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**Sustainable Operations and Maintenance  
of Water Supplies:  
A Conceptual Model for  
Engineers and Development Workers**

A thesis  
submitted in partial fulfilment  
of the requirement for the degree  
of  
**Master of Philosophy**  
in  
Development Studies and Agricultural Engineering  
at  
Massey University, New Zealand

**Clifford James Thomas**

1994



No matter how technically feasible the project may be, it can only succeed if the villagers are truly interested in it, and concerned enough to provide the long-term maintenance necessary to keep the system in working condition.

Thomas D. Jordan Jnr. [1984].

## PREFACE AND ACKNOWLEDGEMENTS

I would like to gratefully acknowledge the following, who have had a hand in the research and completion of this thesis:

To the Massey University Graduate Research Fund for funding towards travel expenses.

To SIM New Zealand and Ethiopia offices for the help and time spent in arranging and preparing my family and me to stay and be able to undertake research in Ethiopia.

To SIM missionaries Gabe and Biz Jens and Doug Stinson for allowing me to look critically at the work they were involved in, and allowing me to get involved.

To the Integrated Holistic Approach Urban Development Project in Addis Ababa for allowing me the privilege of working for the project and the lessons learnt there. Special thanks to Sister Jember the project manager for her time and patience. My hope is that your water projects will be more sustainable because of or despite the project evaluation conducted by Gareth Martin and myself.

To fellow students in the Dept. of Agricultural Engineering, Dr Linus Opara, Sam Weiss and Norman Lessells for support and encouragement over this period of study.

To the many lecturers and staff in both the Dept. of Agricultural Engineering and Development Studies for their input and challenges.

To Associate Professor Croz Walsh for your desire and challenges to see my fellow students and I in Development Studies look at the whole issue of development. Development Studies will be at a loss without your guiding hand.

To my supervisor Professor Gavin Wall for your help, guidance and support especially when the way was unsure in this project.

To Charissa, thank-you for allowing your Daddy to be away so much in the evenings when you wanted to play.

To Lynell, your support and encouragement were needed at many times, thank-you for the joy you bring.

Finally, to my Lord and God, for your strength, power and life you give.

Jesus answered, "Everyone who drinks this water will be thirsty again,  
but whoever drinks the water I give him will never thirst.

Indeed, the water I give him will become in him a

spring of water welling up to eternal life."

John 4:13 & 14.

## ABSTRACT

There have been major problems with the sustainability of many water supply projects in the Developing World. One major area that influences this sustainability is the ongoing operation and maintenance of the water supply. A number of different surveys have shown that within 12 months of a water project being constructed and handed over to the community or government water dept. between 30-70% are not functioning at all or are not producing their original design supply.

The purpose of the research was to produce a conceptual model that could be used by development agencies and engineers to increase the sustainability of water supplies.

A review of the literature revealed that the major factors influencing sustainable operation and maintenance of water supplies were, technology, infrastructure for parts, training of both agency and community in maintenance of the water supply, the source of funding for O & M, design, ownership and responsibility, and management. These factors were incorporated into a conceptual model, each factor fitting into one or more of the different stages of a water supply project, namely: 1. Planning; 2. Design; 3. Construction; 4. Transfer Ceremony; and 5. Operations. There were up to four major groups of people involved in this process, namely, an International Development Agency, a Government Water Dept., a Community Water Committee, and a Community or Users.

Surveys were conducted in Ethiopia, looking at both urban and rural water projects. The results were used to substantiate the model and/or to revise the model.

It was concluded from the survey that the following were influential upon sustainable operation and maintenance in Ethiopia: Community ownership does not equate to community responsibility for O & M; Training of the individual or group responsible for O & M is essential; A lack of infrastructure leads to O & M problems; And, community involvement in all stages of the water supply project is essential.

The revised conceptual model presents the processes and factors needed to instigate sustainable O & M of water supply projects in developing countries.

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## GLOSSARY OF ACRONYMS

Agency	Refers to Government or Development Agency involved in Water Projects
APO	Asian Productivity Organization
AT	Appropriate Technology
CWS	Community Water Supplies
KHC	Kale Heywet Church
IDWSSD	International Drinking Water Supply and Sanitation Decade
IRC	International Reference Centre for Community Water Supply and Management
ISS	Informal Service Sector
ITDG	Intermediate Technology Development Group
LDC	Less Developed Country
NGO	Non Government Organization
ODA	Overseas Development Administration
O & M	Operation and Maintenance
RWS	Rural Water Supply
SIM	Society for International Ministries
SWRC	Social Work Research Centre
UNDP	United Nations Development Programme
UNICEF	United Nations Childrens Fund
USAID	United States Agency for International Development
VLOM	Village Level Operation and Maintenance
WASH	Water and Sanitation for Health Project
WHO	World Health Organization
WSSA	The Ethiopian Water Supply and Sewerage Authority
WS&S	Water Supply and Sanitation
WTP	Willingness to Pay (Survey)
WUA	Water User Associations