseases. Proper education to the communities on the protection of water sources and routes might lead to high quality and sustainable water supply. Water quality and quantity are the major factors that need to be observed when looking at sustainable water supply. In rural areas, it is the responsibility of the communities to form water committees so as to oversee the functioning of the water schemes; and hence reduce water scarcity. This study has shown that inclusion of women in water scheme management raises water supply in rural areas.

Introduction

Water is the basic natural resource for the sustainability of human, animal, and plant life. Yet while it is abundantly available in some areas, a majority of the people are not benefiting out of it due to a variety of reasons. According to Ngomuo (2005) non-functioning of water schemes and water utilities have been singled out as the major obstacle. The main cause of non-functioning of water schemes is due to the lack of proper management and trained technicians.

Even if water schemes were properly managed, there is still a problem of contamination of water sources. Faecal contamination from human wastes is the cause of most environmental health problems in rural areas (WHO 1995; Ngomuo, 2005). This is because contaminated water contributes to diarrhoea diseases which kill more than three million children yearly in developing countries (WHO, 1995).

* Senior Lecturer, Department of Statistics, University of Dar es Salaam.

** Rwegalalurila Institute of Water, Dar es Salaam.

One-way of safeguarding water schemes by involving communities in the running of these schemes. The establishment of International Drinking Water Supply and Sanitation Decade (IDWSSD) in 1981 to 1990, which was extended to year 2002, was one effort towards addressing water management issues. The IDWSSD focused on drinking water and sanitation issues as the most basic needs for human life, and calls for a change in method of water delivery due to unrealised targets in the recent past. The main emphasis of the IDWSSD was the involvement of communities in water management programmes.

Community involvement is now considered a key component of community management not only because of its potential democratizing impact, but also because of its positive effect on governance (Gonzalez, 1995). It should be noted that participation demands minimum objective and subjective conditions. Among the objective conditions is a set of rights, i.e., freedom of speech and assembly, which is fundamental. The state must guarantee people's participation in matters that are important to them, as well as the use of the means for fostering participation (e.g. community action committee, local management boards, inspection committees, participatory development and committee that monitor household public services, etc.). Subjective conditions refer to the willingness, motivation and interest to participate, and the promotion of a democratic culture.

Bwire (1998) has observed that the domestic water supply programme (DWSP) in Ruaha district, Iringa region, has facilitated water user group formation through community mobilization and development. The water users of Ruaha are managing the schemes through a board of directors of local water supply company. The villages finance the operation and maintenance of the scheme; and are responsible for keeping the surroundings of the water supply points in good condition.

Also, there is a community-based water supply project in East Kilimanjaro that is under donor support. This project has managed to provide an excellent service to their customers at the lowest price without making much profit.

HESAWA (1998) has indicated that its programme activities are strongly guided by principles of community participation. The promotion of the concept is based on the principle of villages' interest in participating in the programme. It puts emphasis on decentralization in decision-making, planning, and implementation. To achieve proper participation, promotion is based on participatory methodologies. The HESAWA project has shown positive improvement in all the areas they are operating.

Community Participation in Water Resources and Sanitation Management

Statement of the Problem

In Tanzania, very few regions have shown community involvement in water supply and management efforts, especially in rural areas. Among the few is the Pwani region, which according to Mokiwa (1998), has had community involvement in the Mdaula, Chalinze, and Kidogozera water schemes. These have shown positive results compared to centralized systems. These results have been due to the building up confidence of the communities in overseeing operations and maintenance of their schemes. This has also encouraged the communities to care for the project infrastructure, and guard them against thefts and vandalism.

This paper tries to establish the mode of community participation in water resources and sanitation management in the rural areas of Tanzania. The paper is based on a research conducted in Lindi Rural and Liwale districts of Lindi region in southern Tanzania.

Objectives of the study

The broad objective of the study is to see how one can promote and enhance water supply sustainability in rural areas. The specific objectives are to:

- (i) Examine the impact of community participation in water supply management in rural areas.
- (ii) Asses the quality of rural water schemes.
- (iii) Evaluate the strategies of reducing rural water scarcity.
- (iv) Evaluate the impact of gender participation in water supply management in rural areas.

Research Questions

The following research questions were used in the study:

1. What is the impact of community participation in water supply management?
2. What is the quality of rural waters schemes in rural areas?
3. How can rural water scarcity be addressed?
4. What is the effect of women participation in water supply management?

Methodology

The study used both quantitative and qualitative methods of data collection and analysis. A structured questionnaire was used to collect quantitative data, while focus group discussion (FGD) guidelines were used to collect qualitative data. The questionnaire was administered to a sample of respondents in the selected villages in the two districts. The FGDs were conducted to selected individuals aged 16 years and above. To make the FGDs homogeneous, three groups were identified for the

discussions: women only, men only, and a group having both men and women. Each group had a maximum of 12 people. Other participants in the FGDs were the ward secretary, water experts, and health experts. Participatory approach was applied in conducting the discussions.

Sample size

In the questionnaire survey, a total of 643 respondents were interviewed in the two districts (see Table 1).

Table 1: Distribution of respondents for questionnaire survey by district, ward and villages

District	Ward	Village	Number of respondents
Lindi rural	Mtama	Masasi	17
		Mihogoni	70
		Majengo	27
	Nyangao	Nyangao A	55
		Nyangao B	30
	Mingoyo	Mnazimmoja	63
		Mkwaya	90
	Rutamba	Rutamba New	24
		Rutamba Old	41
	Ng'apa	Ng'apang'apa	9
Mchinga	Mchinga 1	66	
Sub Total			492
Liwale	Liwale	Kipule	44
		Mangilikiti	20
	Mbaya	Mbaya	66
	Makata	Mpengele	21
Sub Total			151
Total			643

Source: Ngomuo (2005) Table 5.1

Among the six districts in the region, the study in Lindi region was done in Lindi rural and Liwale districts. Lindi region was selected for the study due to the following considerations:

- It has low water conflict as a result of low population density
- Non-existence of industrial development
- Non-existence of potential hydroelectric power plants
- Very low livestock raising
- Very low irrigation practices.

Also, the selection of Lindi rural and Liwale districts was based on the percentage population served per water scheme. According to Stockton and Clark (1975), 10% of the population served by water scheme provides

Community Participation in Water Resources and Sanitation Management

a minimum representative sample. In the case of Lindi region, all the districts have more than 10% of its population served by water scheme up to 2002. To have effective water schemes for the population, a district with the lowest percentage of population served per scheme as well, as that with highest was selected. Hence according to Table 2, Lindi Rural district was selected because it had the lowest population served per scheme (15.4%) while Liwale district was selected because it had the highest percentage of population served per scheme (52.3%).

Table 2: Population and water schemes/points distribution in rural Lindi

District (Rural)	Total Population	Population served	Total Schemes	Functional schemes	Population served (%)	Population served per scheme (%)
Ruangwa	106,848	48,808	212	183	55.36	26.1
Kilwa	157,038	78,487	310	238	43.83	18.4
Nachingwea	138,969	38,840	264	168	34.35	20.4
Lindi	184,162	110,520	458	325	50.11	15.4
Liwale	61,290	26,360	120	93	48.65	52.3

Source: Region Water Engineer (Lindi), 1998 and 2002 Population and Housing Census.

Significance of the Study

This study evaluates the impact of community involvement in achieving sustainable water supply and improvement of sanitation in rural areas of Tanzania. This will inform organizations dealing with rural water supply on the possibility of revising their programmes and strategies on explicit policies to improve rural water supply and management of water schemes in rural communities. The study suggests viable solutions on rural water supply development and population issues on handling and safeguarding water schemes, water points, and water sources communities.

Community Participation in Water Supply Management

According to UNDP (1990), observations in developing countries revealed that the existing social structures in traditional rural societies and the interaction between them have resulted in socio-economic development imbalance in many communities. It has also been noted that, even if water and sanitation improvement strategies are introduced, the impact is reduced due to the lack of community management spirit. However, it has observed that the call for community participation and management methods are brought from outside the community, which in a way does not build local management capacity (UNDP & World Bank, 1992). Awareness of participation emanating from the beneficiaries themselves should be the starting point. This will result in local capacity building and water supply sustainability.

Sandra (2004) notes that it needs people with technical knowledge, sense of property, negotiation skills, and the capacity to call meeting where participatory decisions can be taken so that participation to serve as an opportunity to decide on the community's collective well-being, and as a means to decide on the provision of water services. UNDP (1990) considered the household as the community unit to involve, and observed that the major problem facing water projects in developing countries is the lack of understanding of the interaction between water supply, sanitation and drainage projects, on one hand, and the environment and hygiene within the household on the other. More knowledge is required in addressing this interaction. Simultaneously with this knowledge, the effects of water drainage, sanitation and hygiene on health-related conditions and practices must be provided. The knowledge on water supply protection and use from tap to mouth should also be included. Changes and practices along the water routes and how they can cause transmission or out-break of water-borne diseases also need to be considered.

According to Arlosoroff (1987), the concept of community participation for convenient safe water supply system in developing countries must be based on low cost tools such as hand pumps. Examples of community management practices from field experience are in the United States, Central America (Guatemala), and Sub-Saharan Africa (Sierra Leone, Togo, Malawi, and Kenya). In the United States of America it was observed that there is complete absence of promotion, extension, organization and water-related health education on the part of the government. However, the system was observed to have a high degree of autonomy and initiative that came from individuals in the locality, and never from government or funding agency. There was active involvement of the majority of the community members in the system design, planning and execution. Community participation in the USA was assessed as having a possibility of promoting sustainable rural water supply system that could be managed by the community with minimal promotional or directive interventions by the government.

The practice has also achieved positive results in the Sub-Saharan African countries that have used some forms of community participation. Where this has been lacking, the results have been negative. In Ethiopia, for example, the government stressed the involvement of community in their water scheme managements. In spite of all the assistance given by donors, however, recent surveys have indicated that 30% of the rural water points were not functioning (Wood 1991: 11-13). This was due to non-availability of water management committees for improved water system.

Community Participation in Water Resources and Sanitation Management

In Ghana, Awindaogo (1998) observed that prior to 1994 community water and sanitation sectors had poor services because centralized organization and management. However, under community based ownership and control of facilities, the Northern Region of Ghana indicated 38.3% full implementation and 15.4% partial implementation in two years.

In a study in Central Lombok (an Island in Indonesia), Mylius (1987) observed that proper use and maintenance of water facilities is ensured when there is effective community management. This may be based on the users—both men and women – who, when given some encouragement and incentives, get a feeling of ownership of the project.

However, participation from the point of view of the relationship between the state and the community in terms of power, need to be considered. This can be in the form of collaboration, joint management, self-management, or negotiation. In a collaboration relationship, the community is usually excluded from decision-making (subservient), and its members are subject to institutional decisions. Joint management allows community intervention regarding decisions; while self-management is type of participation that emerges independently within the community. Negotiation is a mechanism and strategy used by the community to fulfill its needs. It is thus important to establish the type of participation that is pursued in an agreement as stated in the objectives and organizational mandate when water and sanitation project is considered (Gustavo de Roux, 1993).

Factors Influencing Sustainable Water Supply

Water quality and quantity are the major factors that need to be observed when looking at sustainable water supply. Water supply for domestic purpose is supposed to be of a certain standard as indicated in the Guidelines for Drinking Water Quality by WHO. The bacteriological quality of raw water is important in assessing the choice of the best sources, degree of pollution, and treatment (WHO, 1983).

Four lines of examination are embodied in performing full examination of water supply: bacteriological, chemical and physical, topographical, and biological. Each line has its own uses. Bacteriological examination is the most important as it offers the most sensitive test detection of faecal coliform, which potentially is a dangerous water pollution. Chemical and physical analysis assist in hygienic assessment, but its major role is in monitoring water supplies for the presence of toxic metals such as lead, cadmium, radioactive substances and other potentially harmful substances. Topographical examination of catchments areas and water supply networks reveal potential hazards undetected, and not detectable

by any other method. Biological examination detects the presence of algae and animal life, which may gain access to supplies through deficiencies in water treatment or defaults in the distribution network.

According to WHO (2000), hygiene and sanitation have not been high on country agendas; and often sanitation is not clearly assigned as a responsibility of any particular agency in water schemes. Boot (1991) noted that there is a need of hygiene education, the objective of which is to prevent water and sanitation related diseases. This can be facilitated through construction of improved water supply and sanitation facilities, and continuously using such facilities in a safe way. Both communities' and officials' interests should be put in consideration in maintenance, keeping safe, and having reliability and accessibility to facilities constructed. In addition, the aim should be to promote an optimum use of water supply and sanitation facilities, and taking care for continuous functioning through proper operation and maintenance, and hence prevent water and sanitation related diseases.

Other aspects that contribute towards sustainable water supply are the operation and management of water schemes. Nyumbu (1990) indicated that Malawi had rural population safe water coverage of 36% in 1990 under centralized system of funding for operation and maintenance of water schemes. This increased to 44% by 2000 when operation and maintenance were done through community participation (WHO, 2000).

Discussion of Findings from the Study in Lindi Region

Water Supply and Community Participation in Lindi Rural and Liwale Districts

The findings show that both districts are gifted with abundant surface and underground water sources (see Table 3). Almost all villages have natural springs (87%), ranging from 1 to 3. Areas with no springs have rivers or streams passing through the respective villages. However, all these sources are polluted by individuals through water collection, bathing, and cloth washing due to the lack of bylaws to safeguard the sources. In the two districts, the surface and underground water supply are permanent and supply is available throughout the year, even though not constant.

The main water supply in the districts is through hand pumps. About 57% of respondents in Lindi rural district, and 58% in Liwale district indicated this. However, in Liwale district the pumps are not functioning and have been abandoned. In Lindi rural district, over 79% of the pumps were not functioning. The main factor contributing to non-functioning of the pumps was lack of proper maintenance of the schemes (see Table 4).

Community Participation in Water Resources and Sanitation Management

Table 3: Water supply profile of the sample villages in Lindi Rural and Liwale Districts

Variable	Number and percent of respondents					
	Lindi Rural		Liwale		Total	
	No	%	No	%	No	%
Availability of natural springs						
Yes	405	82.8	151	100	556	86.9
No	84	17.2	0		84	13.1
Type of water supply						
- Underground	239	48.7	0	0.0	239	37.2
- Surface	61	12.4	87	57.6	148	23.1
- Both underground and surface	71	15.3	0	0.0	75	11.7
- None	116	23.6	64	42.4	180	28.0
Underground supply						
- Shallow well	305	70.3	0	0	305	52.1
- Deep well/bore well	120	27.6	0	0	120	20.5
- Locally dug wells	9	2.1	87	57.6	96	16.4
- None	0	0	64	42.4	64	10.9
Surface water						
- River	66	13.5	66	43.7	132	20.0
- Stream	299	61.0	0	0	299	46.6
- River and spring	60	12.2	0	0	60	9.4
- River and stream	0	0	64	42.4	64	10.0
- Pond	0	0	21	13.9	21	3.3
- River and pond	65	13.3	0	0	65	10.1
Permanent Supply						
- Surface	54	11.0	64	42.4	118	18.4
- Underground	68	13.9	0	0	68	10.6
- Both surface and underground	367	75.0	87	57.6	454	70.9

Source: Ngomuo (2005) Table 5.3

Despite the non-functioning of almost all water pumps, there were indications of community participation in the schemes. Over 90% of all the villages in the study had water committees that were nominated by the village local government. However, very few of these committees participated in the water schemes/points management in cases where either the village local government manages the schemes, or where the water scheme/point management is neither defined nor existing.

In almost all villages visited in Lindi rural and Liwale districts, no rehabilitation had taken place since 1986 when the hand pumps were installed under Finnish financial support. Untrained technicians maintained only 0.2% of the pumps. In ring wells where the pumps were not functioning, caps have been removed in order to get water from the wells by dipping cans.

Table 4: Water supply schemes profile of the sampled villages

Variable	Number and percent of respondents					
	Lindi Rural		Liwale		Total	
	No	%	No	%	No	%
Type of Water scheme available						
- Hand pump	281	57.1	87	57.6	368	57.3
- Machine pump	153	31.1	64	42.4	217	33.7
- None	58	11.8	0	0.0	58	9.0
Water scheme functioning						
- Yes	99	20.2	0	0.0	99	15.4
- No	392	79.8	151	100.0	543	84.6
State of breakdown scheme						
- Abandoned	218	51.3	151	100.0	369	64.1
- Maintenance done	1	0.2	0	0.0	1	0.2
- Used without maintenance	206	48.5	0	0.0	206	35.7
Who does maintenance						
- Untrained technician	152	41.2	0	0.0	152	29.2
- Trained technician	1	0.3	0	0.0	1	0.2
- None	216	58.5	151	100.0	367	70.6

Source: Ngomuo (2005) Table 5.4

Only 20.2% of the schemes in Lindi rural district were functioning (12 hand pumps in Rutamba village, 1 in Muhogoni, and 1 in Nyangao). There were no functioning schemes in Liwale district. Where functioning, hand pumps are very old and rusted, so that even when pumping iron particles come out with the water.

The survey results reveal that most of the villages have village water fund (83.5%), and a majority of the villagers have shares in the Village Water Fund (VWF) (65.2%). In villages where the villagers have no shares (34.8%), there is no one who finances the water schemes (97.4%) (see Table 5).

According to the District Water Engineer in Lindi rural districts, there has been a positive response on the establishment of VWF accounts regardless of the existence of poor water situation. Only 44.8% (56 villages) of the villages in the district have no VWF accounts. Villages with VWF accounts of more than Tsh 100,000 have pump machine systems.

In almost all VWF committees, women are involved (95.3%); and in most of these committees the ratio of women to men is 3:3 (48%). This is the required number, which indicates six members at the ratio of 3:3 as indicated in the National Water policy.

Community Participation in Water Resources and Sanitation Management

Table 5: Distribution of Respondents Indicating Presence of Villages with Water Committees, Water Funds and Shares in VWF

Variable	Number and percent of respondents					
	Lindi Rural		Liwale		Total	
	No	%	No	%	No	%
Presence of Water committee						
- Yes	461	93.9	130	86.1	591	92.1
- No	30	6.1	21	13.9	51	7.9
Existence of village water fund						
- Yes	406	99.8	130	86.1	536	83.5
- No	85	0.2	21	13.9	106	16.5
Existence of villagers' shares in water schemes/points funds						
- Yes	339	69.2	65	50.0	404	65.2
- No	151	30.8	65	50.0	216	34.8
If no shares, who finances the water schemes/points maintenance						
- Village local government	1	1.0	0	0.0	1	0.9
- Village water fund	2	2.1	0	0.0	2	1.7
- None of the above	94	96.9	19	100.0	113	97.4

Source: Ngomuo (2005) Table 5.7

In some villages, especially in Lindi Rural District, the ratio of women to men is 4:2 (15%), indicating involvement of more women than men. Some committees have less than six members (37%). Moreover, results indicate that majority of women participate in water management in the villages (75.6%).

UNFPA (1997) has observed that women involvement in community water resources management and decision-making has been able to provide significant improvement of provision of water supply.

According to the focus group discussions held in some villages in Lindi Rural and Liwale districts, villagers had positive opinion on the establishment of village water committees but they are still not clear on what is the role of these committees in water scheme management. Some villagers are not informed on how the election of committee members is done. They even question why local government officials were involved in the election of committee members rather the community itself. In some villages, pumps that were working were destroyed after the election of committee members, and officials took no action.

In all the focus group discussions it seems that the whole idea of having water committee is good, only that some explanations need to be given on

how the committees should be chosen, and the involvement of the communities should be clearly outlined. Also, there should be transparency on the utilization of water funds as some villagers complain that officials are misusing the funds. Villagers have demanded annual reports but these have not been given to them. This by itself impairs trust on the committee by the community.

Water sustainability

Water availability can be identified in two categories: (i) safe drinking water available from flowing natural water sources such as natural springs and traditional rivers that are free from water contamination; and (ii) safe drinking water from underground sources as supplied from boreholes/deep wells and shallow wells, from which water pumps or machine pumps supply water to the communities. Water supplied from both categories is supposed to be of good quality, meeting the agreed international standards, and of sufficient quantity. The achievement of these conditions defines sustainability of water in rural communities.

In both Lindi Rural and Liwale districts, water contamination by faecal coliforms is observed in almost all schemes in the study areas. Non-functioning of almost all schemes in the study area indicates water scarcity in the villages. The contamination and scarcity of water forces villagers to walk far distances seeking for safe water; or congesting at one water point to get a bucket of water.

The unsustainability of water supply in the study area can be minimized through active community participation in the management of the water schemes. This will discourage water contamination and ensure the functioning of water schemes, hence assuring sustainable water supply. The effectiveness of community participation can be achieved through proper election of village water committees by the mutual consent among villagers (users). Mutual understanding and coordination between the committees and the community should enhance this.

Conclusion

Water resources and sanitation management through community participation seems to be one way of achieving water sustainability in the rural communities. The study has clearly shown that community participation in water supply management increases water supply in the rural areas. Community participation in water schemes management through village water committee has shown a strong significant

Community Participation in Water Resources and Sanitation Management

influence on the functioning of water schemes. The responsibility of the villagers to select village water committees, having village water fund to finance villages water schemes—all these strategies have strong effect in ensuring sustainable water supply to rural areas. Also, community education and sanitation improvement can reduce the level of contamination of water supply.

References

- Arlosoroff, S. 1987. Low Cost Water and Sanitation Rural Water Supply Project. *Developing World Water*, Grosvenor Press International.
- Awindaogo, F. 1998. Community Water and Sanitation Delivery: The Ghana Experience. Paper presented at National Workshop on Review Rural Water Supply Components of the National Water Policy. 23-24 April 1998, Arusha.
- Boot, M. T. 1991. *Just Stir Gently. A Way to Mix Hygiene Education with Water Supply and Sanitation*. Technical Paper Series No. 29 IRC. International Water and Sanitation Centre. WHO Collaboration Centre. The Hague: The Netherlands.
- Bwire, K. 1998. Domestic Water Supply Programme, Ruaha Water Supply in Morogoro. Paper presented in National Workshop on Review of the Rural Water Supply Component of the National Water Policy, April 23-24, 1998. Arusha, Tanzania.
- Cairncross, S. 1987. *Water, Women and Children: The Benefits of Water Supply in Developing World Water*. Grosvenor Press International.
- Gonzalez, E. 1995. *Manual Sobre Participaciony Organization Parala Gestion Local*. Ediciones Foro Nacional Poor Colombia, Cali, Colombia.
- Gustovo, De Roux. 1993. *Participation: Tutelaje o anutonmiaq En Taller de analisis sobre dificultades de la planificacion participatioa*. Alcaldia de Santiago de Cali.
- HESAWA, 1998. Health through Sanitation and Water Programme. Paper presented at the National Workshop on Review of the Rural Water Supply Component of the National Water Policy. 23-24 April 1998. Arusha, Tanzania.
- Hulton, L.G. 1983. *Field Testing of Water in Developing Countries*. Water Research Centre. The Gresham Press, Old Working Survey.
- Mokiwa, P. 1998. Water Supply situation in Coast Region. Paper presented in National Workshop on Review of Rural Water Supply Component of the National Water Policy. Arusha, Tanzania.

- Ngomuo, V. I. 2005. *Community Participation in Promoting Sustainable Water Supply and its Impact on Morbidity, Infant and Under five Mortality. A Case Study of Lindi Rural and Liwale Districts, Tanzania*. PhD Thesis, University of Dar es Salaam, Tanzania.
- Nyumbu, I. L. 1990. Financing Operation and Maintenance of Water Supply Systems in Zambia and Malawi. *Community Water Supply and Sanitation*. Proceedings of the Meeting of the Operation and Maintenance Working Group. Geneva.
- Sandra, P.B. 2004. Community Participation in Water and Sanitation within the Latin American Context. IRC1, Univalle, Cinara, Cali, Colombia.
- Stockton, J.K., & C.T. Clark. 1975. *Introduction to Business and Economic Statistics*. Cincinnati: Ohio South – Western Publishing Co. U.S.A.
- United Nations Development Programmes (UNDP). 1990. Global Consultation on Safe Water and Sanitation for the 1990's. Background Paper, Sept 10-14. New Delhi India.
- United Nations Development Programme – World Bank, 1992. FY 92 Country Work, *Water and Sanitation Work Program*. Vol 1 July 1991 – June 1992.
- United Nations Population Fund. 1997. Population and Sustainable Development, Five Years After Rio. United Nations Population Fund.
- United Republic of Tanzania (URT). 2000. *National Water Policy*. Ministry of Water and Livestock Development, Dar es Salaam Tanzania.
- World Health Organization (WHO). 1983. *WHO Guidelines for Drinking Water Quality 3 Volumes*. WHO, Geneva, Switzerland.
- . 1995. *World Health Statistics. Quarterly, Progress towards Health for All*. Third Monitoring Report Vol. 48 No. 3/4, Geneva.
- . 2000. *Africa 2000 Initiative for Water Supply and Sanitation, Water Supply and Sanitation Sector Assessment 2000 African Region Part 2, Country Profile*, WHO, Harare Zimbabwe.
- Wood, M. 1991. Community Participation in Rural Water Supply. 17th WEDC Conference Infrastructure Environment, Water and People, Nairobi.