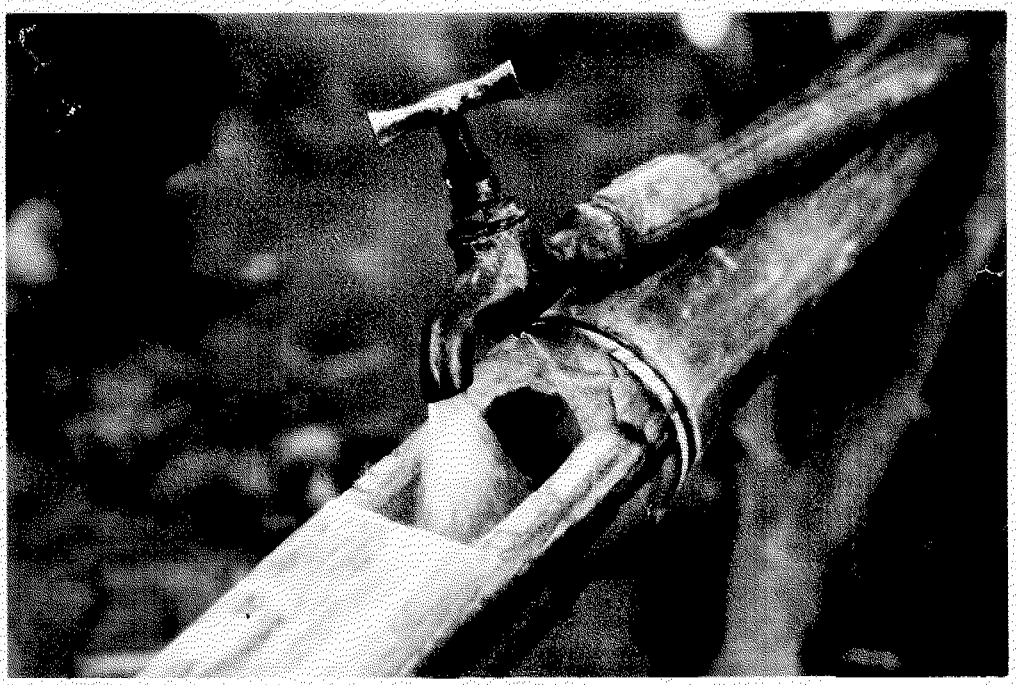
REPORT

DRINKING WATER SUPPLY PROGRAMME IN KABUBATEN MANGGARAI

WEST FLORES, INDONESIA
IMPLEMENTATION BY YAYASAN ST. KLAUS

MISSION REPORT FOR INTERCOOPERATION
(Swiss Organization for Development and Cooperation)
by Karl Wehrle, SKAT



NOVEMBER 1991

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MISSION REPORT - NOVEMBER 1991

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INTRODUCTION

At the very beginning of the mission its TOR (Terms of Reference, compare Annex 1) were reviewed and discussed with YSK's (Yayasan St. Klaus) project management. Jointly with a "To do list" (compare Annex 2), the mission programme was developed. In the following the mission was implemented quite strictly and its progress participatively reviewed according to this list. This method, similar to the one applied for the development of the operational plan, provided an excellent opportunity for on-the-job training and proved to be quite efficient and effective.

Sustainable and effectively used water supply and sanitation systems have already been declared as the main objective of the project activities as stated in the mission report 1990. In the meantime YSK's activities had been developed and changed significantly, both in volume and sectors. The share of IC's (Intercooperation) supported water supply projects has gone below 20 % in manpower and below 15 % in profit contribution. The engineer Rudi Ndoen, formerly in charge of YSK's PAM (water supply section) in addition had become director of the Benkels including all technical sections. This means that the time he can attend to PAM has reduced to 20 percent. Although this development and diversification of YSK as a whole is not only understandable but also to be appreciated, it puts a new question mark to the project's objective in particular as far as sustainability is concerned. That is why it was decided that sustainability should also be evaluated during the mission. Nevertheless, focus of the mission remained on the implementation of the main topics of TOR.

As a matter of continuity and in order to ease reading, referring and using the content of the mission report the table of content of the previous report has been maintained. Just so to ease the realization of recommendations, the valid items of the previous report are repeated here (written in italic) and new ones added as far as required. Basics of sustainability are discussed together with aim and objectives in chapter 1. In chapter 6 roles and responsibilities of project actors are described in particular towards sustainability of the project.

Despite the limited time, partly caused by delays of flights and obstructions by rains the missions' targets could be fulfilled to a reasonable extent. But this was only possible because of the immense efforts made by YSK's project management to support the consultancy and make best use of it. Not only the logistics, such as transport etc. were provided as required but also the project staff was made available at any time. In particular Rudi Ndoen participated despite his other obligations in all aspects of the mission. Ferry Peters, the new assistant engineer arrived just in time and was most helpful in translating since he is quite fluent in English. These comfortable conditions allowed a highly participatively implementation of the mission with an increased learning effect at all levels.

Father Ernst Waser supported the mission from the background and was only active at the front on institutional issues such as at discussions with the Delsos. In this way he gave a clear signal that he is very serious in putting YSK's management into local hands.

Mrs. Suwan's competence in socio-cultural aspects proved to be very helpful again, in particular to understand problems and to develop solutions at village level.

IC's local project manager, Peter Winkelmann, was a substantial support despite his recent arrival only. His background and experience in particular in Indonesia make him not only an esteemed discussion partner, but also a valuable resource person and a sympathetic promotor for the follow up of sensitive aspects.

Many thanks to all for above supports.

1. AIM AND OBJECTIVES

It is important to be reminded frequently of the project's aim and objective in order not to be misled by the day to day problems, e.g. to go solely for output maximization. Just so it is an absolute need to keep on discussing aim and objectives with all actors concerned in order to make them transparent and achieve a common understanding.

Aim and objectives have been extensively discussed in previous mission reports. Therefore, only a summary is given below. For details you are referred to Ref. 1. But since the **sustainability** of the water supply systems as one of the main aspects of objectives remains to be questionable, this aspect is treated separately.

1.1 Aims

The declared aim of the drinking water supply projects is **to improve health, welfare and the economic status of the users of the facilities !**

1.2 Objectives

According to the aims the objectives are **to achieve sustainable and effectively used water supply and sanitation systems as well as to increase the degree of self-sufficiency so that villagers may expand their efforts to new areas.**

1.3 Sustainability of water supply and sanitation systems

1.3.1 Definition of sustainability

(According to Oxford ALSE Dictionary sustainability means : "Keeping an effort going continuously; the ability to last out and keep from falling".) A possible definition of sustainability of water supplies is that the systems are appropriated by the users which implies that they are efficiently (preventively) maintained, that they are effectively used and that they have a lasting impact.

1.3.2 Criteria of sustainability

When looking at the post-project management system (graph 6.1.2) the sustainability of water supply and sanitation systems depends on the following four factors :

A) Water supply system
- simplicity of design
- quality of construction
- reliability of supply
- acceptability of supply standard
- O+M friendliness

B) Villagers' capability
- to adjust to the required social changes
- to make effective use of the system
- to manage the system
- to maintain the system
- to pay for O+M (ability and willingness)

C) GOI's interest + capability
- to provide the legal base for O+M (so that f.i. sanctions can be applied)
- to facilitate funds for repairs which go beyond the villagers' capacity
- to provide long term controlling and guidance support

D) Environment's favorability
- political
- economic
- physical (e.g. deforestation => soil erosion =>decreased ground water)

2. BENEFICIARIES

The analysis made during the 1990 mission is still absolutely valid (compare Ref. 1). This is not surprising since changes in communal behaviour are obviously longterm processes. On the other hand YSK has also not yet started putting into practice the recommendations of Ref. 1. Reasons for this delay are the late translation of the mission report 1990 and the felt insecurity after the budget shortening (compare chapter 8). Nevertheless, some additional observations were made during the field visits which ultimately lead also to reinforce the recommendation of 1990 as described below.

2.1 Felt need for village water supplies

The strongly felt need for safe drinking water in a convenient distance from the houses has been reconfirmed by the following observations. The community of Bari has put extraordinary efforts into the excavation of the pipeline. Because of limited available gradient just after the catchment a trench of 2 meters ! depth had to be dug on a length of 2 kilometers! In Waebanka the project chairman developed much creativity to find solutions to improve the maintenance organisation. On his own initiative he formed standpipe groups with responsible leaders and organized regular inspection trips along the pipeline to the catchment. A closer look indicated that the chairman's initiative is not merely based on his concern for the community, but also on his personal interest since he is irrigating his tree nursery from the water supply system, just so he improved his personal supply standard by the provision of a yard tap. Supply standards are discussed in the next chapter, the important realization however, is that the potential and ability to find solutions towards operation and maintenance are much higher within the village itself as anticipated previously.

2.2 Utilization of water supplies

In most cases, handling of water from the tap to the house is not dealt with appropriately. This is discussed extensively in Ref. 1. During the 1991 mission the utilization of drinking water for irrigation became more obvious. Temporary bamboo-pipes directing water from the standpipes to the gardens are commonly used in many villages. This attitude is quite understandable since excess water is available at any water supply which has been well designed for the future. Because a well designed water supply is considering an increased population in 20 years with a higher water demand by then which results in two- to four-times the actual drinking water requirement. Though the utilization of this surplus water for irrigation seems to be quite reasonable, it may cause problems in the future if not carefully handled. Villagers will quickly become accustomed to use the piped drinking water for irrigation to improve their nutrition and probably create additional income. This means it will be very difficult to stop this practice at that time when the surplus water would be required for increased need of drinking water. Therefore, when a water supply is planned, villagers have to be clearly informed about the reason of surplus at the early

stage and increased demand as the population will grow.

Improved irrigation practices e.g. irrigation with watering cans will help to save water for drinking purposes for the time being, but in longterm piped drinking water supply should only be utilized for drinking and domestic use. Supply of water for irrigation by a piped water supply would be uneconomical as a rough estimate showed in the case of Waebanka. Moreover, in most cases the yield of springs is limited such that it would only be sufficient for the drinking water demand in the future.

2.3 Operation and maintenance

In 1990 it was concluded (compare Ref. 1) that the **main beneficiaries are women**, yet **new additional responsibilities and duties are delegated to men**. This inbalance in the group receiving direct benefits and the group having to bear additional duties certainly contributes to the reluctancy to implement the required preventive maintenance.

YSK has considered this fact and included in the village women courses the topic of standpipe maintenance. This aspect will be given more emphasis in future by providing special standpipe leader courses. In these courses those women who will be responsible for specific standpipes will be instructed about the standpipe maintenance, the appropriate utilization of drinking water including domestic hygiene, route of water related diseases etc. as well as about the need for preventive maintenance of the entire system. Equiped with this increased knowledge these standpipe leaders are expected to play a dual function in that they take responsibility for the maintenance of the standpipe they are assigned to, and that they convey the message of appropriate utilization and share the overall preventive maintenance responsibility. It is also expected that the increased knowledge will give these women increased recognition in the village.

2.4 Recommendations

The recommendations provided here are drawn from the 1990 and 91 analysis of the beneficiaries' perception, utilization and maintenance of water supplies. The strategy discussed in chapter 3 calls for additional measures for the beneficiaires. The recommendations of 1990 are still valid, therefore repeated here and supplemented with new developments recognized in 1991.

2.4.1 The way villagers utilize their drinking water supplies at present calls for some adjustments in the design and service standard, but on the other hand also for some education of the villagers to improve hygiene standards and increase the effectiveness of the precious safe drinking water :

(the text written in italic is copied from the 1990 report)

- *The practice of washing and bathing at the standpipes calls for an improved design of the concrete apron and drainage at the standpipes (compare Annex 7). In addition the provision of bathing houses may be considered.*

- *The service standard may be improved where sufficient water is available. This means for instance that private yard connections may be provided at additional cost (both for investment and maintenance) for the direct beneficiaires. (The improved service standard and increased conveniency are expected to encourage for a greater committment to maintenance and sustainability);* (compare case Waebanka at chapter 2.1).

- Already at the planning stage villagers need to be fully informed about the reasons of surplus water at the early stage of the system and increased demand in the future as the population will grow. For economic reasons piped drinking water supplies should in longterm only be utilized for drinking and domestic use. This fact has to be included in the contract form with the villagers.

- *The necessary health education of villagers may be achieved via the PKK courses. But the villagers' awareness also needs to be increased by informal talks during meetings and house visits. The most important complementary measure to increase the health impact of drinking water supplies is probably the safe excreta disposal by the construction of latrines (compare 4.3).*

2.4.2 *The management of a drinking water supply, and in particular its maintenance, requires certain changes in the organization of village life and also adds new duties for a group of villagers (men) who have not been concerned with drinking water before. That is why villagers need to be made aware of the necessity of these changes and trained for the new duties and responsibilities :*

- *Village leaders need to be trained during short seminaries (3 days). Their understanding and knowledge should be increased by lectures, but even more by exchanging views and experiences among themselves and in particular by visiting well- and mal-functioning water supplies.*

- *Two weeks' caretaker-courses need to be organized to train caretakers for their duties, both the technical and simple administration and management tasks.*

- *A follow up of the designated completed water supplies is required to assist villagers in handling the new situation. During at least two full-day visits annually, problems should be evaluated, discussed and solutions for improvements be developed together with the villagers (compare chapter 3.3.).*

- The ability and potential of the villagers themselves to find solutions for O+M needs to be utilized better (compare chapt. 2.3 and annex 15).

. Standpipe caretaker courses need to be designed and implemented. Subjects of this courses will be standpipe maintenance, preventive maintenance of entire system, utilization of drinking water including domestic hygiene, route of water related diseases, management of drinking water supply including role and responsibilities (compare chapter 2.3.).

2.4.3 A "village management handbook" needs to be developed to provide the villagers on one hand with the basic information about the benefits and obligations to be expected from a water supply and on the other hand with guidelines on how to manage a water supply system (compare annex 12). The following steps are suggested to devleop this handbook :

- Design of TOR by SKAT for a consultancy by Mrs. Suwan to work out the content of the handbook participatively.

- Development of draft by Mrs. Suwan in collaboration with PAM.

- Finalization of draft during SKAT's next consultancy mission.

3. STRATEGY

3.1 Assessment

The strategy applied thus remained quite pragmatic. Therefore the assessment done in the mission report 1990 (Ref. 1) is still valid and the evaluation and recommendations made need to be reconsidered in the next phase.

A constructive attempt has been made to design selection criteria (compare annex 4). The draft designed has been thoroughly discussed during the mission. It was realized that some additional criteria needed to be considered which already had been suggested in Ref. 1 and are recalled in annex 4. Beside the criteria which would be evaluated in view of their degree of fulfillment there are criteria which determine with a yes or no whether a water supply can be constructed at all. This type of criteria (such as clarification of ownership of the source to be caught) needs to be summarized in a so called "killer" list.

Need and purpose of follow up visits were discussed again. These discussions lead into the development of guidelines for follow up visits (compare annex 8). These guidelines are considered as a first draft to be tested in the field and to be adjusted at a later stage. Water supplies to be followed up were selected, the technicians responsible for follow up named and the dates of visits fixed (compare operational plan).

3.2 Evaluation

Reasons for the delay of the implementation of the 1990 recommendations are the late translation of the mission report as well as the felt insecurity after the budget shortening. Neverthless the elaboration of the selection criteria and of the follow up visits during the 91 mission brought the process a step ahead. It is important that the steps for developing useful tools for the implementation of the strategy have been well designed and fixed in the operational plan.

The ideal degree of involvement of the various project actors in the different phases has been discussed and should be the leading base for the future strategy (compare table 6.3).

3.3 Recommendations

The presently applied strategy needs to be maintained and reinforced in all phases with the recommendations noted below :

3.3.1 Project preparation phase :

a) The selection criteria need to be developed further according to activity 9 and as discussed and described in chapter 3.1 and annex 4.

b) *The present contract is an excellent tool for informing the villagers of their responsibilities. But this tool needs to be* reviewed by considering annex 9 as well as additional requirements for clarification such as recommendation 2.4.1. The content of the contract needs also to be communicated more broadly to all user groups in particular also to women.

c) *More time has to be spent in the preparation phase to have more opportunities to meet the villagers and provide more time for them to prepare themselves. (This additional time also gives the opportunity to monitor the yield of the source over a long period which is an important technical requirement.)*

3.3.2 *Project implementation phase :*

a) *The project staff requires training on how to handle the villagers' participation.*

- *The engineer and head supervisor should receive the required insights in socio-cultural aspects and communication by on-the-job training, supported with limited theoretical background provided by Mrs. Suwan during two annual project visits of one week each.*

- *The engineer and head supervisor in turn will have to train, supervise and support the foremen in their daily collaboration with the villagers.*

b) *The villagers must fully contribute their share. The pace of project work needs to be adjusted accordingly, meaning even the suspension of work if villagers are behind schedule.*

3.3.3 *Follow up phase*

A follow up strategy needs to be urgently developed, taking into consideration that the learning process in the village is not simultaneously completed with the handing over of a water supply (compare table 6.3). *In order to obtain more insight into the requirements for follow up, following activities are recommended :*

a) Implementation of activity 8 of the operational plan as described in chapter 3.1. and annex 8

b) Monitoring of the follow-up visits by collecting and evaluating the records of the follow up visits.

4. RESULTS ACHIEVED

4.1 Construction work 1990/91

Brief information about the projects visited is provided with annex 3. Recommendations for the improvement of construction details are the same as in annex 6 of Ref. 1 plus few additions. Since none of the annexes has been translated, annex 6 of 1990 is added to this report again.

4.1.1 Assessment of construction work

The projects visited which are under construction or which have recently been completed are : Wae-banka, Robek, Rura and Bari.

Construction work is also going on at the GOI/WB project in Lembor (mainly pipe laying) and at the Misereor project in Orong. Final completion of Pota water supply has been suspended because of lack of village contributions. Discussions are on the way with the project committee and government officials to improve the situation.

The shortening of IC's budget for the water supply programme made YSK's PAM-section feel insecure about future developments. While the present number of projects to be implemented corresponds with the available staff's capacity, this will have to be reduced dramatically in 1992, since the remaining budget for that period will be used up by that time.

Observations about improvements and shortcomings remain almost the same as in 1990. For example, spring catchment construction has been improved in that they have been dug deeper, but the entrances of the chambers are still situated directly over the water table, etc. (compare chapter 4.1.1 of Ref. 1).

4.1.2 Evaluation of construction work

Since the translation of the main chapters of Ref. 1 has only been received by the project staff in September 1991 and the annexes have even not yet been translated, it is not surprising that the improvements are minimal. Moreover, the limited time Rudi Ndoen could attend to the drinking water supply programme (compare annex 13) caused supervision work to remain minimal, which obviously contributed to slow down the progress of improvements. For the same reason, it seems that the shortening of the budget would have been justified. But just this budget shortening contributed to YSK's diversification into other areas (compare chapter 8).

4.1.3 Recommendations

4.1.3.1 Design

a) Spring catchments

- *Springs need to be measured weekly over at least one year, morning and evening and after heavy rains. This will assist in the analysis of the quality of a spring as well as in the correct design of the system (minimal flow) and the overflows (maximal flow).*
- *Since it is obvious that roots will grow into the catchment construction (despite the cutting down of trees), inspection chambers need to be designed and constructed directly over the catchment (compare annex 6).*
- *Chemical analysis of the springs needs to be done systematically, and in particular, the possible corrosion of building materials analyzed.*
- *In case of highly corrosive water, an airation chamber has to be designed for treatment.*

b) Piping system

- *Adequate hydraulic profiles have to be calculated and drawn for all water supplies.*
- *The provided design guidelines from Pokhara should be applied together with some adjustments as discussed (compare annex 5).*
- *Maps should be surveyed and drawn to scale for each water supply.*
- *The trace of the pipeline needs to be carefully surveyed and marked before excavation is started.*
- *Unavoidable low and high points need to be provided with a cleaning or ventilation pipe.*
- *Gully crossings need to be done in a straight line. If bends are required, they should be placed before and after the crossing. PVC pipes may be reduced for the length of the crossing and inserted into G.I. pipes for protection.*

c) Buildings (tanks and standpipes)

- *The capacity of storage tanks should normally be designed for 30 % of the daily consumption in 10 to 15 years i.e. a population growth factor of appr. 1.5 should be considered. For ex., actual population 500 people, design population for storage 1.5 x 500 = 750 people at 50 lit/cap. day == required storage capacity 30% of 750 x 50 = 11'250 lit = 11.25 m^3.*

- *The reinforcement of the storage tanks has to be adjusted to the statical requirements (compare annex 6).*

- *The design of standpipes needs to be improved to provide a safe support of the tap, a well functioning drainage to prevent standing water and a paved access to prevent muddy areas (compare annex 7).*

d) Standardization

Standardization of the design and construction of the following elements is recommended :

- standpipes, considering that these places will also be used for washing
- catchment chambers with varying volume according to yield of spring
- storage tanks of different volume (e.g. $5m^3$, $10m^3$, $15m^3$, $20m^3$)
- valve-chambers
- special buildings along the pipeline, e.g. gully and river crossings, etc.
- simple reporting forms such as for daily reports, financial reports, etc.

The standardization of VWSS Lesotho will provide useful ideas. Standardization will help to ease design and construction and to improve the quality of work.

4.1.3.2 Construction

a) Spring catchments :

- *Excavation depths of catchments have to be increased, in that excavation is continued following the water course up to the place where sufficient coverage is achieved (compare guidelines catchment construction).*

- *Catchments need to be covered immediately after completion of construction (incl. inspection chamber). At the same time, the surface water drainage needs to be excavated.*

- Intake areas should be afforestated within approximately the radius of 15 and 100 metres from the catchment (compare chapter 4.3). This area has to be established as protection zone. The species of trees should be those of less water consumption. Ampupu trees (Eucalyptus) are therefore not recommended.

b) Piping system :

- Tracing of pipelines has to be done strictly according to the recommendation of annex 6. The traces surveyed by the supervisors need to be checked by the project engineer. The trace has then to be marked properly with strong pegs (preferably painted) in distance of

max. 10 meters, so that the villagers will find it easy to excavate at the correct place and double work can be avoided.

- *A spirit level should always be used when laying pipes to check the correct gradient of each pipe.*

- *If G.I. pipes require bending, they have to be filled with sand and closed up at both ends before bending. This is to avoid indentations and damage to the galvanization.*

- *All bends require a concrete foundation to bear the force which develops when the direction of the water flow is changed.*

- *Pipes need to be protected with dry stone masonry walls where they can not be buried in the ground.*

4.1.3.3 Project Management

Many of the shortcomings have their roots in the lack of supervision. To achieve further improvement the project management has to be organized and implemented more strictly by the following measures :

- Develop, review and redesign the operational plan participatively with all staff concerned quarterly. Be very strict on the analysis of failures and follow up of measures for improvements.

- Develop an organigramme including job description and responsibilities. Make this organigramme and responsibilities known to all staff members concerned.

- Introduce a simple monitoring + reporting system including daily and monthly reports (compare standards of VWSS Lesotho).

- Supervising staff has to visit the sites regularly to follow up the monitoring, to supervise the construction work and to discuss and advise on community issues. Overnight stay in the village during supervision visits should be a common practice. Instructions to the staff should always be confirmed in writing or with sketches to avoid misunderstandings and to ease follow up.

- Increasement in discipline and a more tight supervision should not disturb the existing good team spirit in YSK's PAM-section. Increased collaboration and improvements in the progress and quality of work will create more strength and joy in the teamwork.

4.2 Training 1991/92

4.2.1 Intended programme

The training programme recommended in the 1990 report has been budgeted for the years 1991/92. According to the construction respectively raining season this training is planned for the beginning of 1992. Nevertheless, some classroom training was expected to be implemented also at the beginning of 1991, but exclusively for staff of YSK.

4.2.2 Assessment of training

No classroom training has been done in 1991. The statement that YSK would not be ready at this stage to train outsiders led to some misunderstanding, which gave the reason that no formal training was done.

On-the-job training was implemented to a certain degree, but the limited time Rudi Ndoen could attend to the water supply section did also restrict the on-the-job training.

4.2.3 Evaluation of training

Following the very limited training activities implemented it seemed to be pointless to evaluate the achievements. But after discussing the issue with Rudi Ndoen it was agreed that the by now traditional examination on the occasion of consultancy missions should be done again. This mainly by doing so because the staff would be encouraged to learn and look forward to further training.

The examination included beside the theoretical part also practical work consisting of material selection and pipe laying and tracing. The result of the training again showed surprisingly reasonable improvements, in particular of the staff staying with YSK since many years (compare annex 10).

4.2.4 Recommendations

The planning of the training recommended in Ref. 1 has been operationalized during the 1991 mission in the following way :

- All training courses recommended in 1992 have been included in the operational plan (comp. chapter 8). This means that the required activities have been defined, the persons responsible for it named, as well as place and time of implementation fixed. The budget was then reviewed and adjusted.
- A detailed syllabus and programme was worked out for the main courses, namely foremen and mason course (compare annex 11).

- A standpipe supervisor course to be held 6 times in 1992 has been planned as an additional course. These courses are highly recommended since the standpipe supervisors, usually women, will not only make sure adequate maintenance of standpipes but will be the messengers and advocates for proper utilization of the facilities including hygienical measures. They will also make sure that the user groups support preventive maintenance measures (compare chapter 2.3).

4.3 Complementary Actions

4.3.1 Assessment

The actual situation is still about the same as in 1990 (compare Ref. 1) Nevertheless, awareness of the need for complementary actions has obviously increased at all levels.

4.3.2 Evaluation

Complementary actions have not been put into practice as recommended in 1990 because of lack of time by the project management to attend to it.

Complementary actions to drinking water supplies were comprehensively discussed during the mission and the following 3 areas were considered to be followed up :

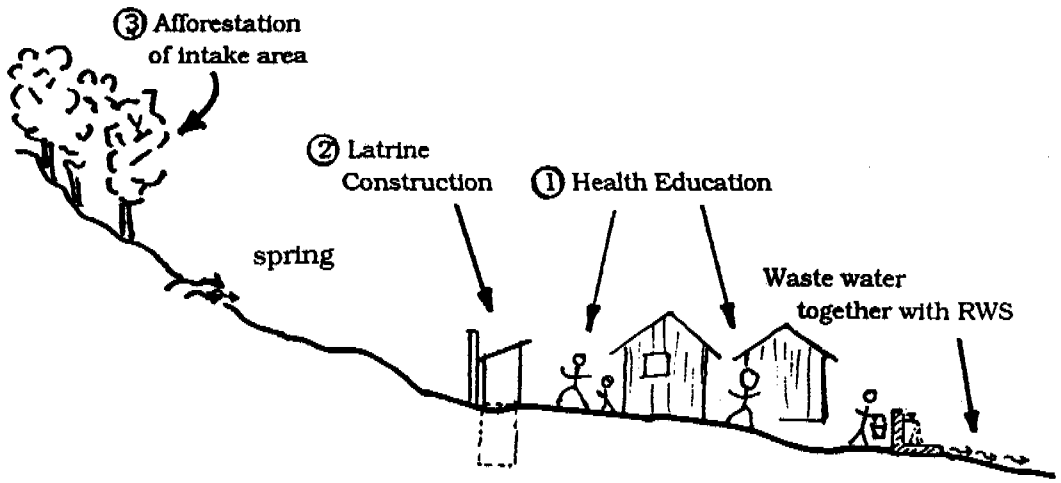
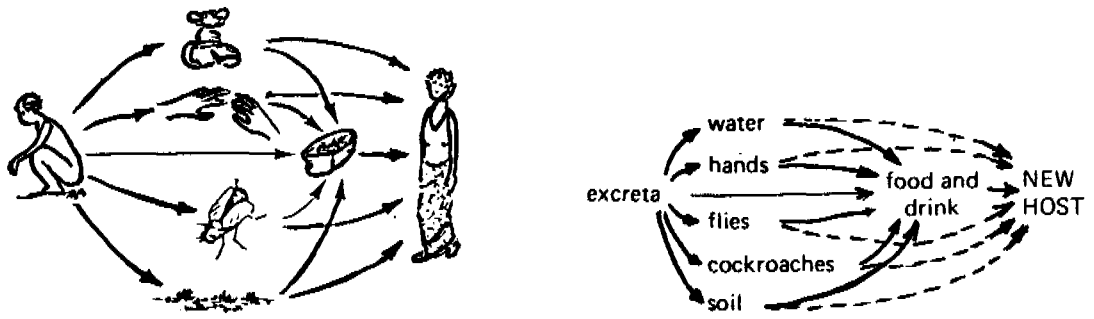


Table 4.3.2

4.3.3 Recommendations

1) Health Education

- The main message concerning health and water is illustrated in the graphic below :



Faecal-oral route of disease transmission

- Villagers' awareness of the routes of diseases and preventive measures has to be increased through the following channels/courses. (This means the aspect of health education has to be adequately considered in the respective courses):

  . standpipe supervisor course
  . motivator course
  . PKK courses
  . agricultural course
  . foremen and mason course

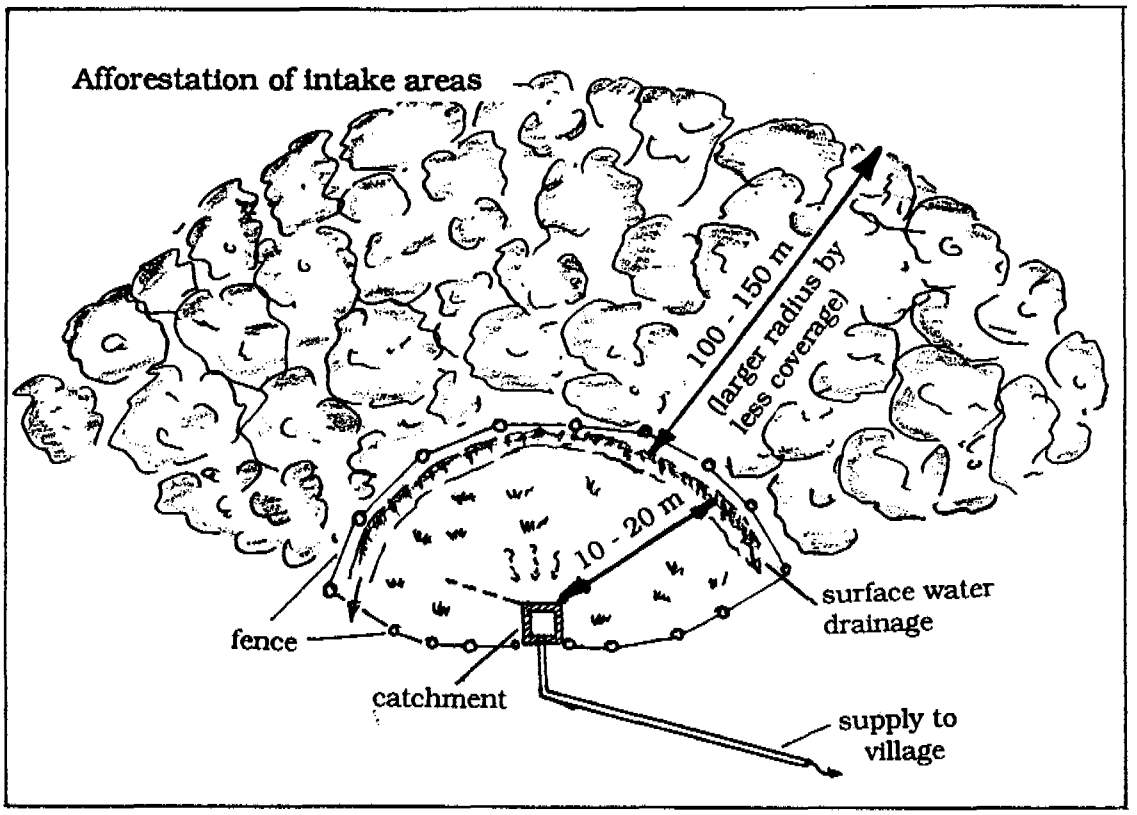
2) Safe excreta disposal by latrine promotion and construction

Suggestions on the design as well as on the promotion and implementation strategy have already been made during previous missions and with relevant supporting documents (compare Ref. 5).

The recommendations of 1990 have been included in the operational plan (compare chapter 8). This means that the required activities have been defined, the persons responsible for it named as well as time and place for implementation fixed.

3) Afforestation of intake areas

- Afforestation of intake areas has to be included compulsory in the contract of water supplies. The minimal requirements are shown in the sketch below. Trees should be those of less water consumption such as local varieties like Ara, Ratung or Dadap. Ampupu (Eucalyptus) trees are not recommended !



- PAM, the Water Supply section of YSK, will in addition support the afforestation programme by the following :

  . Water supplies are not constructed in villages where the forest is cut down and burnt on steep slopes and where no measures are taken for re-afforestation. This prerequisite has to be included in the "killer" list of selection criteria.

  . PAM staff will encourage villagers during project realization for additional re-afforestation and soil-conservation measures.

5. PRINCIPLES FOR IMPLEMENTATION

5.1 Assessment

TOR of the mission 1991 requests under aspect 12 :

> *Review the implementation procedures in particular the preparation/information process. Work out a clear process, stage by stage, including number of meetings required, subjects to be covered, etc.*

Already in 1990 it was recommended (compare Ref. 1) : *"Principles for the implementation need to be developed by the project staff"*. Reasons why this would be urgently required and ideas to be included were provided. No actions have been taken on this subject by PAM.

5.2 Evaluation

The implementation procedure can not simply be prescribed to the project staff by an outside consultant. No project is alike to any other, the project staff has to know and understand fully this procedure in order to be able to handle any guideline with the required flexibility. That's why above recommendation already has been made in 1990. Obviously YSK's PAM has not sufficient capacity to handle this issue on its own. That's why a solution was geared at where the work (writing up of guidelines) would be done by an outside consultant, but the content of the guidelines would be worked out participatively.

5.3 Recommendation

The implementation procedure has been discussed during 1991 mission. Mrs. Suwan prepared a draft of the table of content, which has been commented by the management of PAM (compare annex 12).

In addition the ideas provided in Ref. 1 are still valid. Based on the preliminary work the following recommendations are made :

- Design of TOR by SKAT for a consultancy by Mrs. Suwan to work out participatively guidelines for the implementation procedure.
- Development of draft guidelines by Suwan in collaboration with PAM.
- Finalization of draft during SKAT's next consultancy mission.

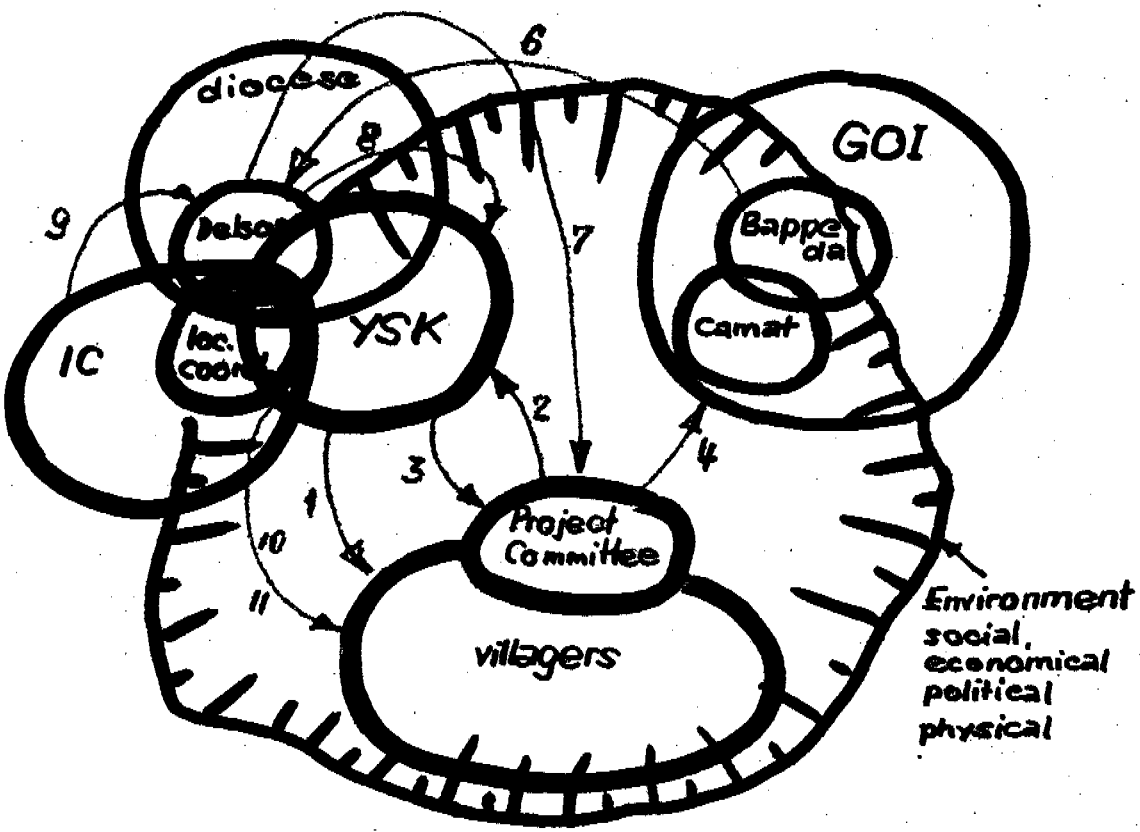
6. ORGANIZATION, ROLE AND RESPONSIBILITIES

Organization, role and responsibilities of the project management have not been requested to be investigated by the 91 mission (compare TOR). The recognition that sustainability can only be achieved in a longterm process in which the implementing organization has to play an important role and the observation that YSK, the implementing organization in this case, is obviously in a fast process of development, made however the mission team to look into this aspect as well. In chapter 1.3 sustainability of water supplies and sanitation systems has been discussed. In this chapter the management systems in different project phases are investigated before the organizations responsibilities towards sustainable projects are discussed. Although the degree of involvement by the different organizations changes over the time, all organizations are involved in a longterm process. That is why sustainability of the projects is directly depending on the readiness for a longterm engagement by the organizations involved and on their own sustainability.

6.1 Communication / Management Systems of YSK's Water Supply Schemes

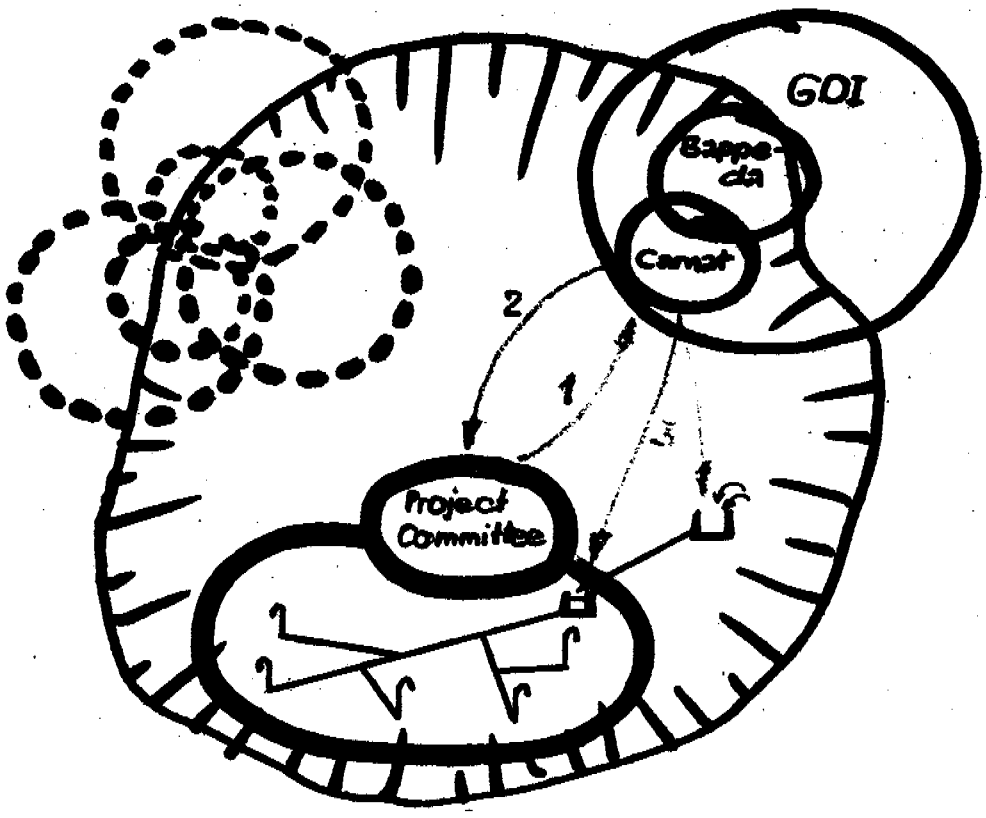
The following systems have been developed participatively with YSK's management team.

6.1.1 Planning and implementation phase :



1 Motivation, education
2 Request to YSK
3 Feasibility study
4 Request to GOI
5 Information to GOI
6 Approval by GOI
7 Contract village/diocese
8 Approval to YSK
9 Financial assistance
10 Implementation
11 Follow up

6.1.2 Post Project phase (after follow up phase)



1 Request for support in case of problems beyond villagers' capacity

2 Assistance according to need both technical or institutional

3 Routine check up of water quality, etc.

6.2 Organization's responsibility to achieve sustainability

When looking at the post-project management system at graph 6.1.2 sustainability of water supply and sanitation systems depends on the following four key factors :

A) Water supply system
B) Villagers' capability
C) GOI's interest and capability
D) Environment's favorability

(These key factors are discussed in detail in chapter 1.3.2)

The table 6.2 on next page shows the directly involved organization's influence on these four key factors. This means that the water supply project's sustainability depends much on the capability of YSK to take this responsibility. Since IC has taken over the responsibility to support YSK, the project's sustainability again depends on the effectiveness of this support.

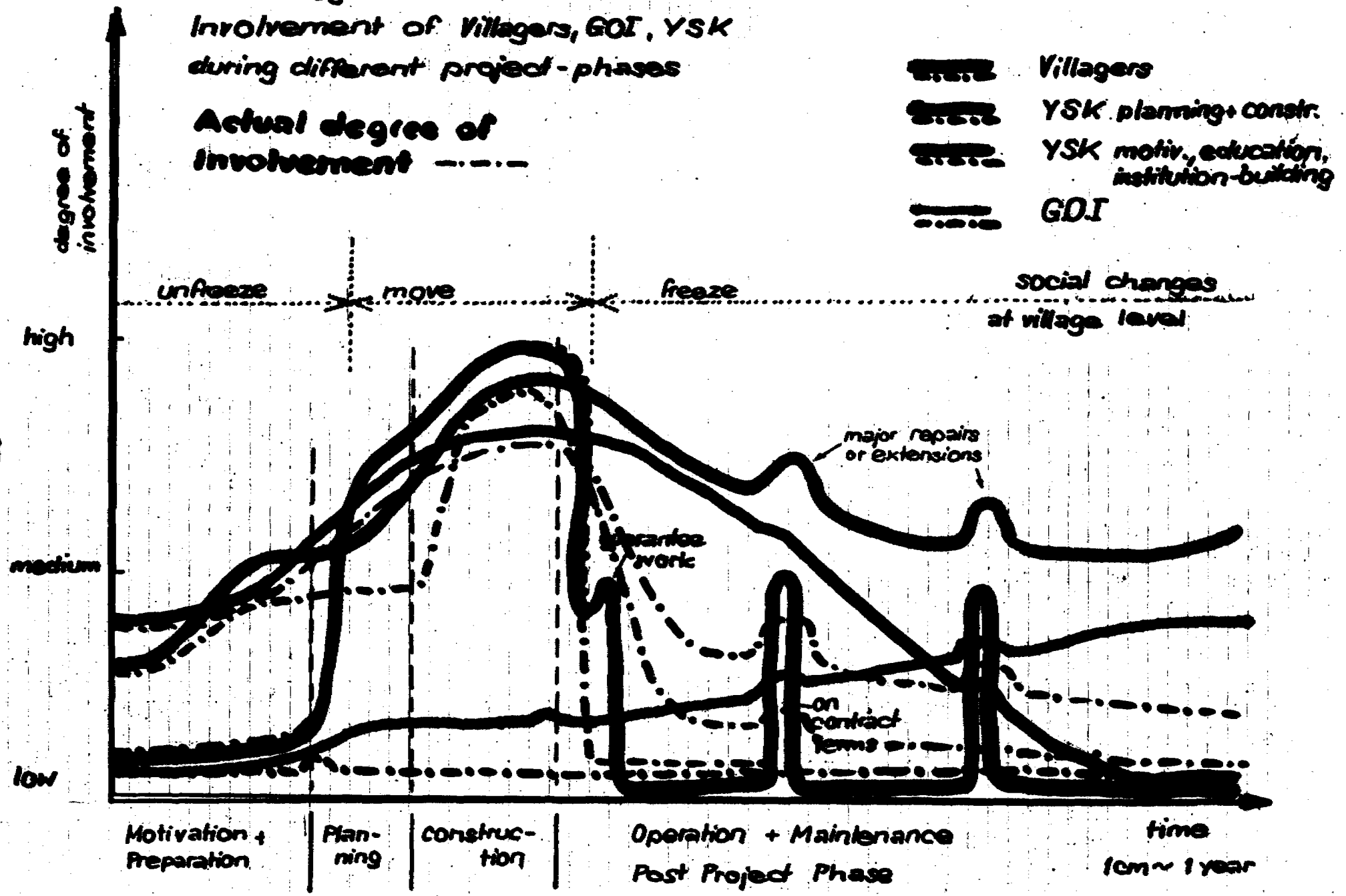
6.3 Course and degree of organization's involvement

On the back page table 6.3 shows the ideal course and degree of the organization's involvement during different project phases. The cover page shows the actual course. Attention may also be paid to the different stages of social changes (unfreeze/move/freeze). Each of these stages requires the adequate assistance.

The difference between the ideal and the actual course indicates when and to which degree the involvement needs to be adjusted. It follows that YSK's motivation, education and institution building support (software support) needs to be reinforced in particular during the post project phase. This is expected to be achieved by the planned follow up visits. Just so the villagers' involvement needs to be increased during the planning phase and in particular during the post project phase. This is of course linked with YSK's software support and is expected to be achieved by the reinforcement of this support. GOI's involvement has to be increased as YSK's is decreased. This is necessary since certain control function have to be maintained from outside the village organization.

The fact is very important that water supply project's **sustainability can only be achieved with a longterm support.** This means the water supply project's sustainability depends not only on the capability of YSK to support the key factors for sustainability but also on its longterm involvement which means on YSK's sustainability.

Tab. 6.3

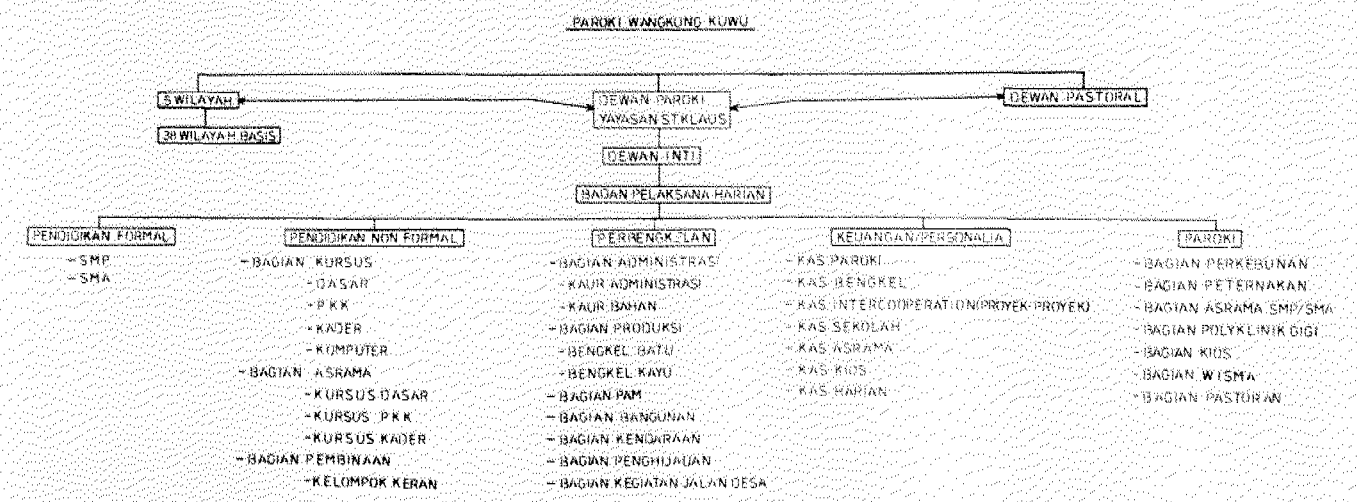

Ideal degree of involvement of Villagers, GOI, YSK during different project-phases
Actual degree of involvement
Villagers
YSK planning + constr.
YSK motiv., education, institution-building
GOI
degree of involvement
high
medium
low
unfreeze
move
freeze
social changes at village level
major repairs or extensions
operation work
on contract terms
Motivation + Preparation
Plan-ning
construc-tion
Operation + Maintenance
Post Project Phase
time
1cm ~ 1 year

6.4 Chances of YSK's PAM section to remain sustainable

The chances of YSK's PAM section to remain sustainable are evaluated since above analysis showed that the water supply project's sustainability depends both on the involved organization's capability and readiness for a longterm engagement and on the sustainability of the implementing organization, in this case YSK.

6.4.1 Set up of YSK

Without going into historical details, the following assessment is made : YSK evolved from different activities which were mainly initiated by Father Ernst Waser in Kuwu and Wangkung, such as the school SMP + SMA, mason and carpenter groups to construct church and school buildings etc., carpentry and concrete production workshops, mason groups to support infrastructure projects in the villages such as water supply, road and housing projects as well as undertaking contracts from GOI, World Bank, etc., mechanic group to maintain the equipment, agricultural production group (for internal supply), adult education, afforestation group, private and public transport facilities, etc. In recent years, Father Ernst Waser has developed a management system to organize and control over very diversified activites (compare graph 6.4.1 below). He has personally withdrawn from direct management functions to a great extent. Yet the presence of his personality (authority) is certainly still the important essence to maintain the required discipline and to solve problems in case of emergency.



6.4.2 The status of PAM section in YSK

The status of PAM section within YSK has certainly decreased over the past years since many new sections came up and other sections grew more rapidly. This development has been accelerated in very recent times because of budget shortening as described in chapter 8.1. The decrease of the status of the PAM section is partly reflected in the engagement of Rudi Ndoen. Rudi Ndoen had been originally hired to train the PAM section and lateron to build it up and to direct it as the engineer incharge. Today he is the director of the workshops and all construction activities (section Perrengkelan), he is the confidential person to deal with GOI, World Bank officials, etc. During the 91 mission Rudi Ndoen was requested to show graphically the shares of different activities of his section (compare annex 13). From these graphs it can be seen that RN today can spend merely 20% of his time for IC supported activities in the water supply section. This is understandable considering that only 17,8 % of the sections workforce is engaged in this subsection and the profit out of it is less than 15 %.

6.4.3 Organization of PAM section (Water Supply Section)

The organigramme of the PAM section remains about the same as shown in Ref. 1, page 24. But its capacity was reduced as Rudi Ndoen shows in the actualized organigramme in annex 14. From this paper can also be seen that Ferry Pieters has become assistant engineer. Very recently he replaced a formerly recruited engineer who had left YSK after few months of work. It is hoped that Ferry Pieters can take over some of the responsibilities of Rudi Ndoen. Yet his background is mainly in the teaching sector and he has no specific experience in drinking water supplies nor village work. This means Rudi Ndoen will have to train Ferry Pieters for the coming year in addition to his responsibilities. The head supervisor Gaba Gat got also involved in other subsectors such as afforestation, which means an additional reduction of the PAM sections' capacity. The IC budget insecurity (compare chapter 8) leads also to the fact that dropouts from the PAM section were not fully replaced so that its capacity got reduced further.

The reduction of the PAM sections' capacity to handle projects at a time looks as follows :

	Number of projects	
	before	actual
execution	6	3 to 4
study of new projects	4	3 to 4
intensive follow up	15	10

6.5 Recommendations

The importance and concern which have been given to this chapter are based on the consultants' experience with other village water supply projects. For instance in Cameroun, West Africa, external support has been provided during 25 years, resulting in a reasonable village approach (high participation during implementation), very well trained technical staff (incl. engineers) and appropriate construction standard. In spite of these very successful achievements the sustainability of the projects today is in great danger because of the missing follow up in particular the missing support in institution building both at village and government level.

6.5.1 Although the above analysis has already been extensively discussed during the 1991 mission with YSK's senior project staff, the discussion needs to be continued and deepened. The senior project management has to become fully aware of the importance of sustainability. Only an extended understanding about the key factors influencing sustainability will make it possible that priorities in the project management, organization, planning, implementation and follow up are set effectively.

6.5.2 The present set up of YSK needs to be further elaborated with the goal to achieve a simple, clearly arranged management system which can be managed locally and provides good chances to remain sustainable. At a first glance, following measures seem to be necessary :

- **"Consolidation and focussing of the different activities by setting clear and manageable goals and objectives"**. The rapid development and diversification of YSK led to an inequality between the management and implementation capacity. A kind of crisis management system evolved from it, which led to overloaded management positions and lack of planning capacity.

- **"Disentanglement of the various subsections with very different objectives and aims and provision of more autonomy to these subsections"**. This seems to be necessary so that those subsections (such as PAM), which are by their objectives less profit oriented than those subsections (such as production sections) which are intended for profit making, receive still the required attention. Similarly the village development oriented projects are not necessarily also very labour intensive and may therefore not support the objective of job creation as other activities. It has also to be envisaged that one or the other subsections may have problems in the future. Problems or even closing of one subsection should not endanger other subsections.

- **"Development of a management system including inbuilt monitoring, evaluation and planning capacity"**. This management system should still work in future when probably less project objective motivated people will be involved and in particular when the éminence gris in the person of Father Ernst Waser will not be in the background anymore.

6.5.3 The organization at village level still needs improvements as already recommended in 1990. This may be partly achieved by the suggested follow up visits, seminars for village leaders and caretaker courses etc. In addition Mrs. Suwan may assist to establish a more village appropriate form of organization. The envisaged "village management handbook" is intended to clarify and support the village organization.

6.5.4 Above recommendations have to be based and reflected on a continuous monitoring, evaluation and planning process. These seem to be typical activities where the assistance of IC's local project coordinator will be most helpful. His presence and preparedness to discuss these issues with YSK's project management will not only make sure that the required attention is paid to sustainability, but also actively support the aspects of institution building.

7. NEEDS FOR CONSULTANCY

Provision of consultancy to improve the effectiveness and to achieve sustainability of the water supply projects seems to be essential at different levels (compare operational plan at chapter 8).

IC's project coordinator, Peter Winkelmann, is certainly predestinated to support and partly train YSK on management aspects such as MEP (Monitoring, Evaluation and Planning), institution building, conceptual issues, etc., such as activities 24, 25 and 37 of the operational plan. He is supposed not to involve himself directly in operational issues except for the purpose of training on-the-job.

Mrs. Young Suwan (SW) will have to continue to assist and train the project staff in developing a village approach which provides the best chance for a sustained base. The shortcomings in the translation of mission reports etc. call for improvement measures. SW accepted to take responsibility for an efficient organization of the required translation work (compare activity 15). "Guidelines for Implementation Procedure" as well as a "Village Management Handbook" need to be developed. Although much experience and knowledge is already available from YSK project staff, the systematic writing and editing needs to be done by an external person. It was agreed that TOR for these two activities would be designed by SW und KW; SW would then write down the guidelines accordingly (compare activities 10 and 11).

SKAT, Karl Wehrle, is supposed to assist in the drawing up of above TOR's (activities 10 and 11). He will also mail additional material to support the planned training courses. He is expected to review the prepared training courses and syllabi as well as new project designs. Some special material such as water testing items need to be organized by him. Depending on the development and progress of the project a consultancy mission has been supposed for the second half of 1992 (compare activity 16). Within this mission a workshop may be organized to exchange experiences with YDD (Yayasan Dian Desa) and may be other organizations which are involved in village drinking water supply projects in NTT.

8. BUDGET AND OPERATIONAL PLAN

8.1 Assessment

Action plan and budget for 1991/92 were designed during the 1990 mission. They were based on the evaluation and recommendation by then as well as adjusted to the capacity of YSK's PAM section.

Unfortunately, the budget for construction work for 91/92 was reduced by almost 50 percent. This tremendous budget shortening naturally caused an insecurity at YSK. Questions arose like : What should be done with the available staff ? What should be told to those villagers, who had been promised that their project will be started in 91/92 ? Why should the PAM section be reinforced with an additional engineer ? etc. The answer of YSK was : Diversification into other fields. Fortunately, the opportunities were attractive, the GOI/WB projects both for housing and drinking water in the Lembor area offered not only an excellent opportunity to create more jobs, but also additional income (compare annex 13).

Unfortunately, for the PAM section this increased diversification caused also Rudi Ndoen to diversify his attention to different sections. By now RN can only spend about 20 percent of his time for the PAM section (compare chapter 6.4.2 and annex 13).

This situation of insecurity about IC-funding also caused confusion about which projects would be handled directly by the Delsos and probably financed by Misereor. Some projects already have been surveyed by YSK and in some cases even designs have been made, yet YSK does not know, when and by whom these projects will be implemented (compare annex 17).

The budget situation at present looks like this :

- The budget for 91/92 has already been overspent by 75 Mio Rs. This overexpenditures have been caused mainly by the required purchase of pipes for Bari water supply.
- This means the remaining amount for the construction season 92/93 is 105 Mio Rs. When considering the ongoing activities and plans for 92 which are reflected in the operational plan, the budget for 92/93 will be spent completely by the end of 92. This means no construction work will be possible in the first half of 1993. YSK will have to transfer the PAM staff to other sections.
- The action plan provided with mission report 90 has not been developed into an **operational** plan. This is understandable, considering the late translation of the report as well as the budget shortening.

8.2 Evaluation

IC's budget shortening is certainly not the only reason which made YSK to diversify significantly into other fields, which caused a kind of neglection of the PAM section.

(Concern about this is expressed in chapter 2.) But it contributed to this development and it makes it difficult to ask YSK's PAM section to improve the management and to focus on the agreed programme, when funds are cut substantially on rather short notice. Moreover classroom training makes little sense if it is not supplemented by on-the-job training. On the other hand budget constraints give also reasons to review priorities. It was agreed that those activities which increase sustainability should be attended with priority. The operational plan has been designed accordingly (compare following chapter).

The lack of an operational plan made planning and management of the PAM section difficult. The section has some times been run in a pragmatic way as a sort of crisis management with attention changing at any time to the most burning issue.

8.3 Recommendation

It is recommended that a supplementary credit should be considered so that the original cost frame is maintained. Distribution of budget will partly change since increased actions (such as standpipe supervisor course, village management handbook etc.) have been foreseen to support sustainability.

In intensive sessions the operational plan was developed participatively with the senior staff of PAM on wall charts (compare tables below). Additional information was provided in form of guidelines on how to develop and handle the operational plan (compare annex 16). The operational plan will be used as a mangement tool. The senior staff will review the operational plan monthly, while the entire PAM staff will meet quarterly to do the same (compare activity 24).

Budgeting for 1992 has been done together with the operational plan (compare tables 8.3.2). A compilation of the budget can be seen from table 8.3.1.

Table 8.3.1 - Compilation of budget in Mio Rupees per year

Nr.corr with O.P.	Activity	1	2	3
	Training of Beneficiaries :			
1	Motivator Course	3,0	3,5	3,5
5	Caretaker Course	3,5	4,0	4,5
6	Standpipe Supervisor Course	8,4	10,0	12,0
7	Village Management Seminar	2,3	3,0	3,0
8	Follow up visits	3,5	4,0	4,5
9	Selection criteria	0,4	--	--
10	Village management hand book	10,0	20,0	--
	Sub-Total	31,1	44,5	27,5
	Training of staff YSK			
2	Foreman Course (only sep. week from mason course)	1,8	2,0	2,5
3	Mason course	5,5	6,0	6,5
4	Technician course	2,4	4,0	4,0
37	Training of senior staff			
	1 concrete course	5,0		
	1 language course		5,0	
	2 special technician course		30,0	30,0
11	Guidelines for impl. procedure	7,0	5,0	
	Sub-Total	21,7	52,0	43,0
	General support activities			
12	Standardization	0,5	1,2	1,5
28	Motivation + preliminary survey	1,0	2,5	3,0
29/30	Purchase of equipment, etc.	2,5	2,5	3,0
	Sub-Total	4,0	6,2	7,5
	Completion construction work:			
	PAM Pota	2,0		
	PAM Wae Banka	4,2		
	PAM Rura	4,0		
	PAM Liang Bua	8,0		
	PAM Orong	Misereor		

	Design + Construction of Water Supplies :			
	PAM Roebek	17,9		
	PAM Bentang Iawa/Tengku Leda	13,7		
	PAM Golo Meleng 1st phase	14,5		
	PAM Bari 1st phase	178,3		
	PAM Tengku Leda			
	PAM Wukir		25,0	
	PAM Bari 2nd phase		70,4	
	PAM Paang, Lembor		22,6	
	PAM Ngkiong Dora		68,0	
	PAM Pangga		60,0	10,0
	PAM Tompong			100,0
	PAM Nanga Lanang (G.Mel.2nd ph.)			75,0
	Others		10,0	123,0
	PAM Lembor 2nd phase			
	PAM Judul Gambar			
	Sub-Total	242,6	256,0	308,0
	Complementary actions :			
31	Feasibility study	0,5		
32	Pilot latrine	0,1		
33	Monitoring	0,5		
34	Field test	0,9	2,0	
35	Design of manual		2,5	
	Training for constr. of latrines		3,5	4,0
	Limited subsidy for construction of latrines to prepared villagers	5,0	15,0	20,0
	Sub-Total	7,0	23,0	24,0
	Total overall	**306,4**	**381,7**	**410,0**

Operational Plan / Rencana pelaksanaan

No	Activity / Aktifitas	Indicator / compl. / Indikator	Who? / Siapa?	When? / Kapan?	Where? / Dimana?	required Budget / Mio Rs
1	Motivator course: (Penilma)		RN			
	a) design sylabus	a) detailed sylabus	RN/FP	(49) 31	Kuwu	
	b) design programme + prep. course	b) prep. course / programme	FP	50/51	Kuwu	3.0
	c) organization	c) invitat. / classroom / accom.	GG	(49)+(1)	"	
	d) implementation	d) 10 p. trained	RN, GG, FP	(23)+(4)	"	
2	Foreman Course: (Kepala Tukang)		FP			
	a) design sylabus	a) detailed sylabus (3)	All	(45)		
	b) design programme + prep. course	b) " programme + prep. course	FP	→ 31.12 key to syls. 3	Kuwu	1.8
	c) organization	c) regist. part. / accom.	GG	(1)+(5)		
	d) implementation	d) 16 p. trained	RN, GG, FP	(6) to (9)		
3	Mason Course: (Tukang)		FP			
	a)	a) (2)	All	(45)		
	b)	b)	FP	→ 31.12		
	c)	c)	GG	(49)+(1)	Kuwu	5.5
	d)	d) 20 m. trained	RN, GG, FP	(7) to (10)		
4	Technician Course (Teknisi) (2nd part)		RN			
	a)	a)	RN/FP	(49)		
	b)	b)	FP/RN	→ 31.12.		
	c)	c)	GG	(1)+(16)	Kuwu	2.4
	d)	d) 8 techn. trained	RN/FP	(17)		
5	Caretaker Course: (kader) (1st part)		GG			
	a)	a)	GG, RN, FP	→ 31.12.		
	b)	b)	FP, RN, GG	→ 9.2.		
	c)	c)	GG	(4)+(11)	Kuwu	3.5
	d)	d) 20 caret. trained	GG, RN, FP	(12)		
		(2) completed		date or week (3)		

No.	Activity	Indicator	Who?	When?	Where?	Budget / Mio Rs
6	standpipe superv. course	(Kelompok Kran)	RN			
	a) design sylabus	a) detailed sylabus	FP/RN	(16)		
	b) design programme + prepar.	b) " {prep. course / prepar.	FP	→ 2.5		
	c) organization	c) applicat. / accom.	GG/RN	(1) (5)	Kuwu	8.4
	d) implementation	d) 15 (10) m. trained	RN, GG, FP	(23) (24)		
7	village managem. seminar	(Opa)	GG			
	a) like 6	a) like 6	FP/GG	(15)		
	b) "	b) "	FP/GG	→ 4.9		
	c) "	c) " incl. transp.	GG	(18)+(21)	Kuwu	2.3
	d)	d) 20 v. manag. train.	GG/RN	(22)		
8	follow-up visits:		RN w. FP	20.12 (93) Born		
	a) finalizat. guidelines	a) compl. guidelines	GG	30.1 (Kuwu) Jak./Kuwu		
	b) design programme (8)	b) programme	RN, GG + All	(9) for - bac 93	Kuwu	3.5
	c) implementation	c) 24 visits in 92			Sem. Program 8.6	
9	selection criteria:					
	a) design draft	a) draft	RN	3.1	Kuwu	
	b) commenting draft	b) comm. draft	RN/Sw	31.3	Jak. → G.	0.4
	c) finalization	c) final. select. criteria	RN	Sep 4	Kuwu	
10	village manag. handbook		Sw/Ku			
	a) design TOR + content	a) TOR + cont.	Sw/Ku	Jan '92		
	b) " content	b) content	Pl/Sw	Feb '92		
	c) collect / compil. material	c) draft	All/Sw	Sep '92		separate
	d) comment. draft	d) com. draft	All	Sep '92		
	e) finalization / editing	e) ready f. print	Sw, FP	May '93		
	f) printing	f) village man. handb.				
11	guidelines f. impl. procedure:		Sw/Ku			
	a) like 10	a) like 10	Sw/Ku	Jan '93		
	b) "	b) "	Pl/Ku	Feb '93		
	c) "	c) "	All/Ku	Sep '93		separate
	d) "	d) "	All	Sep '93		
	e) "	e) compl. guidelines	Sw	Dec '93		

Table 8.3.2

No.	Activity	Indicator	Who?	When?	Where?	Budget
12	standardization design standpipe (consider existing) - catchm. cham. - storage-tanks - valve-chamb. - spec. built. pipl. reporting forms pipe laying (incl. instruct.)	(draft) standard plans " " " special constr. pipe-line rep. forms guide line	FP FP FP	Oct. 92 30.6.92	Kuwu	1.2
13	mission report 91 writing up translation	 report 91 mengl. report 91 indon.	 KW SW	 → 22.2 → 15.1.92	 CH Jakarta	separate
14	caretaker-course: selection of sites programme design inform. + prep. villages organization of logistics implementation	2nd part (field) villages detailed progr. villages ready avail. trsp. + accom. 20 caretaker trained	GG All GG RN FP GG GG GG LL CR AN	 (15) (16) (19) (20)	 Ncebanka, Popo, Anam	together with 5 w.o.
15	project visits Suwan in 92 discussion of village issues disc. activity No. 10 + 11 fieldvisit (social issues) supply of course material participation in act. 6 (partly) organization of translation translation annex. rep. 90 participation mission 92 KW (partly)	 guideline-notes → act. No. 10 + 11 guideline-notes course mat. relevant inputs to act. 6 translated documents (effeciently)	SW SW SW SW SW	March 92 July 92 " " " acc. to need → 15.12.91	Kuwu + Field Jakarta "	separate
16	mission KW 92 TOR design TOR + contract mission 92 making of addit. course-mat. review of prep. course-mat. review of new proj. design supply of special material	 draft TOR impl. TOR commentary " material supplied	 RN + All/PW AJ KW/All KW KW KW KW	 → 31.7.92 Sept. 92 Oct./Nov. 15.12.91 3 weeks upon receipt	 Kuwu Bern Kuwu + Field CH CH CH CH	separate

No.	Activity	Indicator	Who?	When?	Where?	Budget Mio. Rp. IC	others
17	Robek PAM r. construct. compl. 5%	compl. proj.	[illegible] GG/AN	July 92		-	6.8
18	Orong PAM r. constr. for compl. 10%	"	GG/GN	July 92		(5.9)	2.0 5.9
19	Bari PAM r. constr. f. compl. 40%	"	GG/AJ	80% by Dec. 92		70.4	17.0
20	Tengku Leda PAM r. constr. f. compl. 20%	"	GG/HM	Sept. 92		5.8	2.9
21	Paang Lembor PAM new construction	"	GG/FJ	Dec. 92	/	22.6	2.4 (2.0)
22	Planning of new Projects (3 to 4 out of many requests) selection f. new criteria survey decision m. meeting planning	 selected proj. feasibility study contract hydr. prof., sit. plan	RN RN LL, GR, [illegible] [illegible] FP/RN	 May 92 July-Oct. 92 Nov. 92 Dec. 92	 Kuwu Field + Kuwu Ruteng Kuwu	to be included in budget f. new project	
23	Lembor PAM 3rd stage constr.	compl.	RN/GG FP	Dec. 92	Lembor		4 52
24	Operational Plan review evaluation of progress adjustment "O.P."	 evaluation report new Oper. Plan	senior staff + PW entire staff	monthly last Friday quarterly	Kuwu Kuwu	incl. in overhead cost	
25	Review Recom. Mission 90 + 91 compaire achievements to recommendation	evaluation report	FP, RN	(26)	Kuwu	dito	
26	Hydraulic Profile Survey, Design	Finished drawing	RN	(15) May 1992	Rum, Bari, Robek	dito	

No	Activity	Indicator	Who?	When?	Where?	Budget
27	Excavation of Rock - Sharpening of tool - Cross chisel - Chisel engine	- better chisel - ___ " - operating engine	RN, PW RN, III GG, PW	30.11.91 new visit 20.11.91	RUTENG SURABAYA KUWU	
28	Motivation + preliminary survey	- increased awareness - decision about requests	Motivator RN/LLI/GR/PW	throughout 92 May to Dec. 92	existing + new projects Manggarai acc. to requ.	2.5
29	Purchase of bacteriology test kit		KN/IC	Jan. 92	UK	2,5
30	Purch. levelling instr.		RN	July 92	Surabaya	1.5
	Complementary Actions					
31	feasibility study existing design + social behaviour	info about accepted design + design	FP	→ 20.12.91	Manggarai	0.5
32	construction of pilot family latrine	pilot latrine	GG	⑧	Lait	01
33	monitoring of pilot lat.	design modification	FP	March to May 92	Lait	0.5
34	controlled field test of partly subsidised latr.	finalization of design + approach	FP GG, RN	June to Dec. 92	Rura, Papo Naebanka	2.0
35	design of manual + implement. policy	manual + impl. policy	FP + artist	Jan./Feb. 93	Kuwu	2.5
36	translation + typing operational plan	operational plan as managm. tool (incl. poster) in indon.	FP + admin.	15.12.91	Kuwu	incl. in other cost
37	training of sen. staff 1 concrete course 1 language course 2 special techn. course		GG RN RN/FP	92 93 94	Malang Australia ? ?	? ? ?

Key:

)1 preparation of course papers (written form. incl. sketches)

)2 time table

)3 remaining construction work for completion

)4 95 % of cost for material (pipes)

)5 allready paied

)6 Miserior

Key to initial

1 RN = RUDI NUGEN

2 FP = FERRY PIETERS

3 GG = GABA GAT

4 KN = KARL WEHRLE

5 SW = SUWAN

PW = PATER WASER

PW = PATER WINKELMAN

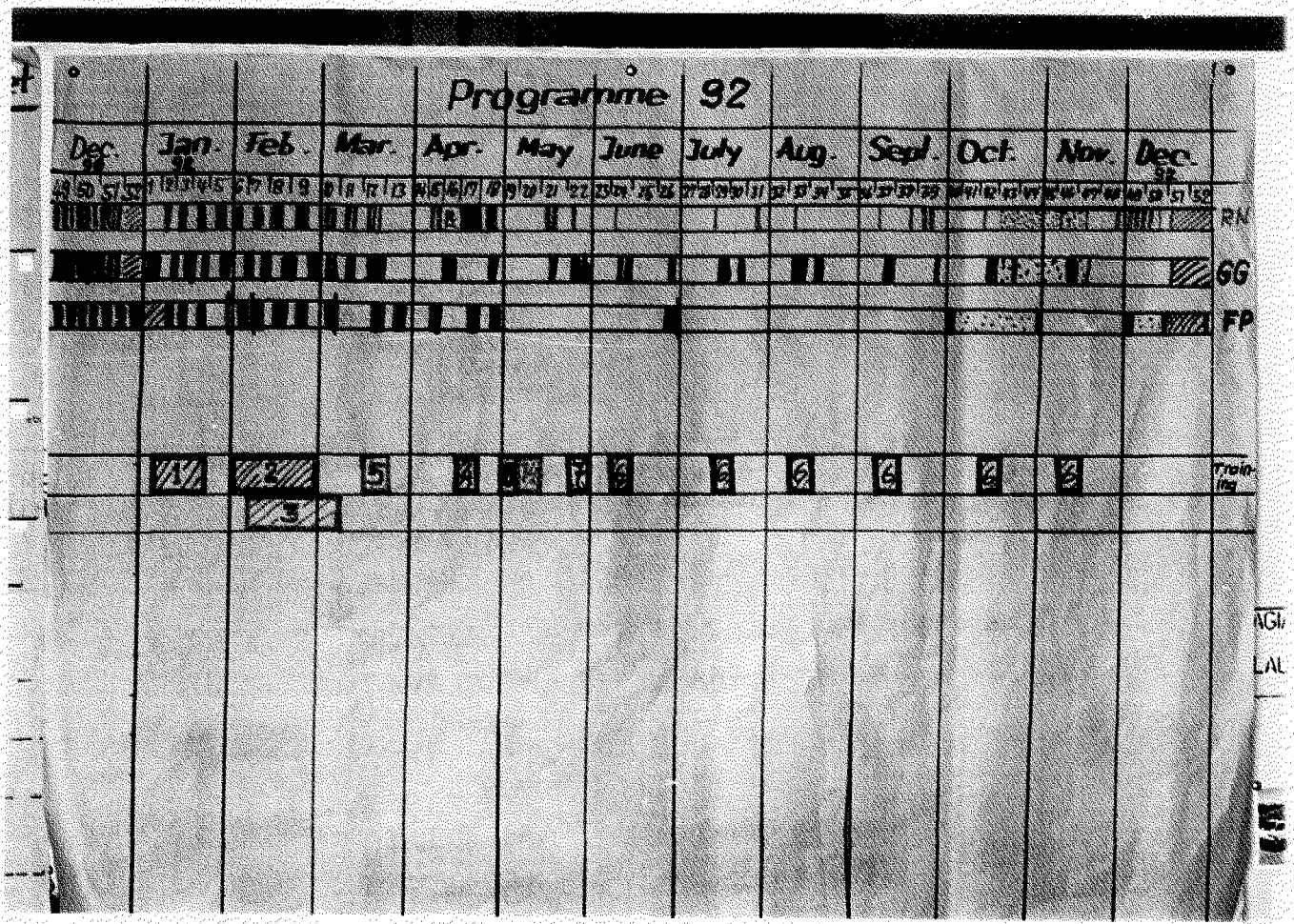
8 FP = FRANS JELALU

GN = ANA NAHAT

AT = ALUS TANJUNG

AN = ALEX NGANTI

HM = HENDRIKUS MANGGU


Programme 92
Dec. 91
Jan. 92
Feb.
Mar.
Apr.
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec. 92
RN
GG
FP
Train-
ing

KUNJUNGAN KE WILAYAH PAM
OLEH STAF BENGKEL YAYASAN ST. KLAUS (Programme for follow up visits in 1992)

NO	NAMA DESA	KUNJUNGAN PERTAMA	KUNJUNGAN KEDUA	STAF BENGKEL ST. KLAUS
1	WAE BANGKA	3/5-92 - 4/5-92	3/9-92 - 4/9-92	ALEKS NGARUT
2	WAE KANTA	3/5-92 - 4/5-92	3/9-92 - 4/9-92	AGUS JANGGUR
3	PONG PAJOK	3/5-92 - 4/5-92	3/9-92 - 4/9-92	FRANS JELALU
4	ROBEK	3/6-91 - 4/6-92	3/10-92 - 4/10-92	GABA GABUR
5	RURA	3/6-91 - 4/6-92	3/10-92 - 4/10-92	MARTEN PARUS
6	BENTENG JAWA	3/6-91 - 4/6-92	3/10-92 - 4/10-92	HENDRIKUS MANDUR
7	COLOL	3/7-92 - 4/7-92	3/11-92 - 4/10-92	ROVINUS DANGGUT
8	GOLO LANGKOK	3/7-92 - 4/7-92	3/11-92 - 4/10-92	ANUS HARUS
9	LIANG BUA	3/7-92 - 4/7-92	3/11-92 - 4/10-92	MIKAEL CARI
10	ANAM	3/8-91 - 4/8-92	3/12-92 - 4/12-92	NATALIA MAMUR
11	LETE	3/8-91 - 4/8-92	3/12-92 - 4/12-92	MAXI GAMBAL
12	KAKOR	3/8-91 - 4/8-92	3/12-92 - 4/12-92	WILHELMUS TARAM

MENGETAHUI,

(RUDY NDOEN)

DIRENCANAKAN KAMIS, 15 NOVEMBER 1991

(GABA GAT)

Annex 11

Syllabus and Programme for Foreman- and Mason-Course

SYLLABUS FOREMAN / MASON COURSE - 1st week Foreman Course

No.	Subject	Reference readings	Duration hours	Respon-sible
1	**Leadership**, staff handling on-the-job-training, etc.	35	6	GG
2	**Community issues**; communication, systems for learning and problem solving, roles and responsibilities of various actors (incl. operation and maintenance)	9, 27, 4 (5+ annex 4)	7	GG
3	**Site management** : workplan, site organization, stores, tools	35	6	RN
4	**Project administration :** reporting, bookkeeping, order of material	7, 19 (8, 11), 26, 30, 35	8	RN
5	**Tracing of pipelines :** use of clinometer, contourline considerations, etc.	1 (5), 2 (3.7.4)	4	RN
6	**Setting out**	11, 12, 13	4	FP
7	**Quality control :** importance of tight control and discipline at all levels	2, 3, 4	4	FP
	TOTAL 1st week		39	

TRAINING 6.11.91

Reference List

1	Buku Pegangan Untuk pengadaan air bersih pedesaan (SKAT / Yayasan Karya Desa)
2	Mission Report KW August 86
3	Mission Report KW April 89
4	Mission Report KW November 90
5	Instruction Manual for Mason (Lesotho)
6	Basic Hydraulics / Nepal Edition 1991
7	Manual of Standardization Edition 1991 (Lesotho)
8	Penanganan Mata Air April 89 (SKAT/YKD)
9	Drinking Water Supply and sanitation : Technical Aspects by Karl Wehrle, 1985
10	Caretaker Manual for Rural W.S. Lesotho + Sri Lanka
11	Pentunjuk Praktek Bangunan Air (1980)
12	Pentunjuk Praktek Bangunan Gedung (1980)
13	Pentunjuk Praktek Batu dan Beton (1982)
14	Survey S. Bahri Dian Desa (1983)
15	Membersikan Air D. Srihono Dian Desa (1983)
16	Hydrologi A. Soedjarwo Dian Desa (1983)
17	Pompa Hydraulic Ram, A. Lowa Dian Desa (1983)
18	Petunjuk Penggunaan Altimeter S. Bahri, Dian Desa
19	Manajemen Kenangan Proyek Ch. Aristanti, Dian Desa
20	Saluran Tertutup, V. Renyaan Dian Desa
21	Konstruksi Pengadaan Air, Bersih Pedesaan, Dian Desa
22	Konstruksi Instalasi Air Minum, R. Ndoen YKD
23	Cara Menyediakan Air Bersih, Dian Desa
24	Survey + Pemetaan by S. Bahri, Dian Desa
25	Perpipaan by R. Ndoen, YKD
26	Rencana Anggaran Biaya, Dian Desa
27	Paket Kasus Masalah, Dian Desa
28	Mari Membuat Proposal, Dian Desa
29	Perencanaan by A. Lowa, YKD
30	Anggaran Biaya, A. Lowa + R. Ndoen, YKD

4th week Mason Course

No	Subject	Reference Readings	Duration hours	Respons. Person
27	**Tool maintenance :** daily and weekly maintenance, storage and repairs of tools	13	6	FP
28	**Community issues :** behaviour of villagers, role of villagers (including O+M)	27	10	GG
29	**Collaboration with :** unskilled worker, etc.		3	GG
30	**Building Material and Construction :** (compare subject 17)	5, 4 (7 + 6)	6	RN/FP
31	**Skills :** waterproof plastering, stone masonry, repairs	5	8	GG/RN
32	**Finishing work :** required standards, importance of one time finish, danger of patch work	13 (42)	4	FP
33	**Examination**		2	
	TOTAL		39	

31	Kehilangan Tenaga Dalam Pipa, A. Lowa, YKD
32	Mengenal Acuan Beton Bertulang by I. Dipohusodo
33	Sarvodaya Rural Technical Service : Correspondence Course by H. Pfiffner (1988)
34	Spring Catchment by SKAT, 1991 (will be sent)
35	Pengaturan Organisasi Bangunan, n. hEIZT rICK
36	Guidelines for Preliminary Survey, SKAT 5/87
37	Manual for Survey Work, SKAT 6/87
38	Mission Report Kw, January 1992
39	Mason Course BTC, Cameroon

Annex 1

Terms of Reference

Annex 1

Terms of References for Consultancy in the Drinking Water Supply Programme for Mr Karl Wehrle, SKAT (Project: Road Construction and Rural Development Programme, Flores, Indonesia)

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1. Background

In his report of the third mission (Nov. '90) to the Water Supply Programme, K. Wehrle reviewed the project implementation and outlined the programme for the coming phase (July 1991 - June 1994).

Among others the report proposes:

- Trainings at different levels and for different target groups (beneficiaries, staff of Yayasan St. Klaus).
- Follow-up programme to ensure preventive maintenance.
- Promotion of latrines and sensibilisation of the beneficiaries for hygiene and health aspects.

However, most of these recommendations are only sketched out roughly and need to be worked out more in detail.

2. Purpose and mandate of the consultancy

The purpose of the consultancy is twofold:

- To provide continued technical support (follow-up on previous recommendations, assessment of state and quality of construction, suggest necessary improvements).
- To develop further and operationalize the proposed training programme and other new activities proposed to be implemented under this phase.

To this end the mandate of the consultant comprises the following tasks:

- **On-going construction of Drinking Water Supply Schemes:**

(1) . Describe state and assess quality of construction, advise on technical improvements;

(2) . Follow-up on previous suggestions (have they been applied?);

(3) . Provide on-the-job training if and where required.

((...) figures corresponding with "TO DO LIST")

- **Training Programme:**

(4) . Assess state and quality of the on-going course programme, suggest improvements;

(5) . Review the proposed training programme, (priorities, timing of courses);

(6) . Operationalize proposed courses (concrete contents, detailed course programme, training materials etc.), work out at least 1 course in sufficient detail;

(7) - **Follow-up visits:**

. Conduct at least 1 follow-up visit as an on-the-job training (procedure, check-list of parameters, reporting);

(8) . Prepare a work-programme for future follow-up visits.

(9) - **Complementary actions** (health education, latrine promotion:

. Prepare concrete work-programme

- **New schemes:**

(10) . Test and finalize selection criteria for new schemes (list of selection criteria prepared by R. Ndoen);

(11) . Appraise the cost estimates prepared for new water supplies;

(12) . Review the implementation procedures in particular the preparation/information process. Work out a clear process, stage by stage, including number of meetings required, subjects to be covered, etc.

(13) . Review the policy for other requirements prior and during implementation in particular beneficiary participation of money and labour, suggest improvements.
(14)

3. Procedures

The consultancy shall be implemented partly in collaboration with Mrs Yang Suwan who will advise in social aspects related to drinking water schemes. The IC Programme Coordinator will participate and assist in all aspects required. If required he will support and follow-up the implementation of the recommendations of the consultancy.

However, the key-beneficiaries of the consultancy shall be Pater E. Waser, R. Ndoen and the concerned staff of the Drinking Water Supply Section. A comprehensive draft report shall be prepared and discussed with the concerned staff and the IC-Programme Coordinator before the end of the mission.
A final report (in 8 copies) in English shall be submitted within one month of completion of the field work.

4. Timing

The mission shall be combined with a consultancy for a SDC supported Programme with YDD (see separate TOR).

The tentative timing for these missions is as follows:

(a) Flores: Monday 4th - Saturday 23rd November

(b) YDD/NTT: Monday, November 25th - Monday, December 2nd

Annex 2

Mission 1991 : TO DO LIST

Annex 3

Mission Itinerary

- Working session at Kuwu :
  . information about achievements to PW
  . review draft "guidelines for follow up visits"
  . review "homework" RN

9.11. Working session at Kuwu on operational plan 92

10.11. Review achievements / Preparation field visit

11.11. Ruteng - Reo - Robek - Rura
. Reo visit of retreat center SVD
Robek : informal meeting with women and men to learn about their stage of preparation for the planned water supply
. inspection of excavation of pipeline by 30 men of Robek, brief meeting with Kepala Desa and men of Robek
. evening meeting with project committee of Rura
. overnighting in Rura

12.11. Rura - Bari
. inspection of catchments Rura and Robek (catchment Rura requires reconstruction, but a "traditionally" protected tree prevents a technical sound solution)
. inspection of pipeline from catchment to storage tank (hydraulic profile is missing, drainage of low point wrongly placed)
. extensive meeting with village women at Rura, (Kelombok Kran system is highly accepted, women are ready to take over responsibility for O+M)
. inspection of catchment Bari (well designed, construction started correctly, impressing excavation of trench by community up to 3 m depth, rock excavation causes problems, since blasting is prohibited =⇒ improved chissels are recommended)
. overnighting in Bari

13.11. Bari - Ruteng
. meeting with Camat and some committee members (organization of community work in 23 groups seems to work well, up to date only limited responsibility has been handed over to community, Camat takes a strong lead, but cash contributions lack behind target, complementary actions are already envisaged)
. survey of the planned new settlement (too ambitious and too extensive =⇒it is recommended to build up the new settlement in phases according to the response by the population).

14.11.
- Review of findings and preparation of debriefing by KW at Wankung
- lessons learned from field visits and development of conclusions and recommendations by all at Kuwu
- completion of operational plan.

15.11.
- Completion of operational plan including budget at Kuwu
- preparation of examination
- review of mission findings with PW
- review of mission findings with PW and EW at Wangkung.

16.11.
- Finalization of operational plan
- examination of implementing staff
- meeting with implementing staff.

MISSION ITINERARY Annex 3

28./29.10. Travel Zürich - Jakarta

30.10. Briefing at SDC headquarters Jakarta with Ueli Lutz, SDC's outgoing Deputy Coordinator and Walter Hofer, SDC's incoming Deputy Coordinator

30.10./ 1.11. Travel to Ruteng via Denpasar and Bima

1.11. Preliminary discussion with Peter Winkelmann (PW) at Wisma Dalhia, brief meeting with Rudi Ndoen (RN) and Gaba Gatt (GG) at Kuwu.

2.11. Meeting with PW, RN and GG with the aim to develop a "To do list" for mission 91 base on the tasks according to TOR and to design the mission programme. Bi-lateral discussion with PW.

3.11. Preparation of "homework" for RN (data to be collected by RN)
Working session with PW and RN (homework RN)
Introduction meeting with PW and Father Ernst Waser (EW)
Transfer to Wankung

4.11. Arrival of Mrs. Suwan (SW)
Working session with PW, SW, RN, EW (objective of mission and intended programme).

Field visit to :
- Waebanka (meeting with Kepala Desa and interviews with village women at standpipes)
- Lembor housing scheme (timber [eucalyptus] construction proves to be surprisingly good)
- Kiln to burn clay bricks
- New catchment for 2nd phase Lembor water supply (well designed and constructed).

5.11. Teamwork at Kuwu :
- Review Waebanka incl. follow-up programme
- Preliminary draft for follow-up visits
- Design programme for follow-up visits.

6.11. Working sessions at Kuwu focussed on training issues :
- Review of ongoing activities
- Training subjects, target groups and priorities
- Design of programme
- Detailed syllabus for mason/foremen course

7.11.
- Draft for guidelines "Follow-up visits" by KW at Wankung
- Working session at Kuwu :
  - review remaining work
  - brainstorm complementary actions ⇒ setting priorities implementation programme
  - "village management handbook" ; aim, content
  - guidelines for project implementation

8.11.
- Completion draft for guidelines "Follow up visits" by KW at Wankung
- Preparation of operational plan 92 by KW at Wangkung

17.11.	- Review meeting with RN and Ferry Pieters (FP) - preliminary draft mission report - visit of Rahon road with EW.
18.11.	- Draft mission report - preparation for 2nd mission (Maumere) - evening meeting with Father Marssel, EW, PW and RN
19.- 24.11.	Mission to Water Supply Programme in NTT of Yayasan Dian Desa and SDC
24./25.11.	Debriefing YSK and IC at Wankung (EW, PW, RN) Travel to Labuanbajo with PW
26.11.	Day off
27./28.11.	No flights from Labuanbajo to Bima because of technical problems ⇒ ferry to Sate plus bus to Bima
29.11.	Travel from Bima to Mataram Lombok, settlement of logistics, visit of NGO's involved in drinking water projects and meeting with Dr. Santoso, Chief of Health Department NTB
30.11.-4.12.	50 percent each writing down of report and taking off-time at Lombok
5.12.	Travel to Yogjakarta, preparation debriefing
6.12.	Morning debriefing with SDC's Deputy Coordinator Walter Hofer Afternoon debriefing and discussions with W. Hofer and the Director of YDD, Anton Soedjarwo
8.12.	Departure for Delhi

Annex 4

Selection Criteria for Village Water Supplies

- Draft by Ruedi Ndoen
- Suggestions for additions by Karl Wehrle

YAYASAN ST. KLAUS

KRITERIA SELEKSI P A M

NO	K R I T E R I A		KUALITAS			SKOR
	ASPEK	INDIKATOR	A	B	C	
1.	Permintaan	a. permintaan resmi dari desa b. persetuujuan dari bupati				
2.	Survey pendahuluan	a. kebutuhan nyata akan air b. kelayakan teknis c. - sumber air cukup - penghijauaan d. jalan masuk ke desa e. biaya proyek per jiwa f. permintaan seluruh maasyarakat g. kemampuan memimpin dlm. masy. h. keadaan sosial i. kesiapan masyararakat menerima PAM (persediaan material lokal, partisipasi tenaga , dll) j. tanggung jawab operasi dan perawatan k. hutan lindung sekitar mata air				
3.	Bantuan IC	a. bantuan 90 %				
4.	Yayasan St. Klaus	a. kemampuan yayasan b. pelaksanaan training O + M				
5.	Survey	a. kelayakan konstruksi b. biaya konstruksi c. partisipasi masyarakat				
6.	Persiapan Pelaksanaan	a. terbentuk panitia pelaksana (termasuk ibu) b. pembagian tugas dalam masyarakat c. persetujuan memberikan tanah - lokasi mata air - lokasi penghijauan - lokasi jalur jalur pipa - lokasi bak - lokasi kran d. kesediaan membayar 2/3 dari swadaya murni sebelum pelaksanaan proyek e. kesediaan pengadaan material lokal si lokasi pekerjaan				
			TOTAL SKOR			

Keterangan :

A = baik / bagus / tinggi /ada / ya ; nilai = 3
B = sedang / cukup / cukup / ; nilai = 2
C = buruk / jelek / rendah /tidak ada/ tidak ; nilai = 1

Translation (by Peter Winkelmann, Ruteng, 12.12.91)

YSK
Selection Criteria Watersupplysector

1. Request
a. official request from a village
b. agreement by Bupati
2. preliminary survey
a. obvious need for water
b. proper technical quality
c. - ample water source
   - forestry aspects
d. road connection of particular village
e. project cost per person
f. wish for water by the whole population
g. competence of leaders
h. social situation
i. readiness of population to receive PAM (local materials ready, participation of local labour, etc.)
j. operational responsibility
k. protection of the forest in catchmentarea

3. Support from IC
a. Support 90 %
5.
4. Yayasan St. Klaus
a. Capacity of Yayasan
b. Implementation of training O + M

5. Survey
a. suitability of structures
b. construction cost
c. participation of village population

6. Preparation of implementation
a. Creation of a watersupply-comittee including women
b. Sharing of duties amongst villagers
c. Agreement on contribution of land
- location of well
- location of reforestation activities
- location of conduite
- location of reservoir
- location of standpipe
d. readiness to pay for 2/3 of local contribution before project-implementation
e. provision of local materials at work-sites

Index: A = good, nice, high, existing yes: value = 3
B= being considered, enough, enough, value = 2
C = inadequate, low, not existing, not ; value= 1

Suggestions for Additions to the "Kriteria Seleksi PAM" designed by Rudi Ndoen

The evaluation of a new water supply scheme according to the selection criteria designed by Rudi Ndoen will provide a useful indicator about the stage of preparedness for the implementation. But the total score cannot be the unique criteria to decide whether the water supply in question should be implemented. The following two aspects need to be considered as well :

a) "killer" criteria
b) common sense evaluation

a) "Killer" criteria

"Killer" criteria are those which need to be fulfilled totally, else the water supply could not be implemented. "Killer" criteria include the following indicators :

1. agreement by Bupati
2. accessibility by road ?
3. minimal supply per capita 25 lit/day
4. maximal cost per head < 40 US$?
5. agreement on contributions of land for catchment and protection zone as well as for the different constructions required
6. two third of village cash contribution paid into the project account
7. ....

b) "Common sense" evaluation

It is essential to evaluate a new water supply in addition to above criteria also with common sense. There might be indicators which are not included in above lists, but which are very particular for a specific village water supply (e.g. planned settlement schemes, ...)

RECOMMENDATION

Develop the following three tables to support your selection and the setting of priorities of new water supplies up to the time schedule 30.4. (compare activity 9) :

- Adjust the "Kriteria Seleksi PAM" (evaluation criteria) by transferring those criteria which need to be fulfilled totally to the "killer criteria".

- Complete the "killer criteria"

- Provide space for remarks from the "common sense evaluation".

Apply and test these three tables for the ongoing projects of this phase.

Annex 5

Design Guidelines Pokhara

with adjustments for Manggarai Flores on pages 1 and 2 of Design Procedure
and on pages 2 and 3 of Design Guidelines

COMMUNITY WATER SUPPLY AND SANITATION PROGRAMME

POKHARA

MINISTRY OF PANCHAYAT AND LOCAL DEVELOPMENT
REGIONAL DIRECTORATE
WESTERN DEVELOPMENT REGION

DESIGN GUIDELINES

FOR

WATER SUPPLY SYSTEMS

REVISED SRAWAN 2044

DESIGN PROCEDURE (Flowdiagram)

ASSUME:

a) Design Period = 20 years

b) Population Growth Rate:
for village area = 1.5 %
for bazaar area = 2.5 %

=> Population Growth Factor:
for village tapstands = 1.35
for bazaar tapstands = 1.64

see 1.2
1.3

→ 2,0 for piped systems
1,5 for storage tank

CALCULATE:

a) Design Population / D_1, D_2, D_3,...
for each tapstand:

D_T =Present population x 1.35 (village)
x 1.64 (bazaar)

see 1.4

CALCULATE:

b) Water Available / A
per Capita per Day
(assuming 10 % losses)

$$A = \frac{0.9 * \text{Measured Yield (l/s)} * 86400}{\text{Total Design Population}}$$

see 2.1

A = available liters per capita/day

DECIDE: (Type of System)

see 2.3

if:	if:	if:
A < 45 l/cd	45 ≤ A ≤ 115	A > 115 l/cd

Supply insufficient see Engineer

25

OPEN SYSTEM

CLOSED SYSTEM

see 2.4/2.6

ASSUME:

a) Peak Demand Factor -
- Closed Systems : 3.75 (village)
3.00 (bazaar)

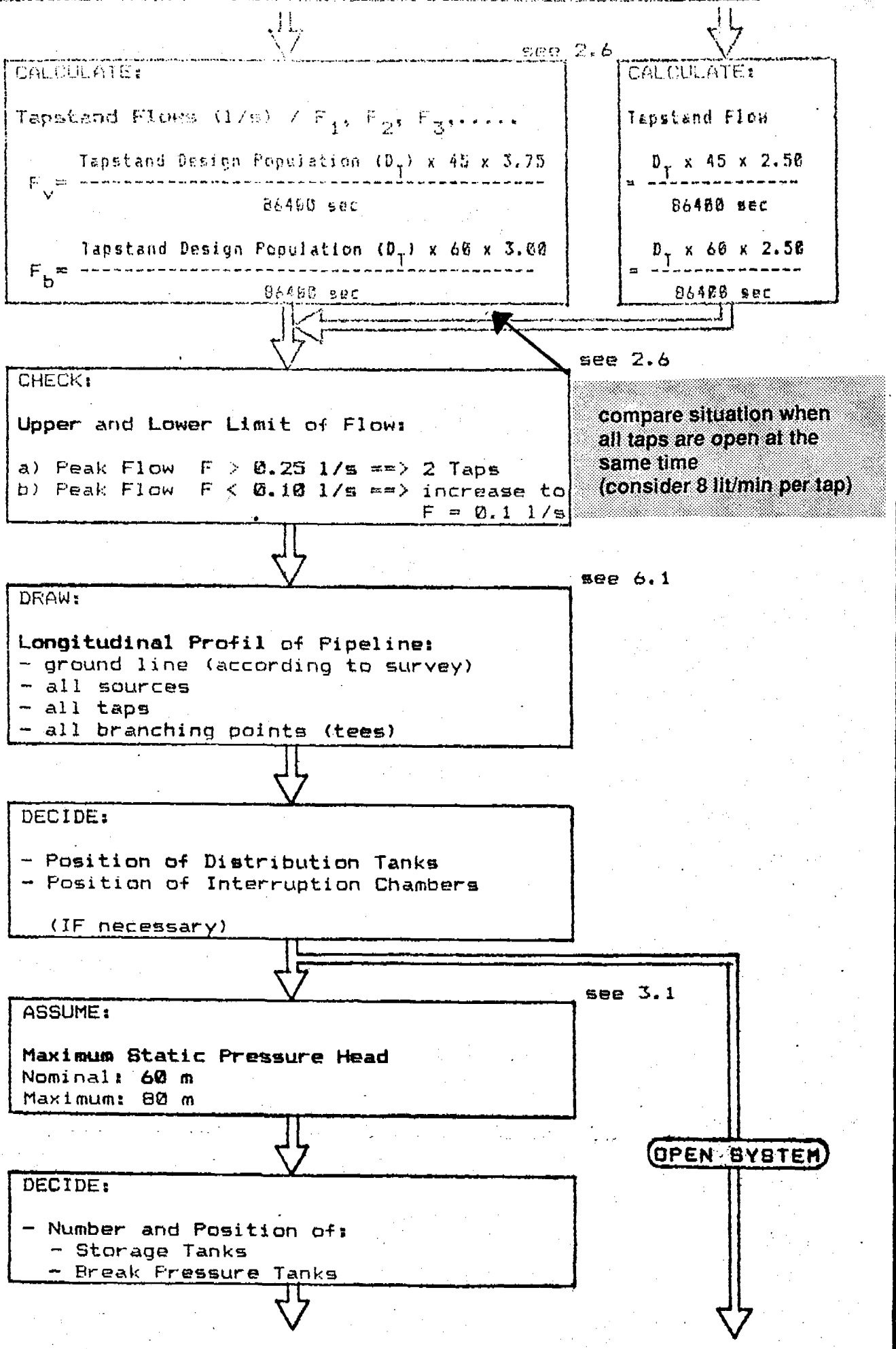
3,5

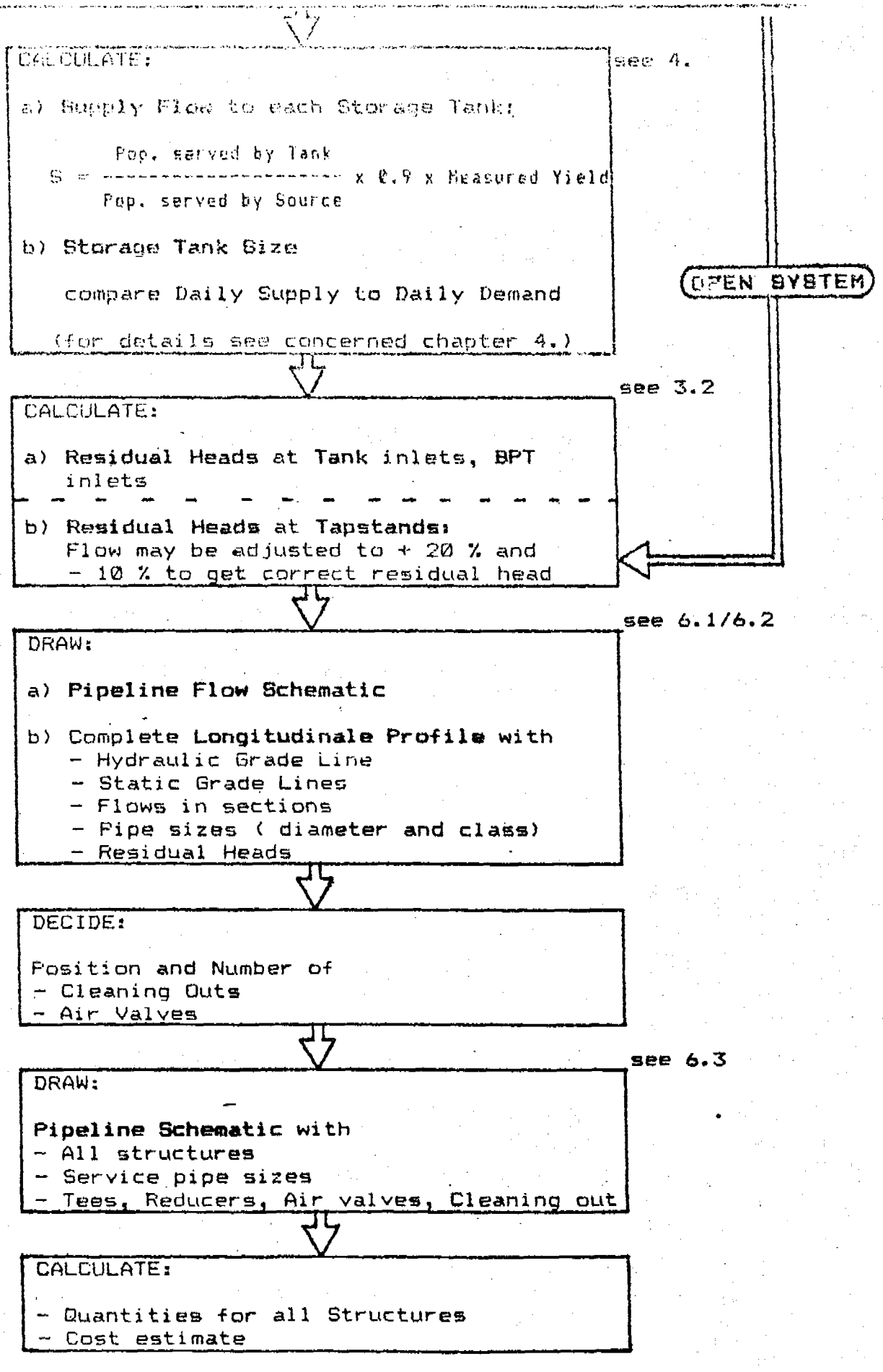
b) Daily Water Demand
- 45 liter per capita per day (village)
- 60 l/cd (bazaar)

ASSUME:

Peak Demand Factor
: 2.50

Daily Water Demand
: 115 l/cd


see 2.6
CALCULATE:
Tapstand Flows (l/s) / F_1, F_2, F_3.....
F_v = Tapstand Design Population (D_T) x 45 x 3.75 / 86400 sec
F_b = Tapstand Design Population (D_T) x 60 x 3.00 / 86400 sec
CALCULATE:
Tapstand Flow
= D_T x 45 x 2.50 / 86400 sec
= D_T x 60 x 2.50 / 86400 sec
see 2.6
CHECK:
Upper and Lower Limit of Flow:
a) Peak Flow F > 0.25 l/s ==> 2 Taps
b) Peak Flow F < 0.10 l/s ==> increase to F = 0.1 l/s
compare situation when all taps are open at the same time (consider 8 lit/min per tap)
see 6.1
DRAW:
Longitudinal Profil of Pipeline:
- ground line (according to survey)
- all sources
- all taps
- all branching points (tees)
DECIDE:
- Position of Distribution Tanks
- Position of Interruption Chambers
(IF necessary)
see 3.1
ASSUME:
Maximum Static Pressure Head
Nominal: 60 m
Maximum: 80 m
OPEN SYSTEM
DECIDE:
- Number and Position of:
- Storage Tanks
- Break Pressure Tanks


CALCULATE:
a) Supply Flow to each Storage Tank:
S = Pop. served by Tank / Pop. served by Source x 0.9 x Measured Yield
b) Storage Tank Size
compare Daily Supply to Daily Demand
(for details see concerned chapter 4.)
see 4.
OPEN SYSTEM
CALCULATE:
a) Residual Heads at Tank inlets, BPT inlets
b) Residual Heads at Tapstands:
Flow may be adjusted to + 20 % and - 10 % to get correct residual head
see 3.2
DRAW:
a) Pipeline Flow Schematic
b) Complete Longitudinale Profile with
- Hydraulic Grade Line
- Static Grade Lines
- Flows in sections
- Pipe sizes (diameter and class)
- Residual Heads
see 6.1/6.2
DECIDE:
Position and Number of
- Cleaning Outs
- Air Valves
DRAW:
Pipeline Schematic with
- All structures
- Service pipe sizes
- Tees, Reducers, Air valves, Cleaning out
see 6.3
CALCULATE:
- Quantities for all Structures
- Cost estimate

DESIGN CRITERIA

Design Period 20 years

Population Growth Rate

- Bazaar tapstands	2.5 % per year
- Village tapstands	1.5 % per year

Water Demand (per capita per day)

- Bazaar tapstands	60 l/cd
- Village tapstands	45 l/cd
- School tapstands	6 l/cd

Peak Demand Factor (peak hour demand / average day demand)

	closed system	open system
- Bazaar tapstands	3.00	2.50
- Village tapstand	3.75	2.50
- School tapstands	6.00	4.00

Tapstand Flows

- Maximum	0.25 l/s
- Minimum	0.10 l/s

Pattern of Water Consumption

Time Period	% Daily Demand
0500 - 0700	25
0700 - 1200	35
1200 - 1700	20
1700 - 1900	20

Maximum Working Pressures

- Closed systems	60 m static head (80 m in special cases)
- Self-closing taps	20 m static head (maximum flow 0.10 l/s)
- Open systems	pressure rating of pipe

DESIGN GUIDELINES

Introduction

In order to facilitate the design of water supply system a new detailed guideline was developed. It also contains certain modifications compared to the previous guidelines. These modifications will help to make the design more appropriate and economic without making the process of designing more complicated.
A flowdiagram is provided to give an idea of the design process at a glance. In the flowdiagram references are given to the chapters where the issues are explained in detail.
There might be exceptional cases where the provisions of this guideline will not be sufficient to solve the problem in a simple way. In such cases an experienced engineer has to be consulted in order to find a feasible solution.

1. Future Design Demand

1.1 Design Period

Even though so far no system built with UNICEF assistence has reached this age a **design period of 20 years** is assumed. In special cases the phased design of a system might be feasible. It may be more economically not to construct storage capacity for the full working life of the system in areas where transport costs are likely to be substantially reduced in the future (ie. planned road).
In any case the pipelines should be designed for a working life of 20 years. (see also Annex I)

1.2 Population Growth Rate

Assuming that the family planning efforts will have a certain measure of success, then the population growthrate (at present about 2.3%) will gradually decrease. Already now the actual growth rate in many hill areas is lower due to migration whereas for the same reason it will be bigger than average in bazaar areas. Therefore medium growth rates were fixed for village and bazaar areas seperately.

- **Village area : 1.5 % per year**
- **Bazaar area : 2.5 % per year**

1.3 Population Growth Factor

To arrive at the future demand we have to multiply the present population with the population growth factor for 20 years which is calculated from the yearly growth rate as follows:

$$\text{Growth Factor} = \left[\frac{100 + \text{Growth Rate}}{100}\right]^{20}$$

With the above assumptions for the Growth Rate the Growth Factors will be:

- Village areas : 1.35
- Bazaar areas : 1.64
- Schools : 2.00

} consider overall
2,0 for piped systems
1,5 for storage tank

1.4 Design Population

If there are no detailed figures for the present population available we assume that there are 7 persons per household.
6 persons

Example for calculation of design population: (Tab. 1)

TAP NUMBER	HOUSES	PRESENT POPULATION	FUTURE POPULATION	FUTURE WATER CONSUM	AVERAGE FLOW (l/s)	PEAK-FLOW (l/s)	REMARKS
Tap 1	10	70	95				
Tap 2	7	49	66				
Tap 3	9	63	104				Bazaar
Tap 4	school	100 st	200 st				
	+ 3	21	28				
Tap 5	12	84	138				Bazaar
Tap 6	healthpost						
	+ 5	35	47				
		1)	2)				

Notes: 1) 7 people per household
2) Growth Factor: village 1.35
bazaar 1.64
schools 2.00

2. Water Consumption

2.1 Available Water

The yield of all the sources should be measured in the dry season (Baishak/Jesth). Since wastage and leakage of water in the water supply system is unavoidable we have to make a provision for this fact. Practically this means that not the full amount of water measured at the source will be available for the distribution. If we assume that the **overall losses** will be about **10 %** then the Water Available is:

Water Available for distribution = 0.9 x Measured Yield = Safe Yield

In other words the **Safe Yield** is **90 %** of the **Measured Yield** in dry season. If the source yield was measured at some other time than the dry season, then a smaller percentage of the measured yield should be assumed as the safe yield. In such cases the engineer has to be consulted.

2.2 Water Consumption

minimal 25 l/cd if possible 45 l/cd

The average future per capita Daily Water Demand is now assumed to be 45 l/cd. This is obviously less than the figure used so far. Surveys in Western Region have shown actual average consump-tion of about 31 l/cd which means that with the new assumption of 45 l/cd there is still a provision for a consumption increase in future. Furthermore the 45 l/cd are also a figur recommended by WHO and are taken as a standard for the basic needs.
It should also be considered that a higher water demand will reduce the number of feasible projects especially in places where water is scarce and thus a water supply most important.

2.3 Decision on Type of System

In order to decide wether an open or a closed system should be built the **available water** has to be **compared with the daily water demand.** That means the water available in one day (as per 2.1) has to be divided by the total future population (design population)

$$A = \frac{0.9 \times \text{Measured Yield (l/s)} \times 86400 \text{ sec}}{\text{Total Design Population}}$$

If the water available is **more than 115 l/cd** (2.5 x 45 l/cd) an **open system** can be designed. In such cases refer to chapter 5.
If the water available is **between 45 and 115 l/cd a closed system** has to be designed.
If there is less than 45 l/cd of water available it means that we can not supply the standard amount of water. In such exceptional cases the problem has to be discussed with the engineer. However, a project may be designed assuming a per capita daily demand of less than 45 l down to a **minimum of 25 l.**

2.4 Daily Water Demand

As for the population growth rate also for the Daily Water Demand a distinction is made between village, bazaar and school tapstands as follows:

Village tapstand: 45 l/cd
Bazaar tapstand : 60 l/cd
School tapstand : 6 l/cd

Some tapstands may be serving both bazaar and village or both village and school. In such cases the different demands should be calculated seperately.

Example for calculation of Water Demand (Tab. 2)

TAP NUMBER	HOUSES	PRESENT POPULATION	FUTURE POPULATION	FUTURE WATER CONSUM	AVERAGE FLOW (l/s)	PEAK-FLOW (l/s)	REMARKS
Tap 1	10	70	95	4275			
Tap 2	7	49	66	2970			
Tap 3	9	63	104	6240			Bazaar
Tap 4	school	100 st	200 st	1200			
	+3	+21	+28	+1260			
Tap 5	12	84	138	8280			Bazaar
Tap 6	healthpost			2000			
	+5	35	47	+2155			

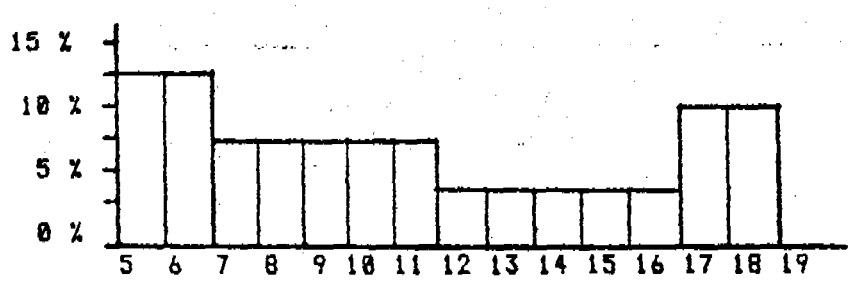
Note: The future daily demand for healthposts is assumed as 2000 liter per day

2.5 Pattern of Demand

The distribution of the total daily water demand over a day follows a certain pattern. Roughly it can be said that a lot of water is collected in the morning and again towards evening. Since a complicated, detailed pattern is not more accurate the following simple pattern was adopted:

Time Period:	% of Daily Demand:
0500 - 0700	25 %
0700 - 1200	35 %
1200 - 1700	20 %
1700 - 1900	20 %

Graphically: (Tab. 3)



2.6 Peak Demand Factor

Besides the distribution pattern of the daily consumption shown above additional "peaks" in the consumption can occur at any time of the day when a lot of people are drawing water at the same time. The Peak Demand Factor shows the relation between such a peak demand and the average demand:

$$\text{Peak Demand Factor} = \frac{\text{Peak Demand}}{\text{Average Demand}}$$

Basically the peak demand factor is a measure of how quick the "gagros" can be filled. The higher the PDF the greater the flow of water per person. Thus a higher PDF provides greater convenience to the users but on the other hand larger diameters of pipe for the distribution system are needed. Therefore the PDF has to be choosen in a balance of convenience against economy.
The Peak Demand Factors are fixed as follows:

	Closed Systems	Open Systems
Village tapstands:	**3.75**	**2.50**
Bazaar tapstands :	**3.00**	**2.50**
School tapstands :	**6.00**	**4.00**

Note: At bazaar taps the PDF is lower because the comsumption is spread more than at village taps.
At schools the consumption is normally concentrated on very short periods.

2.6 Tapstand Flows

In order to get the design flow from each tapstand the Future Water Demand per Day of the concerned tap has to be divided by 86400 seconds and this Average Flow has to be multiplied by the Peak Demand Factor. The resulting Peak Flow will be decisive for the hydraulic calculation of the system.

Example for calculation of tapflows (Tab. 4)

TAP NUMBER	HOUSES	PRESENT POPULA-TION	FUTURE POPULA TION	FUTURE WATER CONSUM	AVERAGE FLOW (l/s)	PEAK-FLOW (l/s)	REMARKS
Tap 1	10	70	95	4275	0.049	0.19	
Tap 2	7	49	66	2970	0.034	0.13	
Tap 3	9	63	104	6240	0.072	0.22	Bazaar
Tap 4	school	100 st	200 st	1200	0.014		
	+3	+21	+28	+1260	+0.015	0.14	
Tap 5	12	84	138	8280	0.096	0.29	Bazaar
Tap 6	healthpost			2000	0.023		
	+5	35	47	+2155	+0.025	0.12	
Total:				28380		1.09	

Note: Tap 3: (6240 l/d : 86400) x 3 = 0.22 l/s
Tap 4: (1200 l/d : 86400) x 6 + (1260 l/d : 86400) x 3.75 = 0.14
Tap 6: (2000 l/d : 86400) + (2115 l/d : 86400) x 3.75 = 0.12

Note that the tapstand flow should be within certain limits to make sure that the calculated flows will actually appear.

If the flow is less than 0.1 l/s it should be increased to that amount. If the flow is higher than 0.25 l/s then an extra tapstand should be included in the design.
This conditions give a certain idea about the numbers of houses for which at least one tapstand should be provided:

$$\text{Max. Number of Houses per Tapstand} = \frac{0.25 \text{ l/s} \times 86400 \text{ s}}{1.35 \times 7 \times 45 \text{ l/cd} \times 3.75} = \text{~~18~~ } 14$$

3. Hydraulic Design of Pipeline

3.1 Static Pressure Head

The closing of bibcocks creates excessive pressure (Water-hammer) which results in higher pressures than the calculated static pressure head. Like this, if the system is designed with static heads close or even slightly higher than the nominal working pressure of the HDP pipes, bibcocks, as well as joints in the pipe and the fittings will be damaged. Therefore in order to keep the system running for the duration of its design lifespan it is essential to limit the

Maximum Static Pressure to 60 m.

In exceptional cases it might be increased up to 80 m.

Self-closing taps with almost instantaneous closure mechanisms such as Jayson Taps should only be used where the static head at the tapstand is not more than 20 m and the design flow at the tap is 0.10 l/s.

3.2 Residual Heads

When calculating the pipe sizes, particular attention should be paid to the **Residual Heads** required at tank inlets and tapstands. The residual heads should be within the following margins to make sure that actually the calculated flow is discharging.

Residual Head at inlets : 5 - 10 m
Residual Head at tapstands: 7 - 15 m

If it proves to be difficult to design for the required residual head, then some sort of flow control mechanism should be included in the design. For this purpose special flowlimiters are available.
In order to meet the required residual heads tapstand flows may be adjusted by up to +20 % or -10 % .

4. Storage Tanks

The position of all tanks should be carefully decided. Storage Tanks should be positioned as far down the system as possible. A number of small Storage Tanks are usually preferable to one large tank.
For the size of the Storage Tank the Daily Supply has to be compared with the Daily Demand according to the consumption pattern. This comparison shows which deficit in supply occurs during the daytime. The storage capacity has to cover at least this deficit. The amount of this deficit can be determined mathematically and graphically.

Mathematic Method:

The supply and demand for the different periods of the day (acc. to the consumption pattern) are compared and the deficits and surplus are continuously added up. The sum of the highest surplus and deficit equal the necessary storage capacity.

Example for a calculation form: (Tab. 5)

Period	Supply (inlet) in %	Supply (inlet) in l	Demand (outlet) in %	Demand (outlet) in l	Difference in l +	Difference in l -	"Water-level" in l
	Daily Supply:	1) l	Daily Demand:	2) l			
5 - 7	8.4		25				
7 - 12	21.0	3)	35	4)	5)	5)	6)
12 - 17	21.0		20				
17 - 19	8.4		20				
19 - 5	41.2		0				7)

Note: 1) the Daily Supply to this Tank in liter has to be shown here
2) the Daily Demand according to Tab.4 (Future Water consumption has to shown here in liters
3) Supply in a period = 1) x the given percentage
4) Demand in a period = 2) x the given percentage
5) Difference between Supply and Demand for a period 5) = 3) - 4) [plus/minus]
6) Continuous addition of differences 5)
7) If Daily Supply = Daily Demand, the last figur under 6) has to be zero.
If Daily Supply is bigger than Daily Demand, the last figur under 6) is equal to the overflow

To determine the Tank Capacity the biggest negative and positive figur of "Waterlevel" [6)] except for the last figur [7)] have to added. See also following practical example.

Period	Supply (inlet) in %	Supply (inlet) in l	Demand (outlet) in %	Demand (outlet) in l	Difference in l +	Difference in l -	"Water-level" in l
	Daily Supply: 16000 l		Daily Demand: 16000 l				
5 - 7	8.4	1512	25	4000		2488	- 2488
7 - 12	21.0	3780	35	5600		1820	- 4308
12 - 17	21.0	3780	20	3200	580		- 3728
17 - 19	8.4	1512	20	3200		1688	- 5416
19 - 5	41.2	7416	0	0	7416		+ 2000

=> Necessary Storage Capacity = 5416 l = 5.4 m^3

If according to this calculation no deficit is shown (exceptional big supply) then the capacity has to be calculated to meet the peak hour demand:

$$\text{Capacity} = \frac{\text{Daily Demand} \times \text{Peak Factor}}{24\ \text{h}} - (\text{Supply in l/s} \times 3600)$$

Once the capacity of the storage tank is calculated, The filling time should be checked. It should be not more than 10 hours.

4.2 Break Pressure Tanks

According to the restriction for the static pressure head the BPTs have to be placed. They should be positioned just above tees and tapstands as far as possible.

5. Open Systems

Provided that there is sufficient water, an open system can be considered. However this will only apply for small systems.
Since the supply main for open systems must carry the peak demand flow, in cases of long mains with low slope, pipe cost can increase considerably due to big diameters. Then it might be more economical to design the supply main for minimum flow and design the storage tank for maximum capacity.
For open systems the peak demand factors are smaller to avoid unnecessary wastage. (see chapter 2.6)
In open systems special emphasis has to be given to the drainage of the tapstands.

6. Drawings

6.1 Longitudinal Profile

The scales to be used for Ground Line Profile are 1:1000 or 1:2000 for vertical scale and either 1:10000 or 1:5000 for horizontal scale.

All sources, interruption chambers, tanks, BPTs, cleaning-outs air-valves, branching points and taps have to shown in the profile.
The Hydraulic Grade Line and the Static Grade Line has to be drawn.
For each important point on the profil the point number and elevation has to be noted.
For each section the horizontal distance, the tape length, the total tape length, the type and diameter and length of pipe and the flow have to be plotted. Whenever a change in diameter or type of pipe is there, a new section starts.
For branch lines shown within the mainline profile, extra lines for the mentioned information have to be provided.
At every relevant point the residual head has to be plotted.

6.2 Pipeline Flow Diagram

Specially for big systems it is helpful to draw a diagram which shows schematically the different branches of the system with its respective flows.

6.3 Pipeline Schematic

In any case it is necessary to draw a Pipeline Schematic, which is just a simplified situation plan of the system. In small systems this plan can be combined with the Flow Diagram. The pipeline schematic must include all structures with pipe diameter, tees and reducers, tapstands with faucet type, air-valves and cleaning-outs.

7. Phased Design

As mentioned in chapter 1.1 in some special cases it might be economic to make a phased design. That means that first the water consumption has to be calculated for the period of 20 years in order to design the pipelines. For the Storage Tank an additional calculation for the consumption in 10 years is necessary.

$$\text{Population Growth Factor for 10 years} = \left[\frac{100 + \text{Growth Rate}}{100}\right]^{10}$$

That means the Growth Rate for 10 years will be as follows:

village area: 1.16
bazaar area : 1.28

For the sizing of the tank the future daily water consumption has to be calculated with these growth factors.
(see chapter 4.)

General Notes on the Design Guidelines

Design

These new design guidelines replace the guidelines included in the Standardisation 2043/44 as well as the note on this subject dated September 1982. A diversion from these design guidelines is only allowed after consultation of the Project Manager.

The present design procedure is as follows:

Phase	Done by	Checked by
Survey calculations	overseer	engineer
Profile (draft)	overseer	engineer
Design (draft)	engineer	Project Manager
Profile/design drawing(final)	overseer	engineer
Estimate	overseer	engineer
Technical approval	Project Manager	
Approval	Director	

2. Project Files

For each project 10 files have to be prepared which are distributed as follows:

1) MPLD, CWSS-section
2) MPLD, Planning & Evaluation Section
3) Distict Panchayat Secretariate
4) Treasury & Account Comptroller Office, District
5) RD, Store Section
6) RD, Planning Section
7) RD, Engineer
8) RD, Overseer
9) Water Supply Committee, Village
10) RD, ORIGINAL FILE

It is most important that the original file is always kept properly since it is the only file which contains all information on the project. The following informations to be included:

- preliminary survey report
- survey calculation sheets
- calculation of (peak-) flow for each tap
- hydraulic calculation sheets
  In case more than one possibility was calculated, indicate clearly which one was selected.
- Plans:
  - Longitudinal Profile (blueprint of final design)
  - Flow Diagram (showing the flow in each pipeline)
  - Pipeline Schematic (situation plan with all information on structures as per 6.3 of design guidelines and features of the supply area like bridges, temples etc.)
- sketch and quantity estimate of additional structures for spring or stream catchment.

. Rate analysis
. Quantity estimate, breakdown
. Transportation estimate
. District and Office Rates
. relevant correspondence.

3. Note on Estimates

In addition to the estimates given in the Standardisation (Bhadra 2043), the following general notes should be observed.

- Each project should receive 3 m wiremesh 1mm and 3m wiremesh 4 mm for sieving cement and sand respectively. After use this wiremesh can be used for preparation of tanks, BPT etc. and for sanitation. This wiremesh should be added to the estimate.

- Tools
The tools provided in pages 9 to 11 in standardisation are guidelines. Depending on the circumstances it is possible to change the quantities given. However a brief explanation in written will be required why the cahnges are necessary.

- Catchment
For the stream and spring catchment only the collection chamber and valve chamber have been standardized. During detail survey, the overseer or engineer has to make a sketch of the sprong, kholsi or khola. On the basis of this sketch additional structures for the spring or stream catchment should be designed. These should be estimated separately and added to the estimate ofthe catchment.

- Village Contribution
The village contribution for stones, gravel, sand and trenchdigging and earthwork of various units of the project should be calculated according the standard Norms of MPLD.

- Sanitation

School/Healthpost latrines are to be included in the estimate on the basis of room per students, or users in the case of healthposts.
As a rule the following can be used to derive the number of rooms of a set of latrines:

School less than 100 students	-	1 room
Health Post	-	1 room
School 100-200 students	-	2 rooms
Big Health Post	-	2 rooms
School 200-300 students	-	3 rooms
School 300-400 students	-	4 rooms

More than 4 rooms will not be provided in a school. In very large school a separate 1 pit box latrine can be provided the teachers.

It should be noted that although a set of latrine is included in the estimate, these will only be built when the headmaster, the school committee or the health-post-incharge have specifically asked for their construction in writing. Until such a request is received no latrines are to be constructed.

For the latrines a new standardisation is underway and will be printed later in a separate booklet. Until then the standardisation used up to now will be valid.

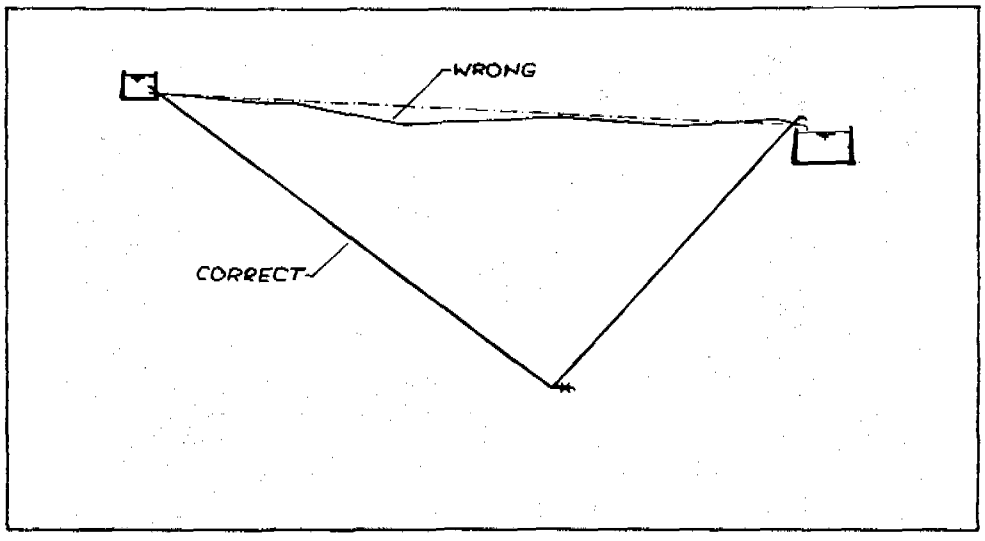
Annex 6

Recommended Modifications of Construction Details

Tracing of pipelines

(Extract mission report 1986)

The tracing of pipe-lines requires improvement, which can be achieved by applying the recommendations provided by Ref. 1 page 115-119. The main problem observed, was caused whenever small gradients were tryed to be maintained on long distances in this case any small inaccurancy lead to low and high points. This can be avoided in futur simply by increasing the gradient and introducing one significant low point equiped with a drainage facility. After the low point the pipeline should climb right to the outlet into the next tank.



An other point to be attended is to provide ventilation after the valves to prevent of vacuum in the main (comp. Ref. 1, p. 118).

High water pressure has to be avoided. At tap points it should not be more then 60 metres (exceptions 80 m) in order to avoid quick wearing of taps and valves. The maximal pressure of pipes at low points has to correspond with permissible pressure of pipes available. In general air-release chambers (comp. Ref. 1 Norm Plan No. 5) have to be introduced wherever the pressure exceeds 80 to 100 metres.

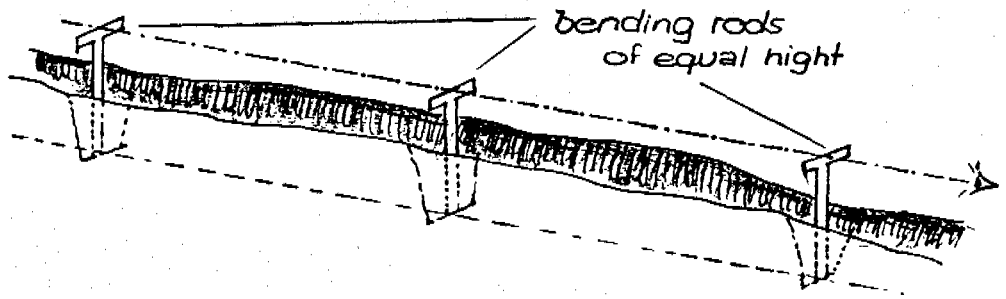
TRENCHING

The pipeline should be laid along the straightest route possible. Road crossings should be done at a right-angle to the road whenever possible.

Every length of main should be laid with a continuous rise of about 2% to 5% to high points, so that air can be released through air valves, or with a continuous fall to a low point, where a cleaning valve should be fixed for emptying that portion of the main. Flat lengths of pipelines, or those laid parallel with the hydraulic gradient, should be avoided since they may give air-lock problems.

CHECK OF GRADIENT OF TRENCH :

Make use of bending rods to check the accuracy of the gradient inbetween two given points.



Laying of pipes

General Rules :

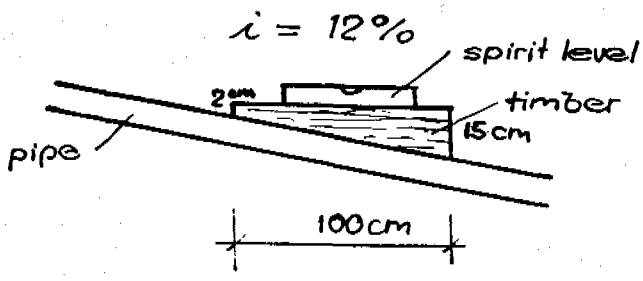
The pipe should be laid on firm ground or foundation in order to prevent uneven settlement, which may damage pipe joints. In rocky soils, rocks and stones should be cleared away from the bottom of the trenches for 15 cm beyond the pipes and should be replaced by plain earth, sand, pea-size gravel or concrete. A very large proportion of burst mains are caused by pipes settling on large stones or rock points.

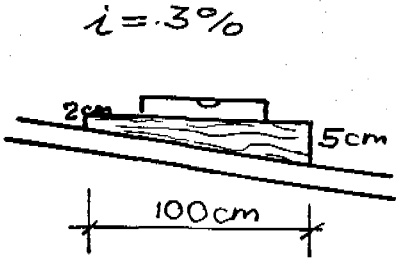
All tree roots between the surface and a depth of 1 m should be cut to prevent damage to pipes from root growth (moving or squeezing of the pipe) or by uprooted trees. This is very important if the pipes are joined with rigid couplings because an uprooted tree can damage a lengthy section of a rigidly joined pipeline.

Just before lowering pipes into the trench the pipes should be reinspected (the first inspection having been done when the pipes were delivered and stacked). This inspection should be concerned with finding cracks, blemishes, punctures or other discontinuities of the external protection of all pipes. At the same time - just before lowering them into the trench, the inside of the pipes should be inspected for foreign bodies (like snakes, mice, gravel or sand). The pipes, as well as their joining ends should be wiped and cleaned.

Check correct gradient of pipes :

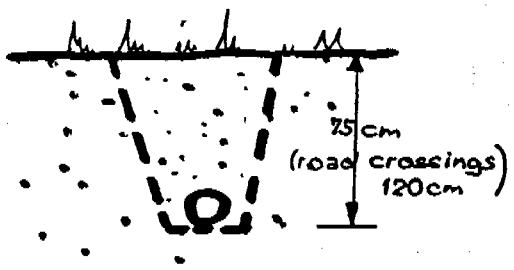
As a rule every pipe should be checked for its correct gradient with a spirit level. One meter length of timber may be planed to different comen gradients and applied as suggested below.



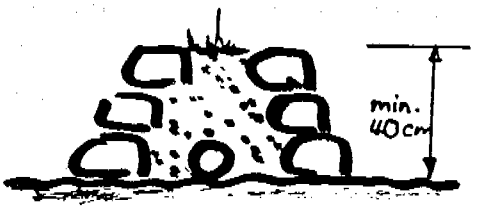


Laying of pipes at different soil conditions

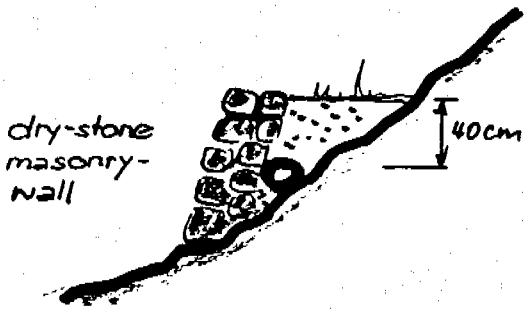
soil normally excavatable:



rocky ground:

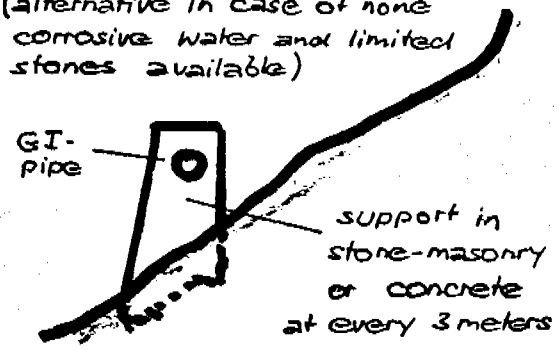


rocky hill side

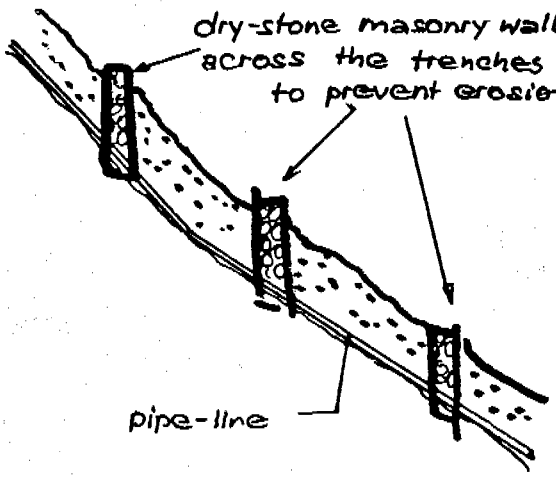


rocky hill side

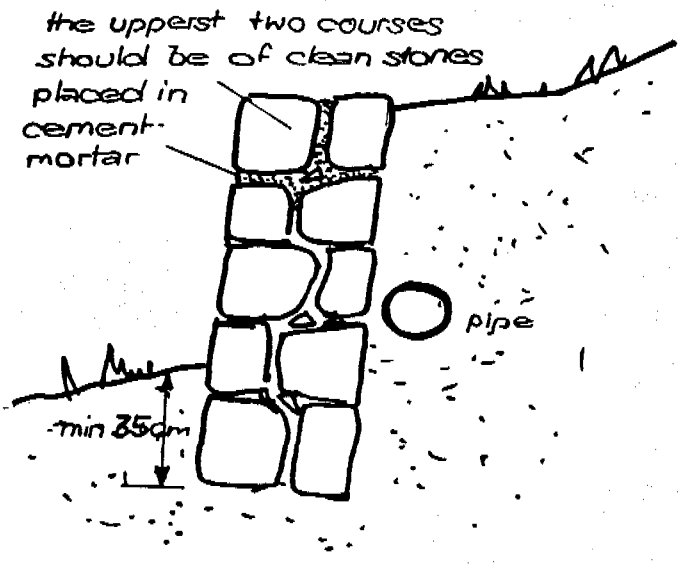
(alternative in case of none corrosive water and limited stones available)



steep trench (longitutial section)

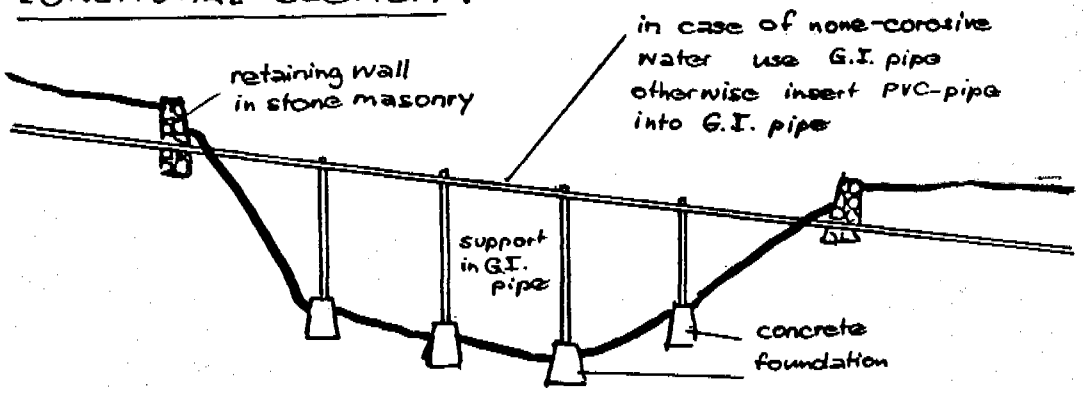


Construction of DRY MASONRY STONE WALLS

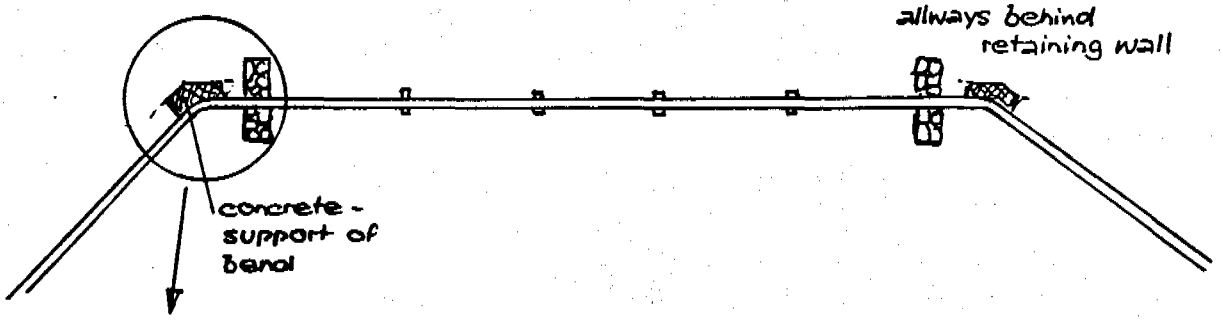


GULLY - CROSSINGS

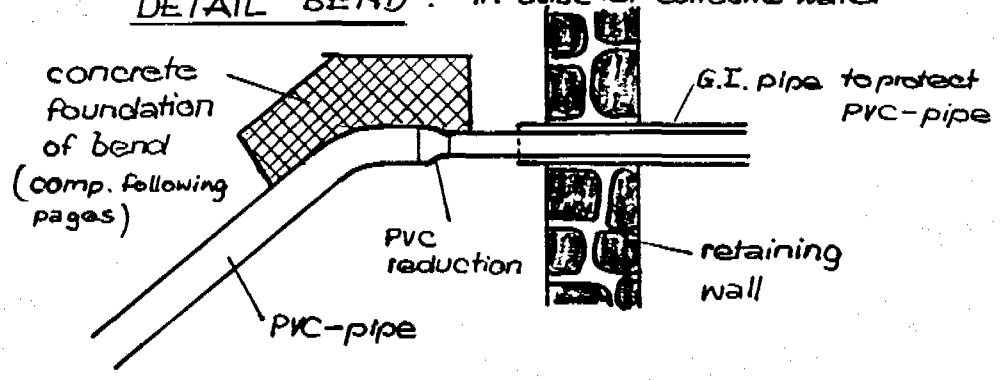
LONGITUTIAL-SECTION :



PLAN :



DETAIL BEND : in case of corrosive water



Bending of G.I-pipes :

G.I-pipes should not be bent into curves because the external as well as internal protective coating may get cracked. In case no G.I.-fittings (bends) are available, pipes should be filled with sand and pluged up at both ends before bending. The supports for bending should be round to avoid sharp cuts of the protective coating.

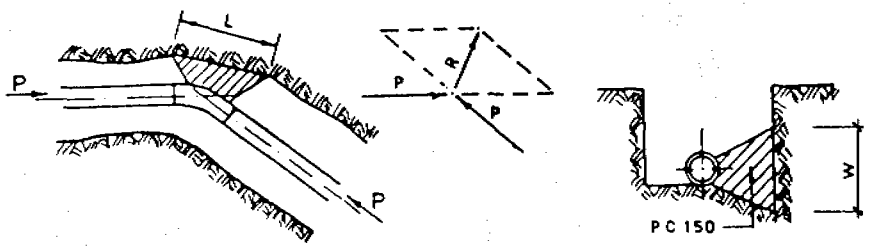
4-8.4.3 Thrust-blocks and anchoring

A pipe laid on sloping ground should be anchored frequently by having a concrete anchor-block cast around it. Further thrust-blocks are necessary at bends, tees, valves and tapers, and also at branch take-off unless flanged joints are used. These blocks often have to be very large and they must, of course, be well keyed into firm ground.

Note: The size of the thrust-block has to be decided on according to the external forces occurring during testing of the pipeline, as the operating pressure is lower than the testing pressure.

In soft soils, make sure that the concrete thrust-block is not firmly attached to the line, or it may endanger line safety if the line beds down unevenly.

Fig. 69 Thrust-blocks for changes of directions



$$\text{required thrust-block area} = \frac{R}{\text{soil-bearing power } \sigma} = L \times W = A$$

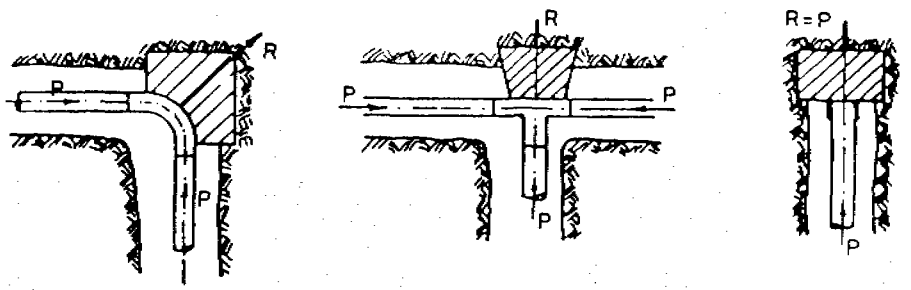
Fig. 70 Thrust forces P in metric tons at end closures:

ø of pipe mm	internal pressure p = kg/cm2 1	3	5	7.5	10	15
80	0.08	0.23	0.38	0.57	0.75	1.13
100	0.11	0.34	0.57	0.85	1.13	1.70
125	0.17	0.52	0.87	1.31	1.74	2.61
150	0.25	0.75	1.24	1.87	2.49	3.73
200	0.44	1.31	2.19	3.28	4.37	6.56
300	0.94	2.82	4.70	7.05	9.40	14.10

Factors for calculating thrust force R at bends and branches:

Bends:	90°	60°	45°	30°	22½°	11¼°
Factors:	1.41	1.00	0.76	0.52	0.39	0.20

Branches factor = 0.70 (empirically drawn from experience)



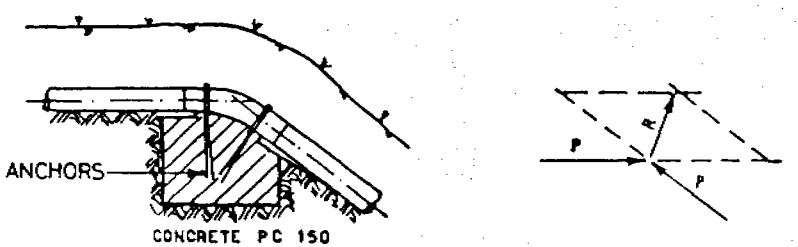
thrustforce
R = 1,41 x P

R = 0,70 x P
= branches factor

R = P

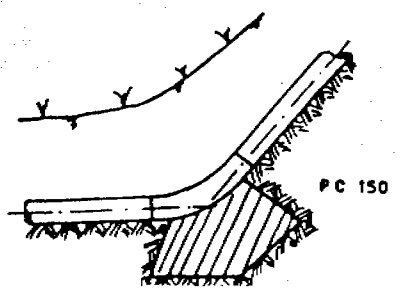
The thrust-block at changes of directions in the ground plan distributes the forces so that the foundation pressure does not exceed the permissible soil-bearing power.

Fig. 71 Thrust-blocks for changes of slopes

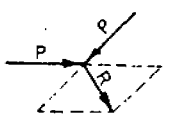


longitudinal section

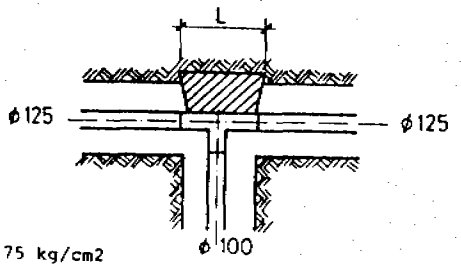
This thrust block relies on its weight to withstand occuring forces.



The following calculations are similar to those for a thrust-block for changes of directions.



Examples of calculation:



Example 1:

Thrust-block for a branch ϕ 100 mm

Water pressure = 10 kg/cm2

Permissible soil-bearing power σ = 0,75 kg/cm2

Out of Fig. 70: P = 1,13 tons, the factor for branches = 0,70

The required thrust-block area $A = \frac{R}{\sigma} = \frac{0,70 \times 1130 \text{ kg}}{0,75 \text{ kg/cm2}} = 1060 \text{ cm2}$

Chosen: L = 40 cm, W = 30 cm } with 30 x 40 cm = 1200 cm2

Example 2:

Thrust-block for a change of slope

Pipe ϕ 150 mm

Water pressure = 7,5 kg/cm2

Specific weight of concrete = 2,4 t/m3

Out of Fig. 70: P = 1,87 tons, the factor for 45° = 0,76

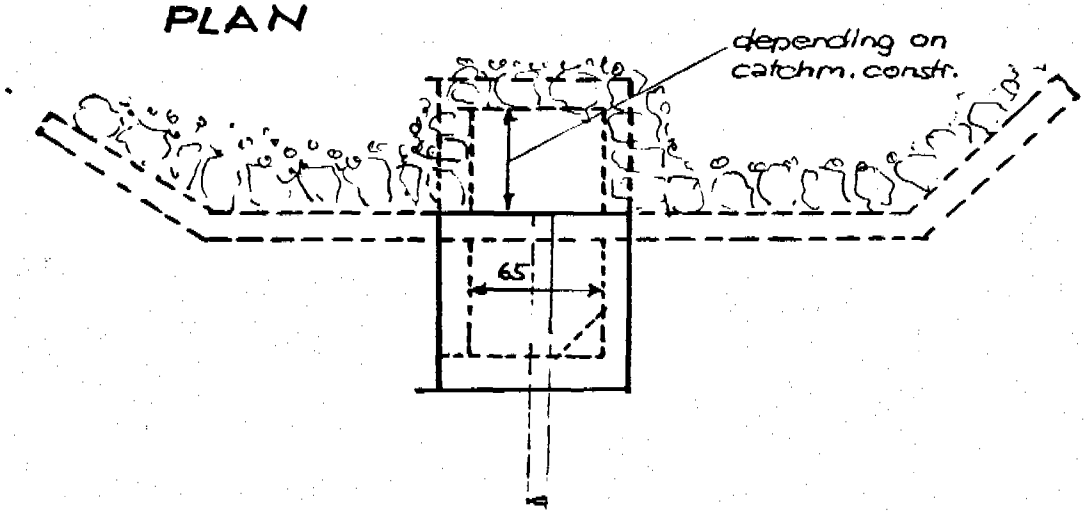
The required thrust-block volume = $\frac{R}{2,4} = \frac{0,76 \times 1,87 \text{ t}}{2,4 \text{ t/m3}} = 0,59 \text{ m3}$

Chosen concrete thrust-block of 0,85 m x 0,85 m x 0,85 m (with 0,61 m3)

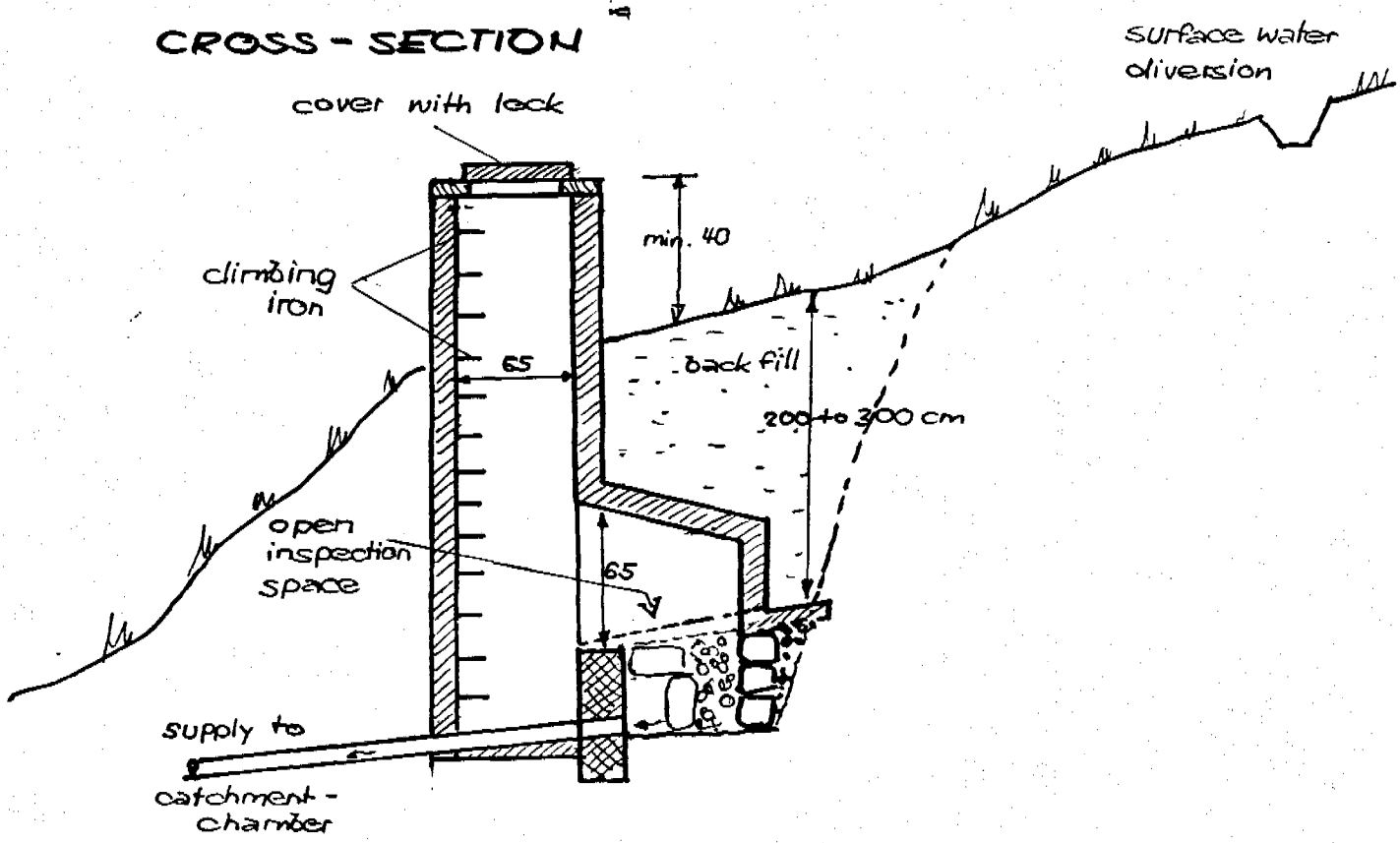
Inspection Chamber

Inspection chambers are advised to be installed at all catchments, since the growing of swimming roots is a common case and requires frequent removal.

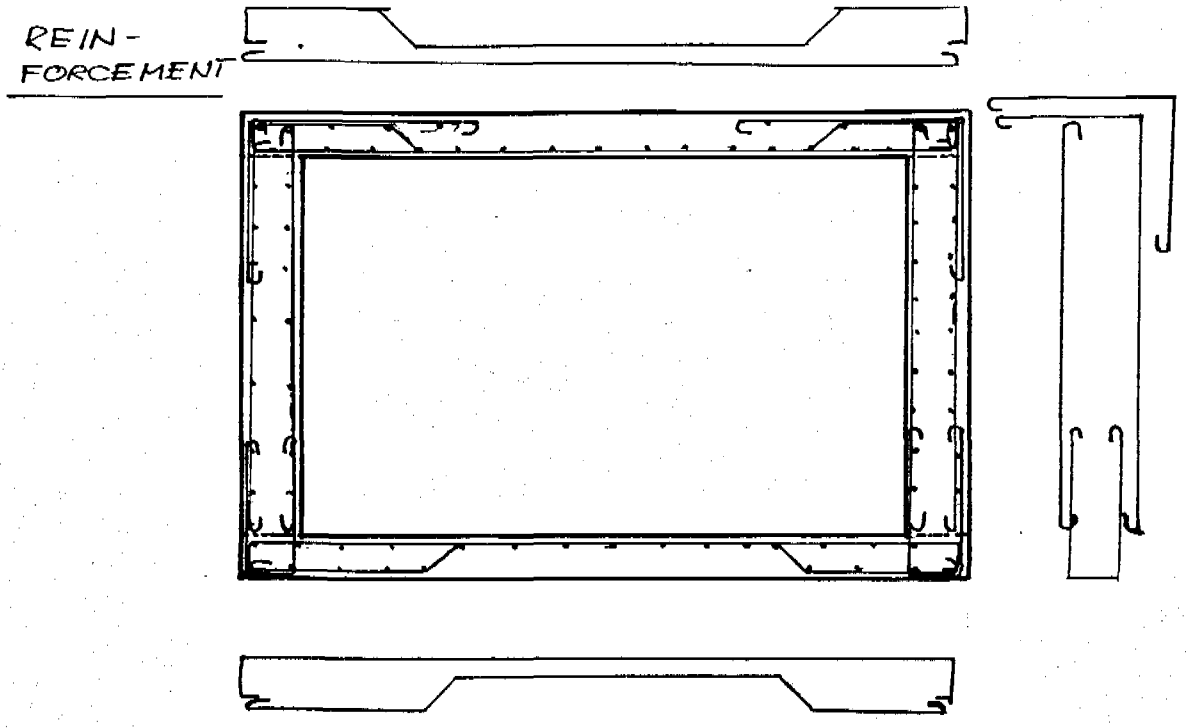
PLAN



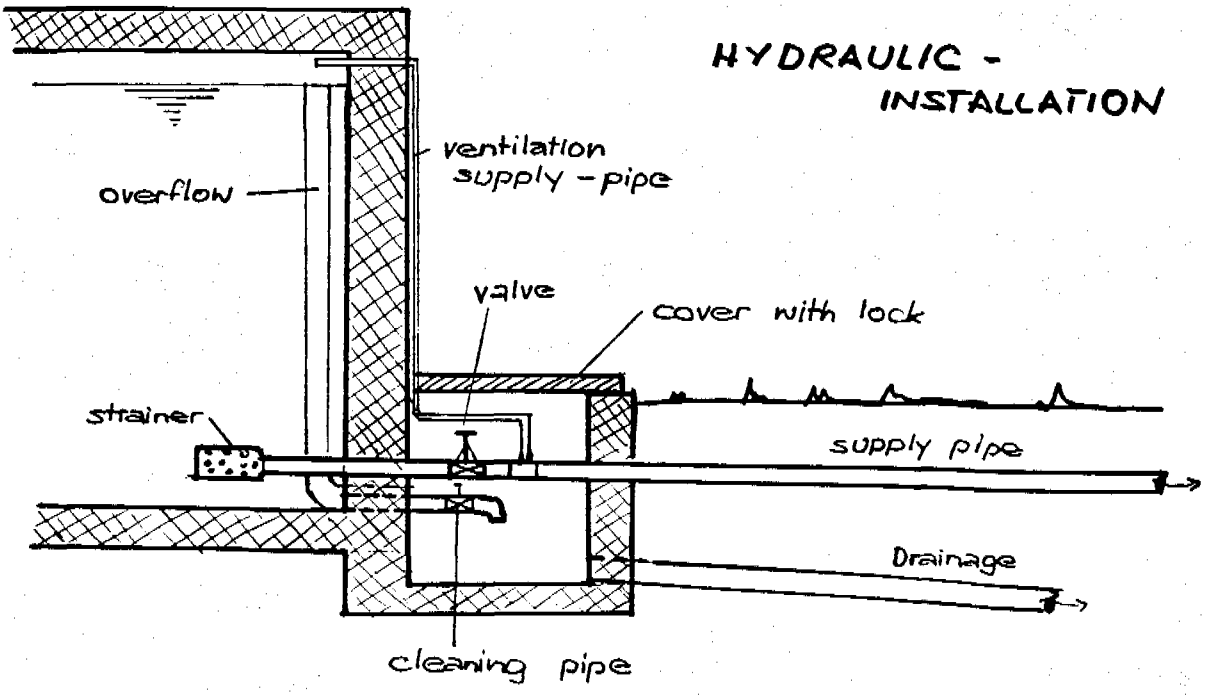
CROSS - SECTION



Storage tanks



Reinforcement of tanks and chambers needs to be calculated for two cases (empty tank, ful tank). Design and calculate standaral size tanks. Above reinforcement sketch shows schematicaly where and how the reinforcement needs to be placed. In any case all plane rods require hokes at their ends!



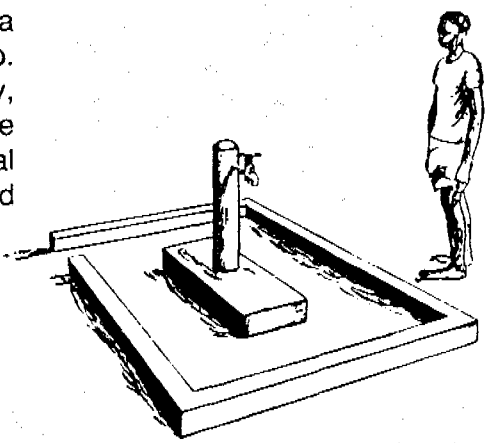
Annex 7

Suggestions for improved Standpipe Design

waterlines

Technical Brief Nº 26/Public standposts

Public standposts provide points where a local community may draw water from a piped water distribution system. They usually comprise a connection to the water main, a suitably supported riser pipe and a tap. Their design and construction has a major influence on their durability, effectiveness and hygiene. However, standposts often receive inadequate attention and failures are frequent. This affects many people, both in rural and urban areas, as standposts often represent the only feasible and affordable means of access to water.



A well-designed standpost must:

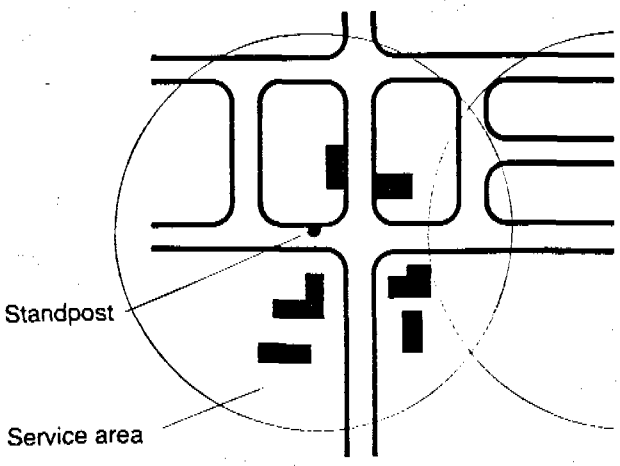
- provide sufficient quantities of water to all users when it is needed;
- be durable and reflect local customs;
- contribute towards improvements in public health.

Water use and location

The amount of water used per person depends upon walking distance to the standpost. The standpost must also be able to meet the water requirements of the community served during times of high demand (usually in the early morning and early evening, covering about six hours).

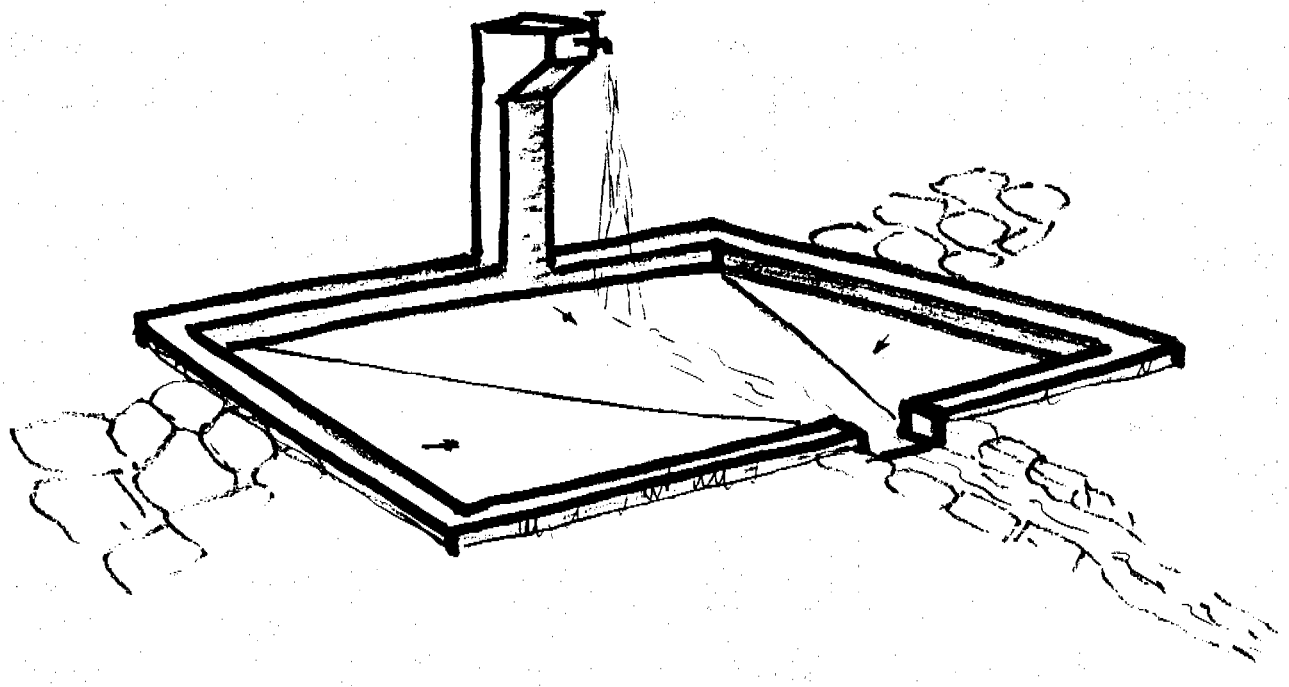
Distance to source:	Not exceeding 250m (<200m where possible)
Water usage:	20-60 litres per person per day depending upon distance
Population served:	150-250 persons per standpost and up to 125 persons per tap

A minimum of 20 litres per person per day (but ideally 35 litres per person per day) should be assured to achieve the benefits of an improved water supply.

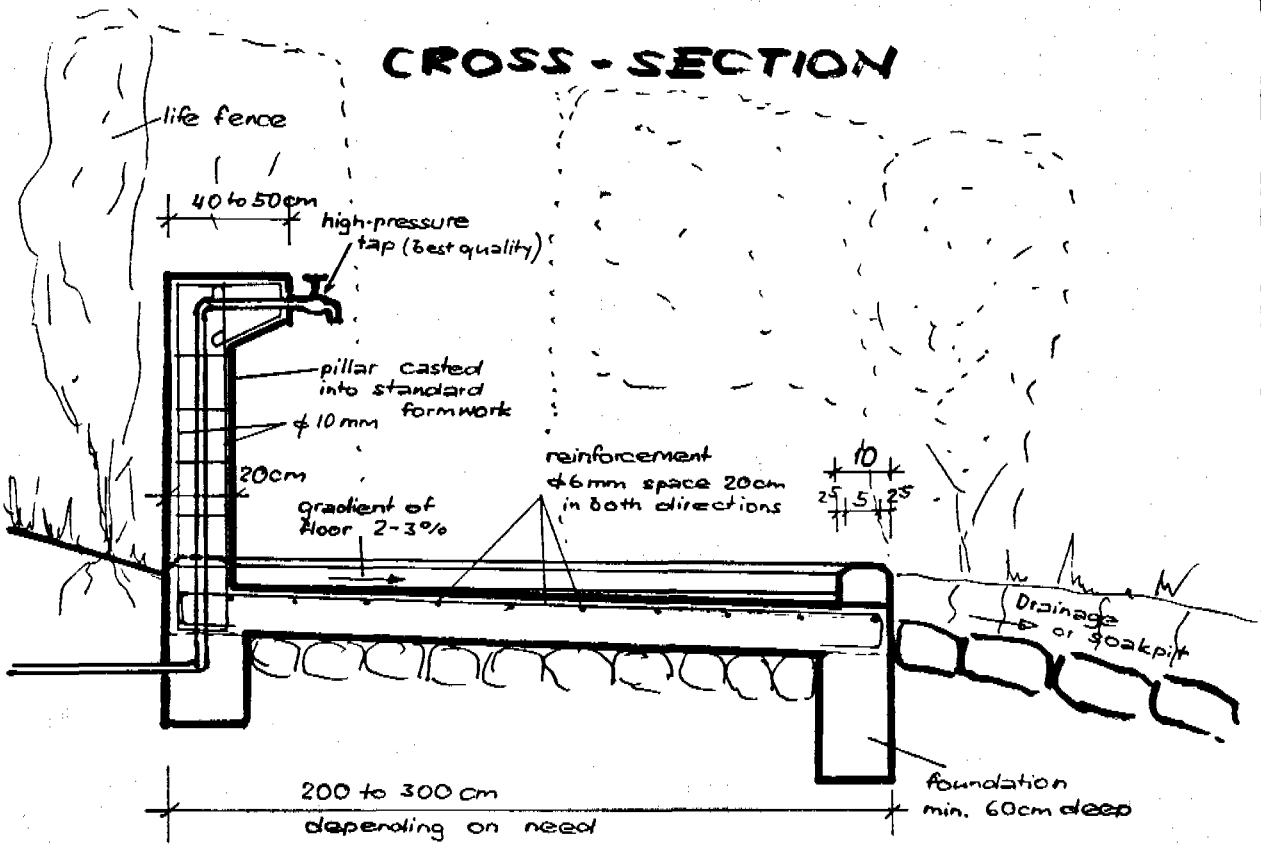


Good access is important both for users and maintenance. The standpost should be located centrally in the area it serves, ideally at a road junction, and must be on public land to avoid access problems. In hilly areas, remember it is easier to carry full containers downhill rather than uphill. Easy removal of waste water must also be considered.

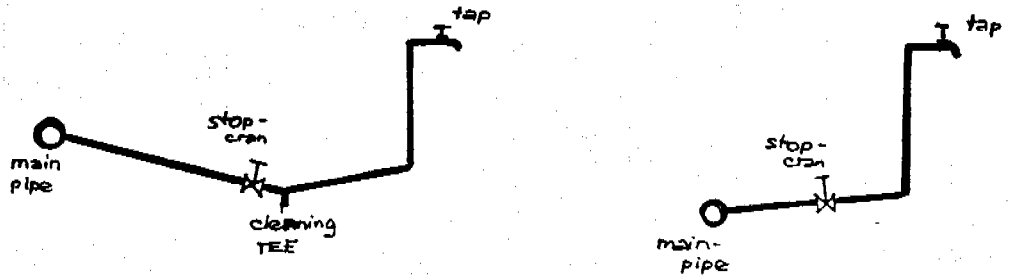
Puplic Standpost



CROSS - SECTION



HYDRAULIC INSTALLATION



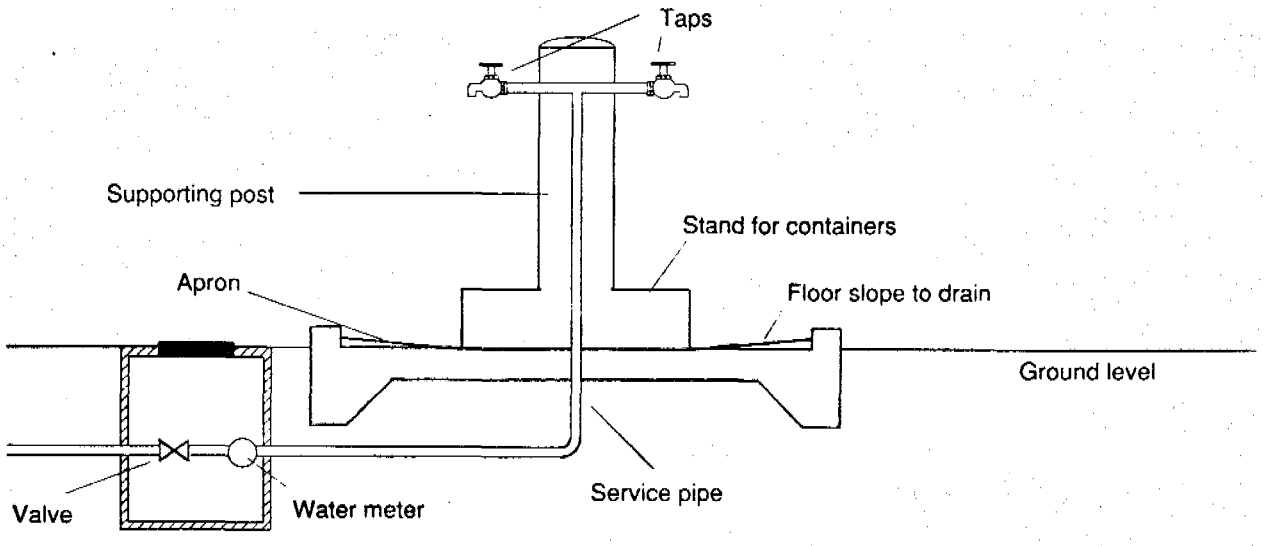
To ensure that an adequate flow of water is available at the tap, the total head lost must equal or be less than the head available in the main at the point of connection.

Total head loss	=	diff. in elev. of main and tap	+	loss in pipes and fittings	+	loss through the tap	<	head in main

In critical situations where the energy losses will exceed the head available in the main, they may be reduced by shortening the connecting pipe; increasing its diameter; relocating the standpost to reduce the difference in elevation between the tap and the main; or increasing the size and number of taps provided. Where considerable surplus energy is available, a valve may be added to restrict the flow and dissipate energy.

Layout and details

Public standposts are subject to heavy use and abuse. They are also the contact point between the public and the water supply. They must therefore be simple to construct, durable and easy to maintain, and reflect local social and cultural needs.



The main components of the standpost are:

The supporting post

The supporting post encases the riser pipe and is made of durable materials such as concrete or masonry. Ideally it is about 300mm square and extends 100mm above the taps to protect them. A raised stand under the taps may be added to support containers while being filled, depending upon local customs.

The platform or apron

The platform or apron extends at least one metre all around the taps. Where bathing or laundry is carried out at the tap, the apron should be extended to collect all waste water. It may be made of concrete at least 150mm thick and lightly reinforced to prevent cracking. An upstand around the perimeter will contain the waste water and a floor slope of between one in 50 and one in 100 will direct the waste water to the drain outlet.

Annex 8

Guidelines for Follow up visits

Guidelines for Follow up visits

Who should use these guidelines ?

The technician or supervisor responsible for the implementation of the project should preferably undertake the follow up visits because he can base his follow up on his previously acquired knowledge about the project, its environment and the villagers. In addition he will learn about the weak parts of the system and modify new systems.

How to use the guidelines ?

The guidelines should be introduced by the project engineer with the assistance of the advisor on socio-cultural aspects (Mrs. Suwan) during a special two days seminar. This seminar should also include introduction of interviewing and monitoring techniques.

In any case the introduction of the guidelines should be studied carefully and the suggested methodology and implementation procedure followed up strictly.

1. INTRODUCTION

1.1 Aim of follow up visits :

To achieve sustainable and effectively used water supply and sanitation systems as well as to increase the degree of self-sufficiency that villagers may expand their efforts to new areas.

This aim should be achieved through :

a) utilization of the available potential of the villagers

b) building up villager's capacity for the effective use and operation + maintenance of their water supply

c) building up Yayasan St. Klaus' capacity in learning more about the critical issues by the monitoring and evaluation process (= follow up visits) and in adjusting the project strategy accordingly.

The follow up visits are not meant to implement the required repairs and maintenance for the villagers !

1.2 Methodology

The task of the follow up visits is manyfold and has to cover different disciplines as it can be drawn from the aim of the visits. That is why the preparation of the staff undertaking the follow up visits requires sufficient attention.

It is most important that these visits are realized in an athmosphere of confidence. Villagers should either feel that they are controlled, nor that somebody would solve their problems for them. The observer should keep his eyes and ears open, listen to the villagers, learn from them and try to understand their problems. Consultancy should be provided to the problem identified by the villagers and not necessarily to the one identified by the observer. Together with the villagers their problems should be clearly formulated in one or two sentences. In most cases this formulation process will lead straight to useful solutions.

Follow up visits should be participative and semi-structured. Forms should be filled in after interviews and surveys together with the responsible villagers (caretaker, member of project committee, etc.) The evaluation of the findings and decisions about required follow up actions again should be done jointly. Only a participative approach during the entire follow up visit will bring the required learning process.

The keys for a successful follow up visit lay in the sincere interest of the observer to fulfill the aims of the visit and in the provision of sufficient time to attend to the villagers' project problems.

1.3 Implementation procedure

The different steps to be followed up are listed below. The sequences of the list have not necessarily to correspond with implementation steps.

- The observer staff is introduced to and trained for follow up visits during a two days' seminar.

- The operational plan for follow up visits is developed jointly with the project management and observer staff.

- Villagers are informed in advance about the intended visits with a letter which briefs about the aim and required participation by the villagers.

- The first follow up visit to a village may require two to three days so that a solid base at village level can be developed. The observers (technicians or supervisors) should be assisted during their first visit by the project engineer or head supervisor.

- Follow up visits are undertaken half yearly for the next three to five years. Each visit should take at minimum one and half day including overnight stay in the village. (This will provide the required opportunities for informal talks).

- Follow up visits normally include the following activities :
  - Courtesy call to the village authority (Kepala Desa). During the first follow up visit an introduction meeting should be held with the entire village population. Information should be provided about aim and methodology of follow up visits. Villagers should be asked whether they are interested in participating. If the answer is yes, the key persons to join the follow up visits should be selected.
  - Contact the key person for follow up visits including caretaker and committee members (this may include the Kepala Desa), start with informal talks and agree on the programme of the visit.
  - Monitor the performance of the system together with key persons by surveying the entire system, starting from the catchment to the standpipes.
  - During this survey meet with villagers of different age groups, sex, etc. Listen and talk to them about water and sanitation issues.
  - Have a semi-structured meeting with the key persons plus eventually other interested villagers. As follow up visits go on, hand over the leading role more and more to the villagers. The agenda of the meeting should include the following items :
    - filling in of monitoring forms
    - evaluation of survey (focus on improvements)
    - formulation of problems
    - development of solutions
    - agree on an action programme for the next 6 months

FOLLOW UP VISITS
1. Village Management of Water Supply

Form..... 1

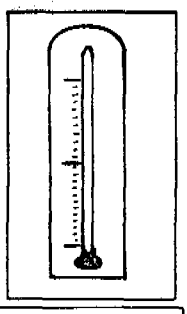
Village :	Date of visit :
Population :	Date of last visit :
Kepala Desa :	Rep. Nr. :
Caretaker :	Reporting person :
Accompanying person :	

- Autonomy and creativity in decision making and problem solving

high

medium

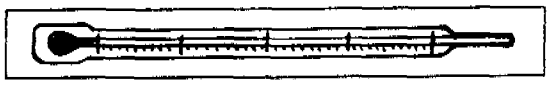
low



- Teamwork of project committee

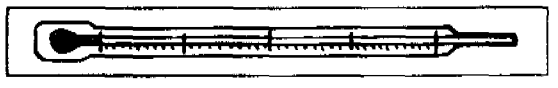
0 % 25 % 50 % 75 % 100 %

- Acceptance of project committee by villagers



0 % 25 % 50 % 75 % 100 %

- Contributions collected



- Responsible person to collect the village cash contribution _____

- Bookkeeping

☐ well in order

☐ partly in order

☐ insufficient

- Reporting for required assistance

☐ Yes

☐ No

- Repairs undertaken

☐ Yes

mandays spent ☐

money spent ☐

☐ Partly

☐ No

- Measures taken to prevent repairs and break downs (preventive maintenance)

☐ good

☐ sufficient

☐ insufficient

- Involvement of women
  - composition of project committee

women ☐

men ☐

- number of standpipe-caretakers

women ☐

men ☐

- Payment of caretaker

☐ fully paid

☐ partly

☐ none

FOLLOW UP VISITS 2. Performance of Caretaker	Form.....	2

- Repairs undertaken because of — own initiative — number _____
  reported by ..... number _____
- repairs reported but not undertaken — number ☐
- break-downs of system — number ☐
  duration ☐
- Number of shortcomings which have not been improved ☐
- Reporting of required preventive maintenance and repairs to project committee — insufficient ☐ medium ☐ well ☐
- Preventive maintenance implemented — insufficient ☐ medium ☐ well ☐
- Quality of implemented repairs — insufficient ☐ medium ☐ well ☐
- Routine work — insufficient medium well
  - logbook maintained ☐ ☐ ☐
  - tools maintained ☐ ☐ ☐
  - spare parts complete ☐ ☐ ☐

FOLLOW UP VISITS
3. Effective Use

Form..... 3

- Condition of surroundings of standpipes such as cleanness, functioning of drainage, protection against erosion, life-fence, entrance, etc.
  Number and condition of standpipes

poor	medium	good
☐	☐	☐

- Quantity of water used in average by family and day

	drinking and domestic use	washing	irrigation
carried from standpipe			
used at standpipe			

- Waste of water

	poor	medium	good
. closing of taps after use	☐	☐	☐
.	☐	☐	☐

. Hygienic use of water

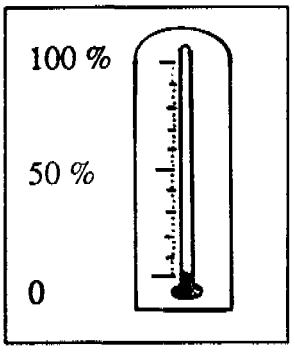
	poor	medium	good
. transport and storage practices	☐	☐	☐
. water quality at home	☐	☐	☐

FOLLOW UP VISITS

4. Awareness and knowledge of villagers

Form..... **4**

- Degree of awareness about cycle of water related diseases



- Home cleanness	poor	medium	good
. children	☐	☐	☐
. clothes	☐	☐	☐
. surroundings	☐	☐	☐

- Cases of diseases related to drinking water and personal and domestic hygiene — number ☐

- Additional latrines constructed — number ☐

- New development activities undertaken

Performance of System

Form..... 5

	Elements	prevent. mainten undert.	number of repairs undert.	condition good	medium	poor
1	Intake area : . afforestation					
	. trespassing					
2	Catchment : . surroundings					
	. drainage					
3	Siltbox : . construction					
	. function					
4	Pipeline catchment to -Storage tank					
5	Storage tank : . construction					
	. function					
6	Distribution system: . piping					
	. valve chamber					
7	Standpipes					
	Nr. 1					
	Nr. 2					
	Nr. 3					
	Nr. 4					
	Nr. 5					
	Nr. 6					
	...					
	...					
	...					
	...					
	...					
	...					
	...					
	...					
	...					
	...					

	Elements	prevent. mainten undert.	number of repairs undert.	condition good	medium	poor
8	Taps					
	Nr. 1					
	Nr. 2					
	...					
	...					
	...					
	...					
	...					
	...					
	...					
9	Latrines (enter the number of latrines corresponding to the headings)					

Evaluation of Survey	Form.....	6

- Achieved improvement and successes :

- Remaining shortcomings :

- Formulation of main problem :

- Opportunities for solution :

Action Programme	Form.....	7

No.	Activity	Success Indicator	Who	When	Where	Req. Budget

Annex 9

Contract between Village and Yayasan St. Klaus for the implementation of Water Supplies

9a) Contract Letter and PAM Rules of Bari Village (an actual example)

9b) Contract Muyebe Village (Uganda)

9c) Proposals for Completion of Muyebe Contract

9a) has to be completed by the project responsible with 9b and 9c)

Bari Village Contract Letter Annex 9a)
Pam Bari Village

Based on the consideration that water is the basic need of human life and helping the villagers of Bari Village to provide their need for safe drinking water, we have a joint-venture between some parties, it is formed to realize the drinking water project.

- The content of the contract is as follows :
- The persons who sign this contract are :

I ..... is the Head of Bari Village, in this case he represents the authorities of Bari village, and the village prominent, and
..... is the Head of Bari LKMD, and
..... is the Tua Golo (the chief) of Bari ; they are the first party.

II ..... is the Pansos / Delsos representative, he represents the Ruteng Diocese as the second party.

The first and the second party hence agreed to fulfill the following articles of contract :

Article 1

This drinking water project is belonging to the villagers of Bari Village.

Article 2

The first party agrees to contribute land freely to the second party. The land is used for water tanks, the main pipe-lines, public taps, public bathrooms.

Article 3

The first party agrees to provide a source of water which has a debit which is in accordance with the design of pipes diametre of the drinking water project (see enclosure).

Article 4

The first party agrees to support the execution of the drinking water project by providing materials, such as, sand, stones, gravel and labour without any compensation from the second party.

Article 5

The first party agrees to plant and to guarantee the forest around Wae spring water up to radius 100 metres, to protect the spring and to keep the volume/debit of the spring water stable.

Article 6

The first party agrees to maintain and to guard the continuity of life of Drinking Water Supply Project.

Article 7

Types of constructional buildings are made as follows :

a) 1 watercatchment
b) 1 silt tank (box)
c) 1 storage tank and its size is 3.5 x 3.5 x 2.5 m
d) 3 tanks for discharging the pressure of water. Size : 1.5 x 1 x 1 m
e) 10 props of pipes
f) 14 public stand pipes are in accordance with the need and the debit of water
g) The pipelines are as long as 17.544 m.

Article 8

The landowners had agreed to offer their property right of the land for the need of drinking water project such as for : pipelines, reservoir tanks and public taps without any compensation from the first party or the second party, for the sake of the public necessity.

The property right of the land will belong to the Drinking Water Project, except for the government land, parish land, and school land which receive the public tap.

Article 9

The area of the land which has been given by the landowner for the need of this drinking water project is as follows :

a) For the land that will be passed by the pipeline routes :
   - The width required is : one metre
   - The depth required is : one and a half metre
b) For the reservoir tank, its size is, in accordance with the dimension of the water tanks
c) For the public tap : three by three metres
d) For the public bathroom : four by six metres
e) The afforestation which is required has to be cultivated free of charge.

Article 10

Personal tap installation is allowed if he has fulfilled the following requirements :

a) Those who want to install the private tap to their home must write a request letter to the Manager Committee of Drinking Water Supply where the project is maintained.
b) The permission of Manager Committee/Organization of Drinking Water Supply must be made in written form with a determination that those who have privilege on that private tap can sometimes be withdrawn without any compensation, because it is used for the public necessity (for the extension of the drinking water network with the public tap).

The first party agrees to offer the right to the second party to supply the drinking water to Parish / Stasi building without any contribuion.

Article 11

The total budget of this project is Rp 50,096,600.-- (numbers are fictitious)
The funds of this project are obtained from :

a) Contribution from the village	Rp 1,000,000.-
b) People contribution in cash money	Rp 2,000,000.-
c) People contribution in local material	Rp 2,326,000.-
c) Donation from Foreign Donator (89.94%)	Rp 44,809,600.-

Article 12

The effort of seeking funds from the second party will be done if an approval from District Authorities, in this case represented by the Bappeda is given.

Article 13

The execution of this drinking water project will be done by the first party, in this case, cooperating with the villagers of Bari village and the second party, is, Yayasan St. Klaus Kuwu-Cumbi workshop.

Article 14

The government, in this case the Bappeda, has the right to make either routine inquiries at any time if there is any case that goes outside the agreement.

Article 15

The first party must take all the responsibility on cases that correlate to the drinking water project either to the Government (to the Bappeda) or to the villagers of Bari village.

When the first party is not able to do well his duty, the second party can take over the management of the project in maintaining it.

Article 16

When controversal issues occur between the first and the second party, those issues might better be solved through deliberation and discussion.

Article 17

The structure of organization of Execution Committee of the Drinking Water Project of the first party is as follows (names are fictitious) :

1. Lazarus Nggeot, the Head of Liang Bua village
2. Nikolaus Liuk, the Head of Liang Bua LKMD
3. Hendrikus Magus, the Secretaresse of Liang Bua village
4. Leo Lampur, Kaur Liang Bua village
5. Yosef Hamu, the Head of Langke sub-village
6. Matias Jehabut, the Head of Teras sub-village
7. Lazarus Apung, the Head of Golo Pau sub-village
8. Gradus Ambong, the Head of Golo Manuk sub-village
9. Stanis Andi, Religious teacher at Langke sub-village
10. Frans Tatang, Tua Golo (the Chief of) Langke village
11. Gaba Gat, the Head of Yayasan St. Klaus Kuwu workshop.

Article 18

In accordance to maintain and to guaranteee the continuity of life of the Drinking Water Supply (PAM), a Drinking Water Committee/Organization at Bari village will be formed and the committee members are (names are fictitous) :

1. Lazarus Nggeot, the Head of Liang Bua village
2. Nikolaus Liuk, the Head of Liang Bua LKMD
3. Yosef Hamu, the Head of Langke sub-village
4. Matias Jehabut, the Head of Teras sub-village
5. Lazarus Apung, the Head of Golo Pau sub-village
6. Gradus Ambong, the Head of Golo Manuk sub-village

The right and the duty of the Drinking Water Project Management Committee/Organization can be seen in the Committee/Organization Rules (see enclosure).

Article 19

Amendments and additions to the contract shall be in writing and will be discussed between the first party and the second party.

Article 20

The contract shall enter into effect after approval of the project by Intercooperation (IC) as the Donator and upon signature.

Ruteng / Bari, ...

The First party	The Second party
1. The Head of Bari village	The Head of PANSOS/DELSOS
(Lazarus Nggeot)	.....
2. The Head of Bari LKMD	
(Nikolaus Liuk)	
3. The Tua Golo / Chief of tribe	
.....	

PAM Rules of Bari village

PAM Rules

In maintaining and guaranteeing the continuity of life of Bari Drinking Water Supply Project, and according to the contract between the Village Authorities and the Diocese of Ruteng, a Drinking Water Management Committee/Organization was formed and the structure of the Committee/Organization is as follows (fictitious names) :

1. Lazarus Nggeot, the Head of Liang Bua village
2. Nikolaus Liuk, the Head of Liang Bua LKMD
3. Yosef Hamu, the Head of Langke sub-village
4. Matias Jehabut, the Head of Teras sub-village
5. Lazarus Apung, the Head of Golo Pau sub-village
6. Gradus Ambong, the Head of Golo Manuk sub-village

and the content of the rules is as follows :

Article 1

The chairman, secretary and treasurer will be appointed and selected by the PAM Committee.

Article 2

The duties of the PAM Committee are as follows :

1. To take all responsibilities about all cases, dealing with the Drinking Water Supply (PAM).
2. To determine the amount of contribution that should be paid by the customers each month/each year.
3. To form a "public-tap" group and their group leader to control the public taps.
4. To hire a technician who will repair/maintain the water pipe networks and public taps.
5. Replace the public taps if they are not useful for the public necessity.
6. Giving a permission to install private tap according to the article 9 in the contract letter.
7. To make an annual financial report that will be submitted to the people and the government.

Article 3

The public-tap group will elect the group chairman.

Article 4

The group chairman has the right to ask the customer for paying the contribution fee. It should be stored without delay to the PAM treasurer.

The basis of the requirement cost to repair the main pipe lines up to the public taps, the group chairman has a right to ask the payment of contribution fee.

Article 5

The collected funds (from contributors) could only be used for the purpose of PAM for instance to repair the main pipe lines, reservoir tank and drinking water network extension.

Cost for repairs of the distribution pipe networks (from the secondary pipeline up to the public taps) and the public taps will be the responsibility of the water groups.

These PAM Committee/Organization Rules shall enter into effect after the Drinking Water Supply Project has been completed and the project report has been submitted to the Drinking Water Management Committee by the Drinking Water Project Execution Committee.

Example of

A C O N T R A C T

BETWEEN THE RECEIVING COMMUNITIES at MUYEBE-KARUBANDA KIGEZI DIOCESAN TECHNICAL STAFF (acting for the SWISS DONORS organised by the RETURN Committee) and KABALE DISTRICT ADMINISTRATION TECHNICAL STAFF (responsible to UNICEF)

CONCERNING THE CONSTRUCTION OF A GRAVITY WATER SUPPLY SYSTEM at MUYEBE-KARUBANDA.

INTRODUCTION:

- To date public meetings have been organised at which four committees of four representatives (viz. the Chairman, Secretary, Treasurer and Counsellor) have been elected by the users. Both sectors of the pipeline, Muyebe and Karubanda, are covered by four separate committees from the communities at Muyebe, Nyamorogo, Katiba and Karubanda.

- Although the initiative for the actual project has come from the local population through the Church of Uganda, the civil authorities have also been involved and are to be kept informed throughout the various phases of the project.

- The water supply system is being provided mainly through the co-operation of the local people who themselves have decided to go ahead with the project and through the availability of external support and funds.

- It is important to note that once the water supply system has been constructed and the local people instructed on how to maintain it, the Swiss donors, the Kigezi Diocesan Technical staff and the KDA Technical staff are relieved of any further responsibility. The people benefitting from such a water supply have the obligation of maintaining it.

- The first task of each elected committee is to provide lists of the families belonging to each sector benefitting from the water supply system.

- To facilitate a clear understanding of the phases and division of the work involved and the importance of future maintenance, the users have been advised to enter into a written agreement with the Kigezi Diocesan technical staff, on behalf of the Swiss donors, and KDA technical staff. These latter two advisory groups are to be jointly referred to as the Technical Staff, with this contract. The Committees will be well acquainted with the contents of the contract before it is signed.

- The village health education and promotion through selection and training of voluntary village primary health care workers is considered as part of the agreement with the users.

CONTENT OF AGREEMENT:

1. CONSTRUCTION OF THE WATER SUPPLY:

1.1 PART ASSIGNED TO THE USERS:

- Define clearly ownership of springs, protection zones, rights for installing pipes, standpipes, etc.

- Bring all local materials required (stone, sand, gravel, wooden poles, clay, etc.) to spots shown to them by the technical staff

- Store and safeguard materials supplied by outside aid near to the work site (pipes, cement, steel reinforcement bars, bricks, etc.).

- Dig the trenches for pipes according to the technical staff instruction.

- Prepare the sites for the special constructions (such as evacuation chambers, reservoirs, equilibration chambers and tap stations with drainage).

- Provide free accommodation for skilled staff in villages whenever required.

1.2 PART ASSIGNED TO THE TECHNICAL STAFF:

- Perform studies in the field (surveying for determination of profiles, making hydrological observations).

- Arrange for the supply of materials not available locally.

- Select sources for water extraction, gauging of yields, evaluation of quality.

- Clearly mark the terrain for the trenches and give instructions on how to lay the pipes.

- Advise the specialist work team from top users on the construction of all special work items as per specification (water extraction sources, reservoirs, equilibration chambers, tap stations with drainage) and provide security for each, in terms of lockable lids and/or wire fencing.

- Arrange for an adequate number of hand tools to be made available during the construction phase. These tools will be assigned solely to the water project work and will be retained for use in the subsequent phases of the project at Nyamorogo, Kinjojo and Buhara. These tools will include hoes, spades, pick axes, sledge hammers, masonry hammers, karaic, crow bars, wheelbarrows and bricklayers' trowels and floats.

2. OPERATIONAL METHODS:

2.1 PART ASSIGNED TO THE TECHNICAL STAFF:

- Through on the job training teach representatives from the USERS how to repair a broken tap or mend a split pipe and how to keep the special construction chambers and water supply sources clean. These representatives will undertake minor repairs to the water system when called upon to do so by and reporting to the Water Committee. Payments to these maintenance representatives will be agreed by the Committee.

- Provide estimates of expected future maintenance costs.

- Provide the USERS with a reasonable supply of spares for which they are themselves responsible and the tools that go with simple repairs (wrenches, mufflings for PVC tubes, 3/4" taps and the like).

2.2 PART ASSIGNED TO THE USERS:

- Select respected and mature persons for training as caretakers for the maintenance of the water lines.

- Open a bank account in the name of the whole water supply system. The dues to be paid in cash per household shall be decided by the representatives from all the committees and then ratified at a subsequent public meeting. The collected dues held in the account will go towards maintenance costs and enable spare parts to be purchased. They should also cover any previously agreed payment to the trained maintenance representatives.

- The four committees of elected representatives will have the following duties:

  - keep the registration lists of users up to date.

  - collect the yearly contributions.

  - keep the keys for locks protecting the various parts of the system.

We, the undersigned, accept the terms and conditions of this contract.

MUYEBE WATER COMMITTEE

_____ Chairman

_____ Secretary

_____ Treasurer

_____ Legal Advisor

NYAMOROGO WATER COMMITTEE

_____ Chairman

_____ Secretary

_____ Treasurer

_____ Legal Advisor

KARUBANDA WATER COMMITTEE

_____ Chairman

_____ Secretary

_____ Treasurer

_____ Legal Advisor

KATIBA WATER COMMITTEE

_____ Chairman

_____ Secretary

_____ Treasurer

_____ Legal Advisor

The representatives of the TECHNICAL STAFF

_____ Kigezi Diocesan Water Engineer

_____ Kabale District Administration Water Engineer

Witnessed by:

_____ Head of Water Project Date _____

Place _____

Agreed by:

_____ Bishop of the Diocese of Kigezi

_____ Kabale District Administrator

- ensure that hygenic conditions prevail throughout the whole system. (In Rwanda, one person is assigned to take care of each specialised construction.

- select and ensure training of future new caretakers.

- keep records of water line irregularities.

3. DISTRIBUTION OF TASKS

After the contract has been signed, the USERS will be given a list precisely specifying what materials are required at each point of operation.

3.1 TAPPING OF SPRING SOURCE:

The following local materials are to be provided at the water extraction sites by the USERS:

- 6 M.cu of gravel (broken stones of 2-3 cm diameter)

- 300 buckets of clay from pit.

Under the direction of the technical staff the specialist work team will tap the spring sites.

3.2 EXCAVATION WORK:

The technical staff will:

- indicate where the trenches for the pipelines are to be dug (in accordance with previous surveys).

- show the location of the specialist construction work.

- give lists of materials to be provided locally for above.

- indicate where protective walls and fences are to be erected.

The USERS will:

- prepare all groundwork.

- dig trenches for the pipelines and then backfill.

- bring to the respective sites all materials provided locally from sources specified by the technical staff.

3.3 SPECIALIST WORK TEAM:

The technical staff will arrange for a specialist work team as required for the construction of:

- extraction and cleaning chambers.
- reservoirs and equilibration chambers.
- laying pipes.
- erecting tap stations.

Because this team will comprise skilled local people (i.e. village masons, carpenter, etc.) who will be employed on a full time basis during construction, they will be remunerated at an agreed rate, comparable to that in their normal employment.

N.B. All other work carried out by the USERS will be on a voluntary basis.

3.4 FINANCING OF THE PROJECT:

The funds raised by the Swiss donors are to finance specific parts of the project as follows:

- To purchase materials considered to be necessary in the construction of the pipeline, reservoirs, tapstands, etc. that cannot be obtained locally. (Locally available materials are considered to be sand, stone, gravel, clay and wooden poles).
- To purchase any special tools and instruments needed for the project.
- To remunerate skilled workers (fundis) employed on a full time basis on the specialist structures (i.e. reservoirs, tapstands, etc.) and possibly one or two co-workers to help the technical staff supervise the construction work. The latter will be chosen in consultation with the committees.
- To transport the purchased materials and technical staff to the work site.

There are no funds set aside to provide any form of compensation to farmers as a result of the pipeline passing through their land. It is intended that any disturbance to crops and/or fields will be minimal and more importantly it will be temporary.

4. MISSING SECTION (see attached sheet)

Some missing sections on contract for Muyebe, Uganda

4. Proposed Post Project Activities

4.1 Operation and Maintenance

a) Village

A village maintenance committee has to be elected and to be responsible for the following activities :

- appropriate maintenance of all elements of the watersupply scheme
- collection of waterfees and handling of finances
- payment and supervision of caretaker
- regulation of water supply in case of water shortage
- reporting of irregularities (need for major repairs) to Bappeda.

b) Caretaker

- inspection and maintenance of all parts of the water supply according to the caretakers checklist and manual
- execution of minor repairs
- inspection and supervision of appropriate handling of taps and hygienical cleanness of standpipes and surroundings
- reporting of requirements for major repairs to project committee and Bappeda.

c) Water Supply Section Yayasan St. Klaus

After handing over of the water supply, no responsibility for maintenance remains with Yayasan St. Klaus, except for those modifications and amendments which show to be required after one year of operation (guarantee work).

d) Bappeda with the assistance of PAM

- Supervision of maintenance work (two inspections annually)
- Execution of major repairs (if need arises Yayasan St. Klaus can be contracted to undertake the required repairs).

e) Financing of O + M

- Minor repairs have to be covered by the villagers
- Major repairs have normally to be covered by the Bappeda. If they are caused by negletance of routine maintenance work villagers have to bear the cost.

4.2 Follow-up activities

a) In order to obtain the possible health benefit to full scale villagers have to improve their knowledge about adequate use of drinking water and safe excreta disposal. Yayasan St. Klaus offers health education training courses. Villagers are obliged to attend those 2 to 3 weeks' courses with a delegation of min. 10 persons annually during a period of min. 5 years.

b) A family latrine construction programme has to be implemented in order to supplement the improvements achieved with the water supply. Villagers are responsible for the entire construction. Yayasan St. Klaus will provide the technical design and prefabricated cover slabs plus ventilation pipes on a subsidized rate.

Annex 10

Results Examination Trainees

List of staff

Results Examination Trainees / November 1991

Nr	Name	Private Aspect	Social Aspect	Surveying	Capturing	Hydraulics	Pipelines	Storage Tank	Tap	Building Material	Sanit.& Hygiene	Subtotal Score	PRACTICAL TEST					Subtotal Score	TOTAL Score	Ranking	%
													Laying Pipe	Pipe Gradient	Select Sand	Select Stone	Sand Test				
1	Agus Janggur	5	4.5	4	5	5	2	5	5	4.5	-	40	3	2	1	1	0.5	7.5	47.5	2	68
2	Damianus Harus	6	6	5	5	-	4	4	4	3	3	40	2.5	0	0.5	1	1	5	45	3	64
3	Frans Jelaba	5	6	4	3	3	3	5	6	2	5	42	4	2	1	1	1	9	51	1	73
4	Martina Tin *	6	5	2.5	-	-	1	3	3	2	-	22.5	2.5	0	0.5	1	0	4	26.5	5	38
5	Natalia Mamur *	4	5	3	2	-	2	3	2	2	-	23	1	0	0.5	1	0	2.5	25.5	6	36
6	Gabriel Gabur	6	6	4	3	2	3	2	2	3	2	32	1.5	0	1	1	1	4.5	36.5	4	52
	TOTAL	32	32.5	22.5	18	10	15	22	22	16.5	10		14.5	4	4.5	6	3.5		232		
		89%	90%	62.5	50%	28%	42%	61%	61%	51%	28%		60%	33%	38%	100	58%		55%		

* Ladies

TENAGA PAM TAHUN 1991

No	N a m A	Umur	Pendidikan	Kerja Sejak tahun	Keterangan
1	Gaba Gat	45 thn	SD	1985	Head Supervisor
2	Karel Hambur	36 thn	SD	1985	Mason
3	Agus Janggur	32 thn	SD	1986	Foreman
4	Frans Jelalu	34 thn	SD	1987	Foreman
5	Gaba Nahat	26 thn	SD	1987	Foreman
6	Wanis Jeramut	35 thn	SD	1988	Keluar thn 1990
7	Aleks Ngarut	24 thn	SMP	1987	Foreman
8	Stef Langgur	20 thn	SMP	1988	Keluar thn 1991
9	Rofinus Danggut	36 thn	SD	1990	Mason
10	Maximus Gambal	20 thn	SMA	1990	Mason
11	Pius Ento	20 thn	SMA	1990	Mason
12	Damianus Karus	20 thn	SMP	1990	Mason
13	Martin Parus	20 thn	SD	1990	Mason
14	Hendrikus Mandur	30 thn	SD	1990	Mason
15	Nober Neo	31 thn	SD	1990	Pindah ke bagunan
16	Tobias Legong	20 thn	SMEA	1990	Pindah ke Kantor
17	Markus Jedor	20 thn	SMEA	1990	Keluar thn 1991
18	Jon Jemparut	30 thn	SD	1989	Keluar thn 1991
19	Bonefasius Tatu	30 thn	SD	1987	Keluar thn 1989
20	Herman Enggor	22 thn	SMP	1989	Keluar thn 1990
21	Theodorus Fengius	26 thn	STM	1989	Keluar thn 1989
22	Bernadus Ranu	26 thn	STM	1988	Keluar thn 1990
23	Mikael Cari	39 thn	SD	1981-1989	Masuk 1991/Foreman
24	Wilhemus Taram	36 thn	SD	1981-1989	masuk 1991/Mason
25	Gaba Gabur	22 thn	SMA	1991	Mason
26	Step Parus	26 thn	SMA	1991	Mason
	S i s a				Sisa 16 orang

Annex 12

Ideas to

- Village Management Handbook
- Guidelines for Implementation Procedure

REMARKS TO ATTACHED IDEAS

Working sessions in Kuwu revealed that the following two manuals or guidelines are required in future :

- **"Village Management Handbook"**

  for the villagers to receive basic information about the burdens and benefits to be expected from a water supply as well as guidance how to manage a water supply system.

- Guidelines for **"Implementation Procedure"**

  for the project staff to receive guidelines on how to handle the project during the different phases (a step by step guideline starting from the request to the survey, during the implementation, at the completion and during the follow up).

Ideas for the content of the village management handbook were developed during above working session (see annex 12 a).

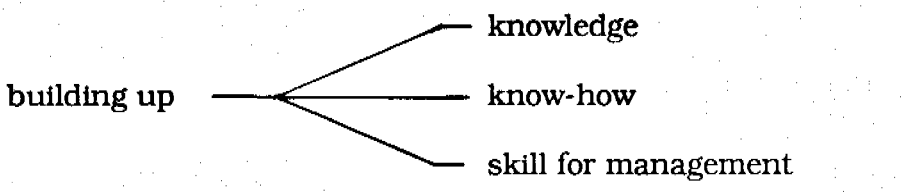
A draft was designed by Mrs. Suwan after the mission (see annex 12 b).

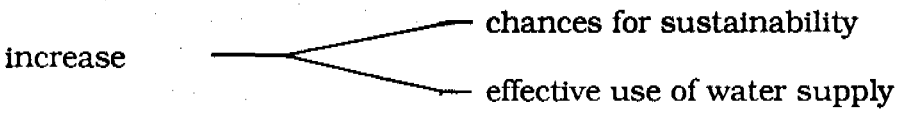
Ideas for the content of the "Implementation Procedure" guidelines were discussed and a preliminary draft designed by Mrs. Suwan (see annex 12c).

IDEAS TO CONTENT OF "VILLAGE MANAGEMENT HANDBOOK"

I INTRODUCTION

1. How to read
2. Target Group : Villagers
3. Aim : Information to villagers (transparency) about what a water supply **can** bring and **what it can not !**





II BASIC INFORMATION AND DECISION CRITERIA

4. Knowledge : What an improved water system can bring ? and what it cannot ? incl. role of sanitation
5. Measures how to improve existing water supply situations
   Starting from simple improvements both for water supply and sanitation
6. Water supply systems
   - advantages and disadvantages (incl. economic aspects)
   - role of villagers, consequences
   - possible assistance / conditions
   - key questions ("killer" questions) as a base for villagers' decision making

III PROJECT PREPARATION, IMPLEMENTATION AND MANAGEMENT

7. How to go for a water supply

   - Warning : Have you read the first part ? It may be wrong to go without careful consideration for an expensive water supply
   - preliminary survey (look for a spring)
   - how to find out whether the majority of the village would support the idea of a water supply
   - how to write a request, procedure ⇒ "killer" aspects

8. Survey phase

   - Technical aspects
   - social aspects (incl. acceptance, role of women, etc.)

9. Planning phase

   - Forming project committee
   - technical planning
   - elaboration of distribution system
   - budgeting
   - contract
   - contributions by villagers

10. Implementation phase

11. Management of completed water supply system
    incl. Operation and Maintenance, roles and responsibilities of different actors involved.

November 91 / February 92
Karl Wehrle

Annex 12 b

Draft.

Village Management Handbook (vorläufiger Inhalt).

1. Einführung : - warum dieses Buch geschrieben wird;
- wie man es anwendet d.h.Grundgedanken zur untehgeführten Inhaltseinteilung.

Für wen das Handbuch gedacht ist : Dorfbewohner/innen.

Ziel des Handbuches :

Informationen an die Dorbewohner was eine Trinkwasserversorgung ist. Hoffnungen versus Realität.

(Aspekte : Wissensvermittlung, sharing v.Erfahrungen, ökonomische u.bewußte Wassernutzung,Erhöhung d. sustainability der Versorgung und Anlagen etc.).

(Haupteil- Erläuterung :

Es gibt 2 wichtige Hauptpunkte in diesem Teil d.i.

- Verbesserte vorhandene Versorgung(incl.Sanitation), die die Dorfleute selbst machen können; und
- Die Trinkwasseranlage; was ist das? Welche Vorteile bringt sie und die Konsequenzen hiervon.

Um diese beide wichtige Hauptpunkte den Dorfbewohnern/innen klar zu machen, geht man von deren Begriffe aus; d.h. wie sie Wasser kategorisieren. Danach geht man schrittweise zu dem Begriff "sauberes Wasser" im gesundheitlichen Sinne,das evtl.durch die verbesserte Maßnahme erreicht werden könnte.)

4. Wissen und Erfahrung.

- lokale Begriffe und Kategorisierung des vorhandenen Trinkwassers bei der Bevölkerung.Gebräuche und Benutzung.
- Gesundheit,Hygiene und Krankheiten in Zusammenhang mit Wasser.
- Verbesserte Wasserversorgung und Sanitation, welche Vorteile welche Konsequenzen.

5. Verbesserungmaßnahmen von vorhandenen Wasserresourcen.

- Quellen - Schutzmaßnahmen und Verbesserung;
- Fluß- Seewasser - Filterungstechniken;
- Regenwasser - Reservierungstechniken;
- Brunnen - Verbesserungs-und Sicherheitsmaßnahmen.
- Sanitation - Bauen/Verbesserungen.
- Zusammenfassung - Möglichkeiten der Selbsthilfe.

6. Trinkwasserversorgung.

a. Bedeutung und Konsequenzen einer Trinkwasseranlage(allgemein).

- Positive Punkte : Erleichterung der Arbeitsbürde der Frauen u.Kinder, Sauberkeit und Hygiene, Zugang für alle d.h. auch für Kranke,alte Menschen etc.
- Grenzen : Änderung bestimmte Gewohnheiten, gemeinsame Verantwortung (Bezahlung,Pflege und Unterhalt,Kontrolle etc.), "Surplus-Wasser".

b. Bedingungen und Folgen

- Naturbedingte und soziale Vorbedingungen :
  - Quelle : wie groß; Schutzmaßnahmen (Reforestration).
  - geographische Lage der Quelle : wo liegt sie,wem gehört die Quelle,Frage und Probleme betr.Bodenbesitz.
- Rolle der Dorfbewohner/innen :
  - Selbsthilfe-Beitrag (Arbeitskraft,Cash,Baumaterial etc.).
  - Lage der Wasserstellen und Bodenabgabe.
  - Klärung über Rolle des Wasserkomitees.
  - Klärung über die Rolle der "Kelompok-kran".

c. Hilfemöglichkeiten und Bedingungen.

- Selbsthilfe als Vorbedingung für auswärtige Hilfe.
- Hilfe seitens der Regierung.
- Hilfe seitens der Stiftung.
- Hilfarten : technische,finanzielle und Trainingsangebote.

d. Zusammenfassung - Vergleich in Bild und Schrift zwischen Punkt 5 und Punkt 6 (Vorteile,Nachteile,Grenzen,ökonomische Konsequenzen, kurzfristig als auch langfristig etc.).

(Erläuterung : Punkt 4,5,und 6 sind somit wichtige Punkte um die Dorfvertreter/innen und die Bewohner/innen Informationen zu ermöglichen,daß es mehrere Möglichkeiten gibt. Die Wahl hiervon ist nicht nur sozio-ökonomisch bedingt,sondern auch sozio-kulturell . Und genau dieser Aspekt wird oft vergessen,auch von den Projektmitarbeitern/innen.)

7. Antrag auf Verbesserungsmaßnahmen im Trinkwasserbereich.
   - Warnung : haben eigentlich alle Bewohner/innen begriffen über die verschiedenen Möglichkeiten der Verbesserungsmaßnahmen im Trinkwasserbereich ?
   - Preliminary survey : über die Hauptmöglichkeit der Wasserversorgung; und über diskutierte Alternativmöglichkeiten, die plausiblen Begründungen haben.
   - Welche Möglichkeit ist technisch am besten (sozio- ökonomisch und-kulturelle Aspekte nicht vergessen) und von der Majorität der Bevölkerung getragen? Welche konkrete Beiträge können geleistet werden (schriftlich festgelegt).
   - Wie man einen Antrag schreibt.
     - Die Ist-Situation der Wasser-und Sanitationsversorgung;
     - Selbshilfemaßnahmen i.d.Vergangenheit in diesem Bereich;
     - Weitere mögliche Beiträge;
     - Welche Verbesserungsmaßnahme geeinigt wurde,und warum;
     - Art der beantragten Hilfe;

8. Survey-Phase.[1)]

   Technische Aspekte (zusammen mit dem Werkstatt-Team).
   - Quelle.
   - Schutzmaßnahmen,Reforestration.
   - einfache Verbesserungsmaßnahmen im Bereich des Wassers und Sanitation.

   Soziale Aspekte
   - Diskussionen mit den Frauen und Adat-Vertreter/innen.
   - Landprobleme/status.
   - Die Frage der Selbsthilfe.
   - Institutionsbildung etc.

9. Planungsphase.[1)]
   - Institutionen :
     - Wasserkomitee
     - Kader und Dorftechniker
     - "Kelompok kran"

     (bei allen: Bedeutung,Ziel,Plfichten,Verantwortung, Verträge, Beiträge und Selbsthilfe etc.)

10. Implementationsphase.[1)]
11. Pflege und Unterhalt.[1)]
    - Bewußter Wasserverbrauch
    - Gewohnheitsänderung
    - Sauberes Wasser zuhause.
    - Verschmutzung.
    - Abwasser und Umwelt.
    - "Surplus-Wasser",Bedeutung-Verbrauch.

1) Erläuterung : Da ich das "Lesotho Wasser-Handbuch"(?) noch nicht in die Hand habe,sind verschiedene Änderungen vorbehalten,insbesondere ab Punkt 8).

Jakarta,Dezember 1991

Yang Suwan.

·1)

Annex 12c

Langkah / Schritte

① Informasi diskusi (2 - 3 x field visits)

② a Diskusi penduduk (4 minggu / Wo.)
Diskussion d. Bevölkerung
di desa / im Dorf.
↕ Proses memilih / Positif - negatif
Wahlen u. Alternativen

b Pengamatan dan wawancara awal
Beobachtungen u. interviews Stufe I.
- Key questions
- technical surveys.

③ Penduduk memutuskan
Entscheidung d. Bevölkerung
- sarana air sederhana - Einf. Wassersysteme
- " " kran - Wasserleitung
(Proposal)

④ Usaha² sederhana / swadaya
Einfache Verbesserungen / Selbsthilfe
- Penghijauan / Reforestration
- Perlindungan sumber yg. ada / Schutzmassnahmen
a - Penjernihan / penampungan etc
↕ Filtern / Auffangen / Sammeln.

b Survey (s. Wehrle Report 90 Annex 3 Point 2)
- Status tanah / Landstatus

c Penduduk / Bevölkerung : - Sumbangan swadaya / Fron - Eigenleistungen
- Kelembagaan / Institution
etc.

(Green light - Sistim Kran)

(5) Implementasi
- tim pelaksana / pengelola
- { Kontrak Kerja
  { lampiran / Annex ²
- Kelompok kran
- Kader etc

(Lihat Annex 3 Point 3-7)

(6) Pemeliharaan / Penjagaan - Proses belajar
Unterhalt / Pflege - learning process

- Follow up visits → penggunaan effektif (Verbrauch)
  → kebersihan
  → menjaga / merawat
  → penghijauan
  → pembayaran

- Training
  - Kelompok Kran
  - Kader
  - anak² jadus / junge Mädchen
    (= Kursus dasar / Pkk).

- Perkembangan yg terjadi / Cara² pemecahan (Air / Wasser)
  Entwicklungen u. Problemlösungen (♀ , ♂)

- Usaha² pengembangan lain yang terjadi
  EW. Schritte in anderen Bereichen (♀ , ♂).

Pengamatan / Beobachtungen

Cara : Jalan² bersama
Methode gemeinsamer Spaziergang

① Sumber² yang ada
Vorhandene Wasserquellen

Jenis / Arten	dipakai untuk / Gebrauch	oleh / von	jarak / Entfernung

② Usaha² peningkatan yg terlihat
Vorh. Verbesserungsmaßnahmen

③ Usaha² perlindungan air
vorh. Schutzmaßnahmen

④ Penyakit yg banyak terlihat / Vorhandene Krankheiten
- Anak / Kinder
- Orang dewasa / Erwachsene :
  - Perempuan / Frauen
  - laki-laki / Männer

⑤ Usaha² swadaya yg ada / Selbsthilfemaßnahmen
Jenis / Arten Tahun / Jahr

Wawancara / Interviews.

a Wawancara kelompok / Gruppeninterviews ♀ ♂ (ibu RT / Frauen)
b " individu / Einzelinterviews

Yang perlu diperhatikan / zu beobachten sind
- Suku / Ethnie
- Agama / Religion
- Mata pencaharian / Subsisten²
- Desa / Dorf
- Dusun / Weiler.

Pada b / Bei Punkt b ditambah / auch
- Keluarga Kaya / reiche Familie
- " miskin / arme Familie
(dengan Kode misalnya KK dan Km)

Cara / Methode: Kunjungan / Besuch

Pertanyaan² / Fragen

1. Air minum yang sekarang adalah ..... ciri² ..... / Vorhandenes Trinkwasser ist ..... Kennzeichen ...

2. Jenis² air yang dikenal beserta penggunaannya / Kategorien von Wasser und ihre Gebrauchsmöglichkeiten

3. Air minum yang baik adalah ..... ciri² / Gutes Trinkwasser ist Kennzeichen

Pengetahuan tentang air / Wissen über Wasser: tinggi / entwickelt; sedang / mittel; rendah / wenig.

Informasi dan diskusi (tahap awal)

Penduduk / Bevölkerung
- Air bersih / Air Kotor
  Sauberes u. schmutziges Wasser
- Jenis" air yg. dikenal / Penggunaan
  Wasserkategorien / Gebrauch
- Baik / buruk. air yang sekarang digunakan
  Vor- u. Nachteile d. jetzigen Wasser (: Ist-Situation)

Staff dan penduduk
- Air / Wasser : Media Kebersihan, Kesehatan / Sauberkeit, Hygiene
  : Media pembawa penyakit / Krankheiten
- Air bersih dan aman
  Safe water
- Air "bersih" yang Kotor
  Non-safe water.

Sarana" air sederhana (usaha" peningkatan)
Einfache Qualitätsverbesserungen

a. Melindungi / menjaga / merawat / Schützen / Unterhalt u. Pflege misalnya / z. B. Mata air, sumur / Quelle, Brunnen

b. Menampung / Auffangen → air hujan / Regenwasser

c. Menjernihkan / Filtern

d. Keuntungan / Batas dan permasalahan
Vorteile / Nachteile / Grenzen.

Sarana air Kran
Leitungswasser

a Segi² sosial-budaya
Sozio-Kulturelle Aspekte.

b Segi² biaya
Unkosten

c Segi² pemeliharaan/perawatan
Pflege u. Unterhalt

d Arti a–c bagi penduduk
Bedeutung/Risiken a–c f. d. Bevölkerung

e Tabel sarana air sederhana - einf. Wassersystem
Tabelle " " Kran - Leitungswasser

Memilih/Wahl u. Möglichkeiten

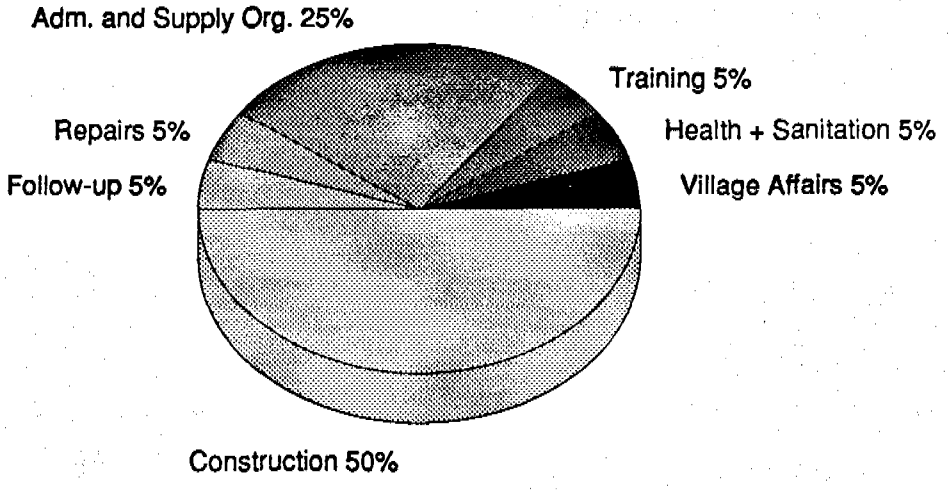
- Memilih biaya — Kosten
- Memilih budaya — Kultur
- Memilih teknis — technisch.

Annex 13

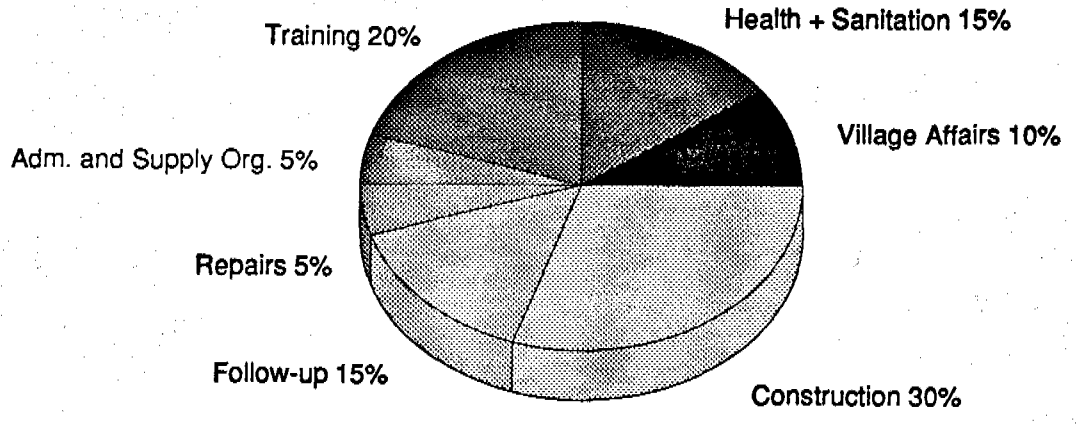
Cakes on :

. Workload Rudi Ndoen
. Water Supply Section
. Yayasan St. Klaus

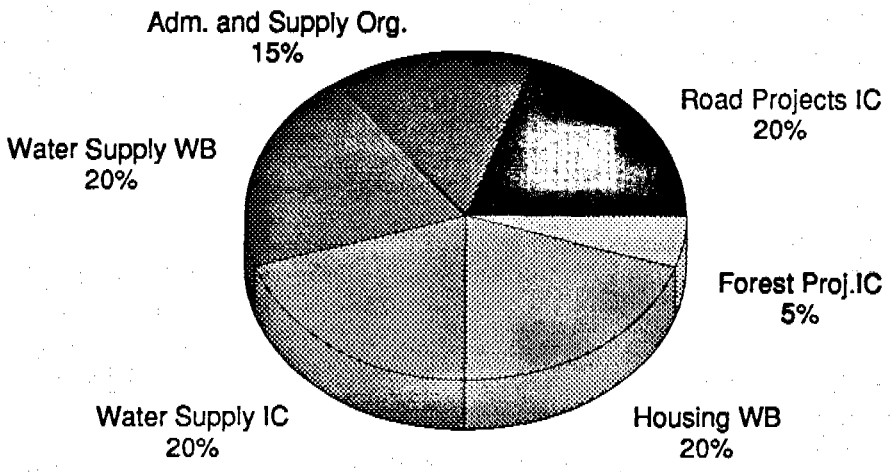
YSK's Water Supply Cake
1991



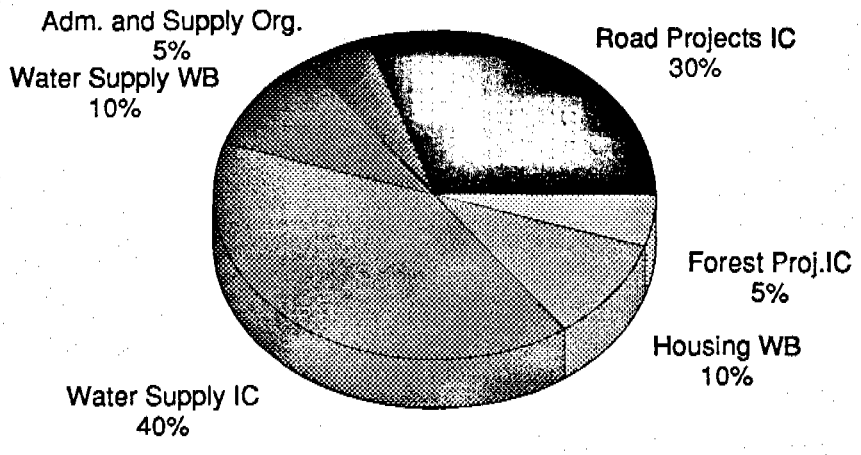
Desired ideal YSK's Water Supply Cake
(according to R. Ndoen)



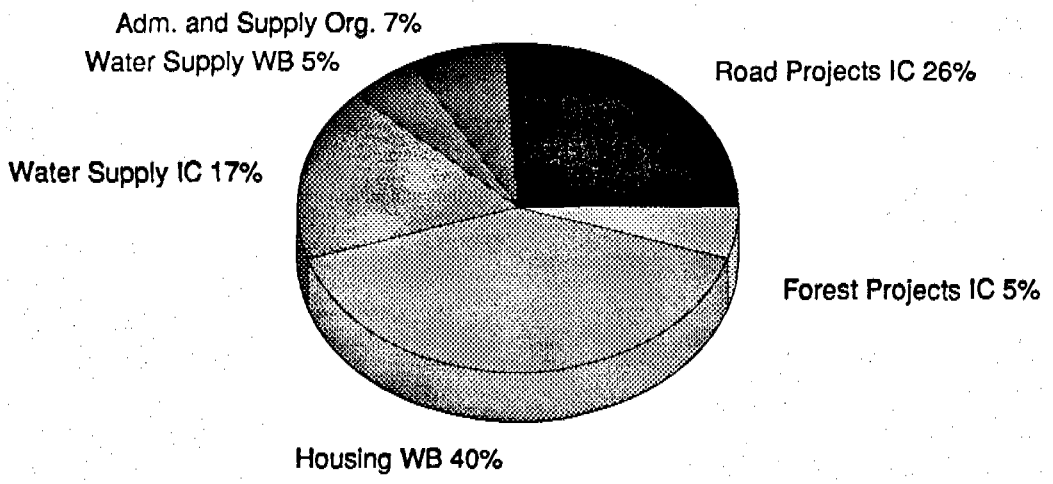
Workload Cake of Ruedi Ndoen
1991



Desired ideal Workload Cake of R. Ndoen
1992

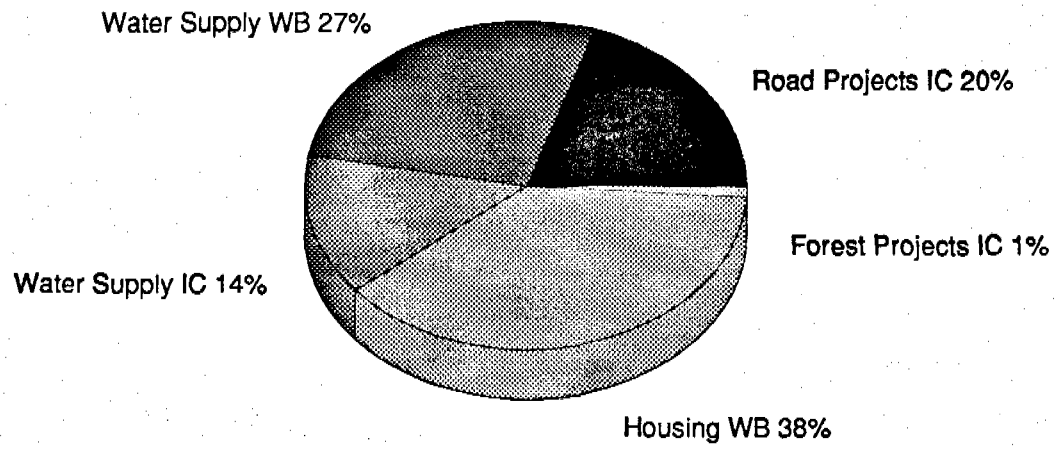


Mandays Cake of YSK
November 1991

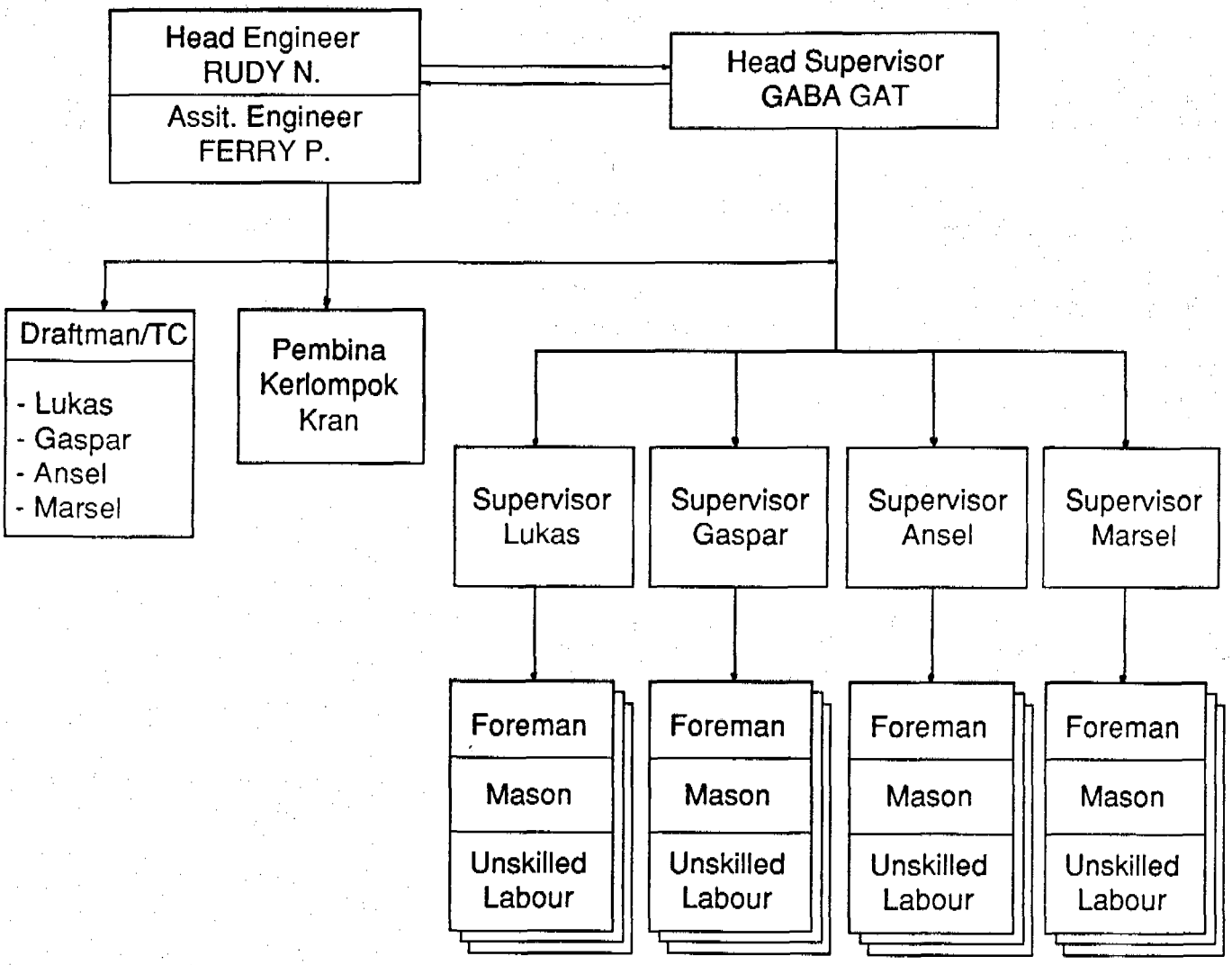


(100% ca. 500 workers)

Profit Cake of YSK in 1991



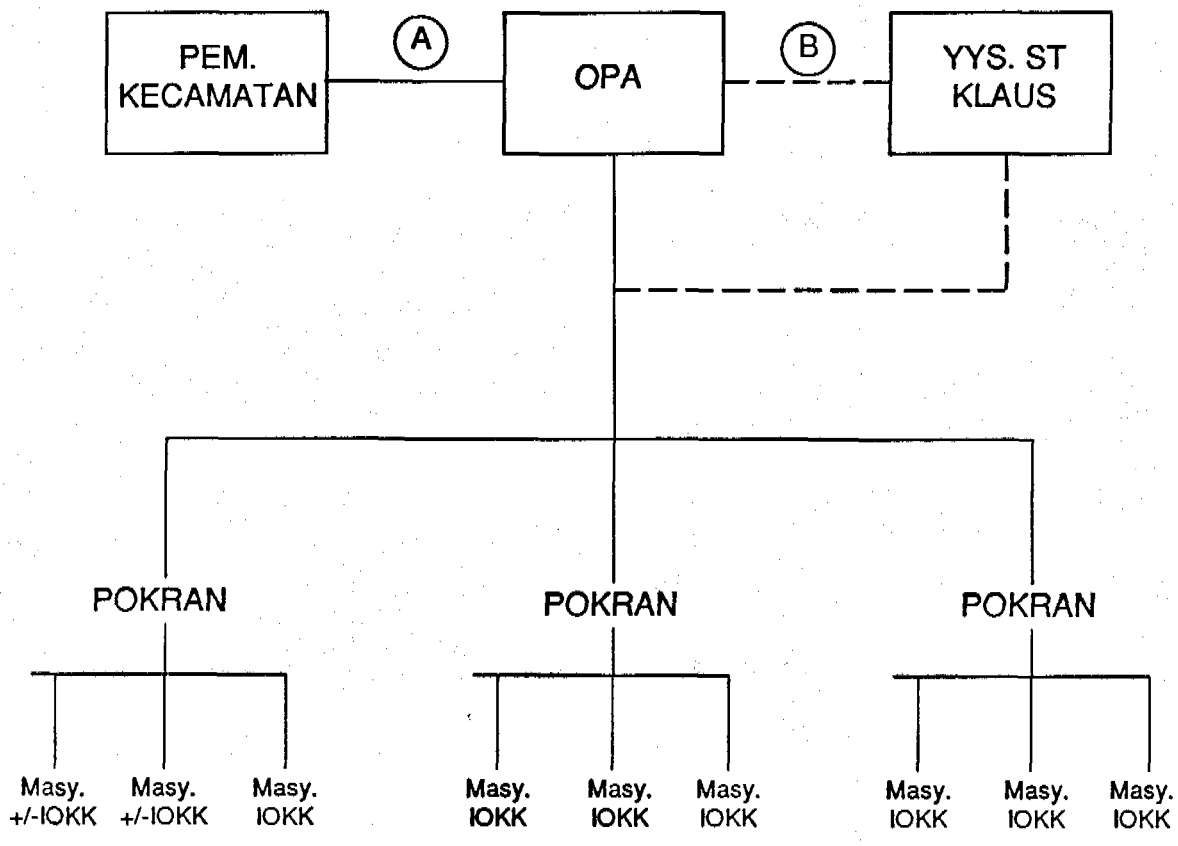
Organigram of YSK's PAM-Section



Annex 14

Organigram of YSK's PAM-Section

Organigram of organization at Village level in post project phase



A **from village to GOI:**

- reporting
- complaints
- request for new extension

from GOI to village:

- checking and supervision
- approval of extension
- facilitation of funds for extension

B **from village to YYSK:**

- reporting
- proposal for extension

from GOI to village:

- education and training acc. to need
- planning and design for approved extensions
- support in implementation acc. to need on contract terms

Annex 15

Organigram of organization at Village Level in post project phase

Annex 16

Brief Guidelines for Operation Planning

BRIEF INCOMPLETE NOTES ON PROJECT OPERATION PLANNING!!

A PARTICIPATIVE PLANNING PROCESS

WHY ???

* People are involved and then feel responsible for their activities.

* people can contribute their ideas,

* Management get a chance to listen to all levels of staff.

* The result is a better quality project that uses its people resources.

*THE PLANNING IS THEN NOT DONE BY ONE OR TWO PEOPLE AT THE TOP

HOW???

* With as many staff levels as is practical

* Usually in a series of meetings or one day workshops

* If possible good food

* If possible where interruption is not easy. ie far away from people not involved and telephones

* After group input a senior management team could fill in the details.

WHAT DETAILS ? ? AND A FEW MORE WHY'S

* Onto a standard operation plan matrix, as per example used in this workshop.IE ACTIVITIES WITH SUCCESS INDICATORS LINKED TO TIME, RESPONSIBILITY AND A BUDGET.

* The matrix clearly shows the stages needed to get something done.

* It makes progress follow up ,project and section reporting and re-planning easier.

HOW TO USE THE OPERATION PLAN

* In regular staff meetings to assess progress and discuss problems.

*As the basis for all reporting.

* As a management tool to give sections and a project a definitive direction with clears targets.

SOME TIPS

* Let the staff involved work out the success indicators and targets.

* Timing should be flexible and changeable

* Targets should be realistic

* Management has veto rights!!

* Under responsibility column staff should be named

SETTING SUCCESS INDICATORS

* QUANTITY AND QUALITY

* SHORT AND CLEAR DESCRIPTIONS

* ACHIEVABLE IN A REALISTIC TIME

* SET WITH THE STAFF INVOLVED

Annex 17

Information by Yayasan St. Klaus (Kuwu) about constructed and planned water supplies

Annex 17

Information by Yayasan St. Klaus (Kuwu)
about constructed and planned Water Supplies

Nr.	Nama Tempat Pam	Popul.	Donatur	Degr.of Compl.	Swadaya	Grant	Total	Tahun
1.	Pam Desa Cumbi / Pong Murung/Kakor		Kota Zürich, Swiss		2.630.000	38.663.000	44.369.650	1981
2.	Pam Paroki Ponggeok (Lale)		Via Paroki Ponggeok		---	4.936.600	4.936.600	1982
3.	Pam Desa Watu		Pem Baden.Württ.		200.000	5.130.000	9.212.850	1982
4.	Pam Desa Langgo		Aksi Puasa Swiss		1.568.000	9.600.000	11.118.000	1983
5.	Pam Paroki Rangga (Perang)		Swiss		439.500	8.870.000	9.309.900	1984
6.	Pam Desa Munting		Pem Kanada		1.735.000	12.770.000	15.231.850	1984
7.	Pam Desa Wae Belang (Cancar)		Misereor German		2.856.000	42.005.300	53.133.850	1986
8.	Pam Desa Cumbi (Tuke Nikit)		Pem Kanada		---	13.709.400	13.709.400	1986
9.	Pam Paroki Beo Kina (Golo Mende)		Via Paroki Beo Kina		---	7.775.000	7.775.000	1986
10.	Pam Desa Golo Worok (Rentung)		Pem Kanada		1.616.750	6.106.000	7.722.000	1986
11.	Pam Desa Pongkor		Misereor German		2.387.500	15.931.000	18.318.553	1986
12.	Pam Desa Pong Murung (Dalo)	1200	Pem Swiss		2.611.000	8.912.900	11.532.900	1986
13.	Pam Desa Cumbi (Lait)	660	Pem Swiss		250.000	2.269.200	2.519.200	1986
14.	Pam Desa Golo Cador (Mendo)		Pem Kanada		3.027.000	4.755.200	7.783.000	1986
15.	Pam Desa Kakor/Lalong	2130	Pem Swiss		11.442.000	55.499.010	60.640.010	
16.	Pam Desa Surunumbeng		Misereor German		5.235.710	55.012.041	62.774.600	1987
17.	Pam Desa Gunung (Lete)	3150	Pem Swiss		4.039.000	24.807.000	28.846.000	1987
18.	Pam Desa Golo Langkok	1770			---	13.725.700	15.048.200	1987
19.	Pam Desa Dali (Cewo Nikit)		Pem Swiss		21.100.000	10.792.000	22.092.000	1987
20.	Pam Desa Uiu Wae (Colol)	3150	Pem Swiss Misereor German		7.000.000	30.556.800 16.380.000	55.936.800	1987
21.	Pam Desa Bulan (Anam)	1206	Pem Swiss		1.500.000	19.542.900	22.192.900	1987
22.	Pam Desa Rura		Pem Swiss		1.844.150	35.038.050	36.883.000	1988
23.	Pam Desa Popo	636	Pem Swiss		1.304.000	12.204.500	13.588.500	1988
24.	Pam Paroki Wangkung Boleng (Lando)		Via Paroki Wangkung Boleng		---	---	6.923.000	1988
25.	Pam Labuan Bajo		SVD		---	18.509.000	18.509.000	1989
26.	Pam Desa Cador (Ling)						5.582.300	1989
27.	Pam Lembor (W. Mowol)		World Bank	100%	---	466.200.000	466.200.000	90/91
28.	Pam Desa Wae Bangka/ Wae Kanta/Pong Majok		Pem Swiss		15.654.000	133.276.740	148.931.000	1990

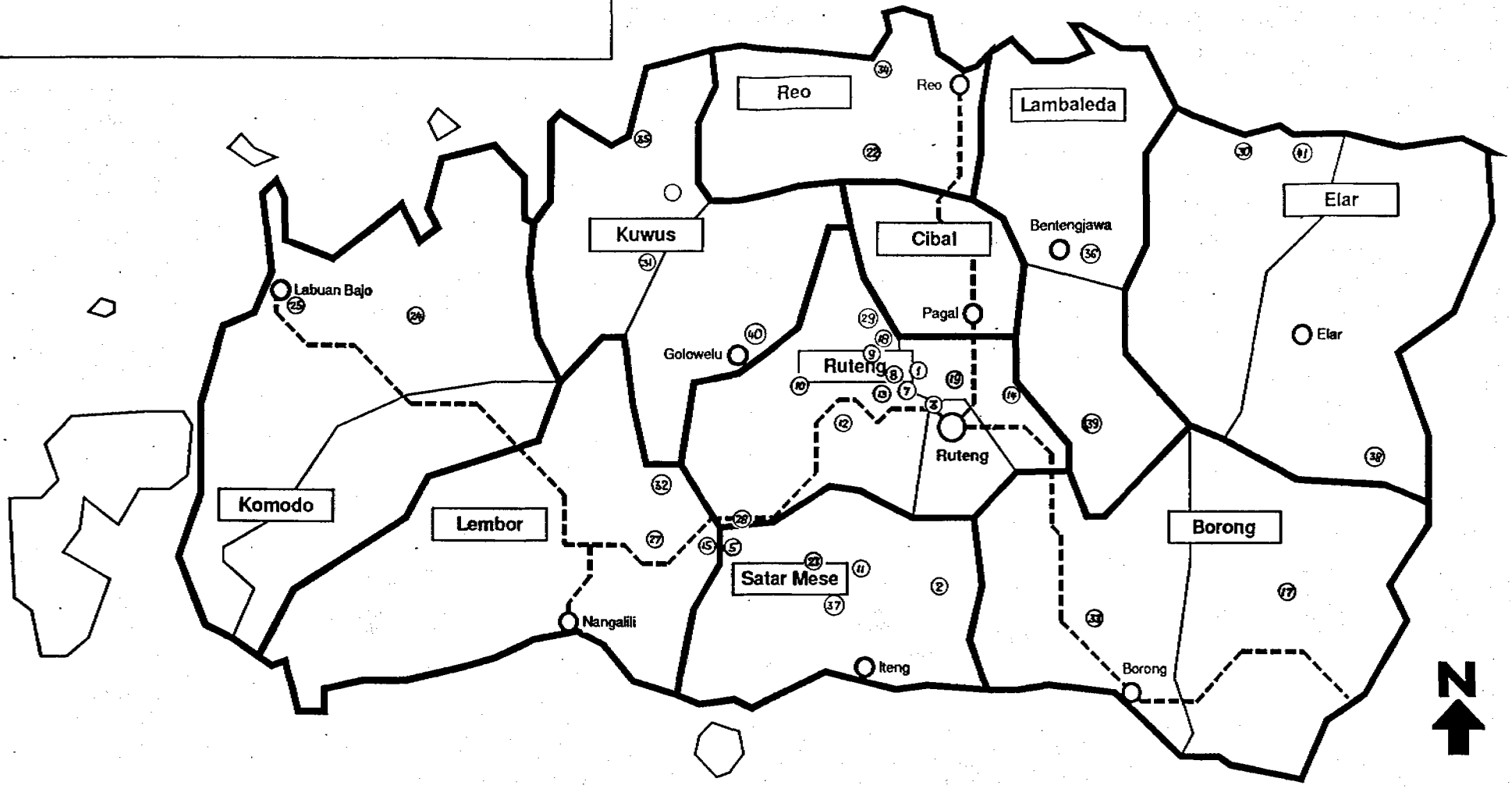
Nr.	Nama Tempat Pam	Donatur	Degr.of Compl.	Swadaya	Grant	Total	Tahun
29	Pam Liang Bua	Pem Swiss	90%	5,6	50,5	56,1	90/91
30	Pam Pota	PEM Swiss	95%	13,4	120,1	133,5	89/90
31	Pam Paroki Pacar	Pem Swiss	?			--	
32	Pam Orong	Misereor German	90%	4,0	75,2	79,2	91
33	Pam Golo Meleng	Pem Swiss	100%	5,1	44,6	49,7	91
34	Pam Robek	Pem Swiss	95%	13,9	123,0	136,9	91/92
35	Pam Bari	Pem Swiss	46%	24,9	223,8	248,7	91/92-92/93
36	PAM Benteng Jawa	Pem Swiss	90%	4,2	40,0	44,2	91/92
37	PAM Ngkiong Dora	?	design[1]	7	61	68	?
38	PAM Wukir	?	Serakhan kepada Delsos untuk mencari dana[1]				
39	PAM Todo	?	Ada Masalah dengan pemilik air[2]			-	
40	PAM Pangga	?	Sudah Survei belum design[3]			-	
41	PAM Tompong	?	Sudah Survei belum design[3]				

[1] Survey and design completed, but because of limited funds uncertainty about whom will handle it (Delsos / Misereor or YSK/IC)

[2] Problem : ownership of spring

[3] Survey, but no design because of limited funds uncertainty about whom will handle it (Delsos / Misereor or YSK/IC)

Kabupaten Manggarai



KEY
- Completed Water Supplies
- Water Supplies under construction
- Water Supplies under study

- Kecamatan Boundary
- Perw. Kecamatan Boundary
- National/Provincial Road
- Kecamatan Capital

References

Ref. 1 Mission Report 1990

Ref. 2 Mission Report 1989

Ref. 3 Mission Report 1986

Ref. 4 Manual Rural Water Supply (SKAT Publication)

Ref. 5 Drinking Water Supply and Sanitation Technical Aspects (SKAT : WP 04/85)