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Supply (DRWS)**

THE REPUBLIC OF FINLAND

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WATER SUPPLY AND SANITATION PROJECT IN OHANGWENA REGION¹

**SANITATION DEVELOPMENT PLAN FOR THE WESTERN PART OF
OHANGWENA REGION**

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First Draft

FINNCONSULT

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ABBREVIATIONS

CHW	Community Health Worker
DAPP	Development Aid from People to People
DRWS	Directorate of Rural Water Supply
DWA	Department of Water Affairs
IABP	Integrated Area Based Programme
IBIS/WUS	Danish NGO
MAWRD	Ministry of Agriculture, Water and Rural Development
NGO	Non Governmental Organization
O & M	Operation and Maintenance
RDC	Rural Development Centre
UNICEF	United Nations Children's Fund
VIP	Ventilated Improved Pit latrine
WASCO	Water Supply and Sanitation Committee
WASP	Water and Sanitation Policy
WSSPOR	Water Supply and Sanitation Project in Ohangwena Region

EXECUTIVE SUMMARY

The immediate objectives of the Water Supply and Sanitation Project in Ohangwena Region are to encourage, organize and train communities to initiate, construct and manage their water supply and sanitation systems by giving technical assistance complemented with material and financial support, to develop local contracting capacity for water supply and sanitation construction and to encourage local production and supply of construction materials complemented by local transportation capacity and to prepare development plans for water supply and sanitation for the project area.

The planning area consists of the Western part of Ohangwena Region in Northern Namibia. Two district hospitals (Engela and Eenhana), one health centre (Odibo) and 18 clinics provide the health services for the area. Six of them have piped water supply with flush toilets and only two clinics in Eenhana and one in Ongenga are still lacking appropriate sanitation facilities. The sanitation coverage in Northern Namibia varies between 5-28 % of the households in the rural areas. Lowest figure represents the area far from existing sanitation projects. Highest figure correlates with the input of the 3 years sanitation programme in the area. Most of the existing latrines (60-70 %) counted are traditional latrines (open pit covered with wooden logs). Rest are flush toilets, VIP latrines and so called Ombili Plat latrines. School and clinic sanitation coverage surveyed by the WSSPOR is 14 % and 86 % respectively in the end of 1993.

The experience gained in the WSSPOR indicates that a demand exist but it is not very strong. Therefore the first priority for the sanitation programme is to develop the demand. The perspective must be marketing rather than providing a service. More powerful than persuasion or exhortation is the strength of example. Any cadre of promotion workers must be seen to own and use sanitation facilities they are promoting, if their words are to be taken seriously. Facilities with an investment cost varying from N\$ 500 to N\$ 1500 have been made available for the households. Anyhow the affordability for these facilities is limited to the households with monthly income more than the average. Therefore, in this limited order to attract the majority of the people, the main effort is to develop demand and products for low-income population. The low cost sanitation programme must be acceptable to consumers, politicians, planners, local leaders and the agencies that fund them. The careful targeting of the initial promotion can ensure that the demonstration potential is exploited to maximum effect.

Technical and user education support services are to be established. User education refers mainly to health education and sanitation promotion. Latrine installation calls for a greater user commitment than what is needed for water supply. Therefore people need to be convinced of the advantages of owning a toilet. Therefore the promotion of sanitation generally requires a cadre of well trained people in the field. The use of Community Health Workers (CHW) as promotion workers shall be encouraged. Female promotion workers are more likely to convince other women of the advantages of sanitation; and women as the guardians of health, cleanliness, and children's welfare in most households, are most likely to be interested in sanitation and committed to its use. To the extent that water and sanitation programmes seek to achieve health benefits, all promotion of them is a form of health education. In health education the participatory techniques are proposed. There is a particular advantage in demonstrating the health benefit to children, since they tend to carry the largest burden of worms and suffer most frequently from diarrhoeal disease. The children can also play a key part in introducing new habits to the family.

Participation of women in the sanitation programme is of crucial importance. Not only because usually women are more motivated to have sanitation facilities for reasons of convenience and privacy, but also because they are the ones who keep the facilities clean, who maintain them, and who train their children to use them. Women are also able to take part in the construction of a latrine. In Uukwanyama formation women participation is accepted and it is possible to hold community meetings where both men and women are present.

The **Ombili Plat (The Sanplat System)** low-cost sanitation system is recommended as a rapid and most affordable improvement of the traditional latrines in rural areas. The Ombili Plat is a concrete slab installed on top of the pit. With this method the hygiene, smell and fly control is improved and it provides complete child safety. The use of wooden logs to support the slab shall be avoided.

The **VIP latrine** constructed either with locally made bricks or with some other local materials is recommended mainly for the individual households with an income above the average. The VIP latrine is convenient for rural areas as well as for semi-urban areas. A VIP latrine is recommended also for schools and clinics in rural areas.

The **flush toilet** is recommended for semi-urban areas only where piped water and sometime sewerage are available. The flush toilet can be aqua privy or septic tank type or connected to the sewerage system if available.

For the semi-urban areas at Omungwelope, Ohangwena and Eenhana as well as at Engela and Eenhana hospitals the treatment facilities are required. **Natural wetland system** can offer an effective, economical system for wastewater treatment of the above mentioned semi-urban and hospital areas.

It is proposed that the Government do not implement sanitation programmes by themselves. The Government should plan for the programmes and create conditions for them to succeed. Therefore the local NGOs or donor projects should take the responsibility for implementation of the programmes.

It is proposed that the programme is built gradually. The process of the programme can be divided into three phases:⁶

- 1) Technology Development; 1994
- 2) Pilot Programme; 1995
- 3) Expansion; 1996 - 2005

The first phase shall focus on listening and studying the needs and problems of the local population in order to build the technical solutions based on the existing situation. The pilot phase is to test the marketing, to define organizational approach, extension service methods, payment arrangements, etc. and to serve as a demonstration to agencies that might consider funding the full-scale programme. A phased expansion is recommended because it allows time to make further refinements to the programme strategy and to build capacity in an ordered way. Each programme is a learning process, in which every staff member accumulates experience that can contribute to improvements in the programme design. The programme must be able to evolve and grow as the best approach to implementation is being identified, developed and refined.

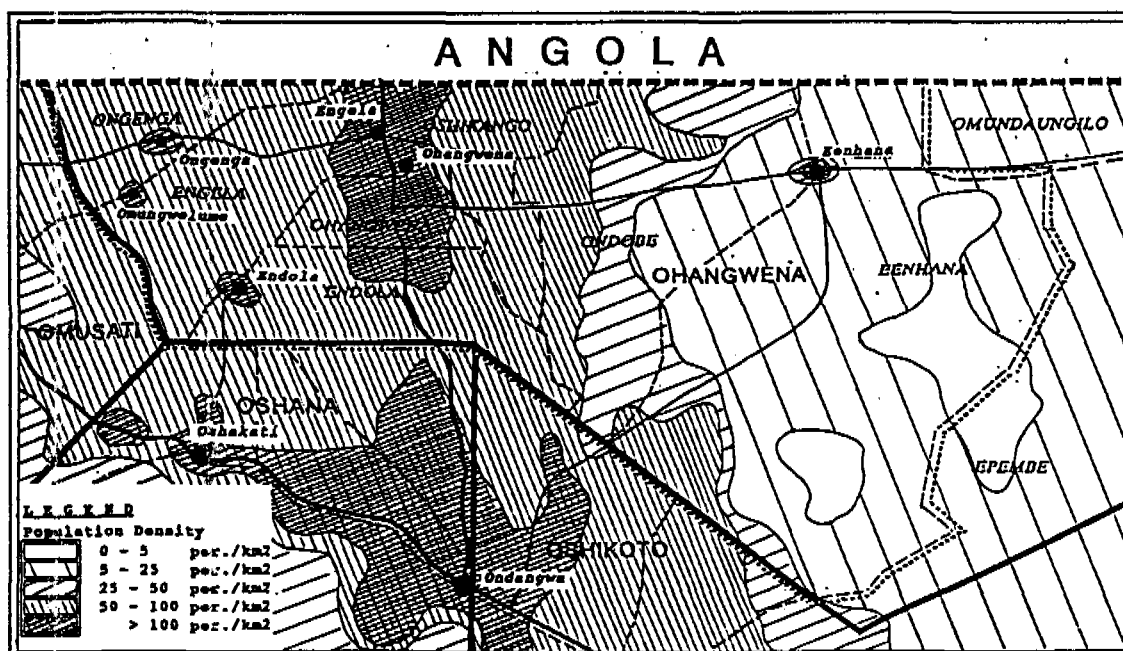
The total population of the planning area at present is 128 800 people from which 115 200 live in rural areas and 13 000 in semi-urban areas. With a rural population growth rate of 2 % and semi-urban population growth rate 7,5 % minus migration the total population at 2005 will be about 165 000 people of which 135 000 live in rural areas and 30 000 in semi urban areas. Based on the assumptions and surveys made, the household, school and clinic sanitation coverages at present are 10 %, 14 % and 86 % respectively. In order to achieve 80 % household and 100 % school and clinic sanitation coverage at 2005, about 11 500 Ombili Plat latrines, 3 300 VIP latrines and 700 flush toilets need to be constructed. It is also proposed that the school and clinic toilets will be completed during 1994 - 1996, before the full-scale Ombili Plat latrine construction promotion will take place.

The following summary of total costs for 80 % sanitation coverage during 12 years time can be concluded:

*	total construction costs	N\$	8,700,000	
*	total investment costs	N\$	10,000,000	
*	total community contribution	N\$	16,000,000	
*	cumulative maintenance costs	N\$	830,000	(households only)
*	proposed subsidy	N\$	2,100,000	
*	annual investment costs	N\$/year	830,000	
*	annual O & M costs	N\$/year	76,000	
*	average constr. cost/capita	N\$/capita	50	
*	average investment cost/capita	N\$/capita	60	
*	average constr. cost/household	N\$/household	370	
*	average comm.contr/capita	N\$/capita	45	
*	average comm.contr./household	N\$/household	720	(incl. const.& maint.)

It is estimated that at present about 127 600 people live in the Western part of Ohangwena Region, 12 400 of which live in the semi-urban areas. The simplified population density is presented in figure 2. One northern hospital records list gastro-intestinal diseases as the second cause of admission and fifth cause of deaths. Malnutrition caused most deaths and diarrhoeal disease is a major contributory factor in malnutrition.⁴ It is likely that the potential health benefits will not be fully realized by a sanitation programme unless it achieves a high degree of coverage and a high degree of use by those households it covers. Health benefits, however, are not the only motives for promoting sanitation in low-income communities. More effective selling point for potential users is the privacy and convenience a latrine can offer.⁶

Figure 2. Simplified population density



This Sanitation Development Plan concentrates on rural areas only. The semi-urban areas have been taken into account in calculations but development plans for those areas are not considered in this proposal.

2. BACKGROUND

2.1 Environmental and Social Settings

The topography of the planning area is characterized by an extremely flat plain. The gradient is approximately 1:2500 decreasing from North to South. The elevation is between 1090 m and 1150 m above the mean sea level. The whole area is situated in the Kalahari Group geological formation. It consists of layers of sand, sandy clays, sand stones and conglomerates up to 500 m and its age varies between 30 to 40 million years. The perched aquifer in the area contains potable water at depths between 5 and 25 m. The common parent material of the alluvial plain in the area is a uniform, medium textured sand. The clay content is relatively low, varying between 2-8 %.

The vegetation of the area falls under the groups classified as "Mixed Woodland" in the East and "Palm Savanna" in the West. The grass cover is generally poor. About 35 % of the area is covered by Oshanas passing through the area from North to South. The oshanas vary between 2 and 7 m in depth and 100 to 500 m in width. The Uukwanyama social formation is covering the whole planning area. The unit which the social and economic life resolves is the eumbo (homestead) headed by omwene gwegumbo. The pattern of dwellings is that of individual kraals within which a cluster of huts are found. Cultivated lands surround the kraal.

Two district hospitals (Engela and Eenhana), one health centre (Odibo) and 18 clinics provide the health services for the planning area. Six of them have piped water supply with flush toilets, 12 clinics have VIP latrines and only two clinics in Eenhana and one in Ongenga are still lacking appropriate sanitation facilities. There are 135 schools in the planning area. Most of them (86 %) are not having any sanitation facilities. School data of 1992 is presented in table 1.

Table 1. School data 1992

Constituency	Number of schools	Number of teachers	Number of students
Eenhana	25	125	6119
Endola	20	170	8861
Engela	25	253	11022
Ondobe	22	162	8475
Ongenga	16	179	7249
Ohangwena	11	157	7489
Oshikango	16	172	8835
TOTAL	135	1218	58050

2.2 Sanitation Coverage and Use of Sanitation Facilities

The sanitation coverage in the rural areas of Northern Namibia varies between 5-28 % of the households.^{1,2,3} Lowest figure represents the area far from existing sanitation projects. Highest figure correlates with the input of the 3 years sanitation programme in the area.¹

Most of the existing latrines (60-70 %)¹ counted are traditional latrines (open pit covered with wooden logs). Rest are flush toilets, VIP latrines and so called Ombili Plat latrines.

School and clinic sanitation coverage surveyed by the WSSPOR is 14 % and 86 % respectively in the end of 1993.

Most of the households (95 %)¹ share the same latrine with all family members. The households having no latrines normally use the bush. People mostly know that it is not good to use the bush or oshanas as a toilet. In the rainy season, water runs from the oshana into the ndungus and omafimas or dams and brings all the rubbish with it. The water is not clean and people will be infected by diseases. People are still using the bushes and oshanas, even though they know it is not good, because they have no other alternatives.³

Most of the rural families do not know the advantages of using the waste water.¹ Normally the water is simply thrown away in the mahangu field or on the ground near the house. Most of the families (68 %)¹ use the rubbish around the house as manure.

2.3 National Policy, Strategy and Objectives

General operational objective of the Government of Namibia is to attain universal coverage of the rural population with information and access to appropriate, low cost, hygienic methods of waste disposal.⁴ The following overall long term policy has been formulated:⁵

- * Essential water supply and sanitation services should become available to all Namibians, and be accessible at a cost which is affordable to the country as a whole.
- * The equitable improvement of services should be a result of the combined efforts of the government and the beneficiaries, based on community involvement, participation and responsibility
- * Communities are to have the right - with due regard for environmental needs and the resources available - to determine which solutions and service levels are acceptable to them. The beneficiaries shall contribute towards the cost of the services and at gradually increasing rates for standards exceeding those determined by the basic needs
- * The environmentally sustainable development, harnessing and utilisation of the water resources of the country is to be pursued to accommodate the various needs

The following broad sector objectives have been formulated⁵:

The provision of improved sanitation should:

- i) Contribute towards improved health
- ii) Ensure a hygienic environment
- iii) Protect water sources from pollution
- iv) Promote conservation of water
- v) Stimulate economic development

The operative strategy would be to ensure the safe and affordable disposal of all human, and other obnoxious wastes, including sewage and industrial effluent.

2.4 Sector Responsibility and Coordination

The DWA's responsibility in sanitation is limited to certain aspects of effluent control. However it is recommended that DWA be appointed the focal agency for the entire sector.⁵ The sector coordination is assigned to:

- a) A WASCO Sector Council composed of the respective Permanent Secretaries and representatives from private institutions or organizations involved in the sector on a prominent scale.
- b) An Executive Committee, being the working body addressing current issues, enabling assignment of clear mandates and tasks to the respective sector actors.

Intersectoral coordination at the national level may be relatively easy to achieve. Far more work is required to achieve a good coordination at local level, but it is even more important for smooth implementation. Therefore permanent or ad-hoc WASCO subcommittees should be established to address specific subjects, such as sanitation. The existing and functioning Ad-Hoc Water Supply and Technical Support Committee in Northern Namibia should be the natural link between the grass-root level and WASCO. The organizations and projects active in sanitation promotion in the Cuvélai area are UNICEF, IABP, RDC, DAPP, WSSPOR, IBIS/WUS Denmark and Oshikuku Catholic Mission. The allocation of responsibilities for the sector in the National level are included as annex 1.⁵

2.5 Classification of Sanitation Techniques

The National Sanitation Sector Policy defines sanitation scheme types into five different categories. Each scheme type may have several modifications⁵.

1.Conservancy Tank

The waste is flushed into a holding tank from where it is emptied by a vacuum tank truck for transportation to a treatment and disposal site. It can be characterized as "Wet system with road conveyance to central treatment".

2.Pit Latrine

The wastes are disposed into a pit dug beneath the toilet where decomposition will take place. The pit latrine is not a suitable receptacle for large volumes of liquid wastes. It can be characterized as "Dry system without conveyance, based on treatment on site".

3.Aqua Privy

The wastes are disposed of through a chute extending well below the water level in the aqua privy tank beneath the toilet. The tank has to be waterproof and kept full at all times. Moderate amounts of liquid waste may be discharged into the tank. It may be characterized as "Wet system without conveyance, based on treatment on site".

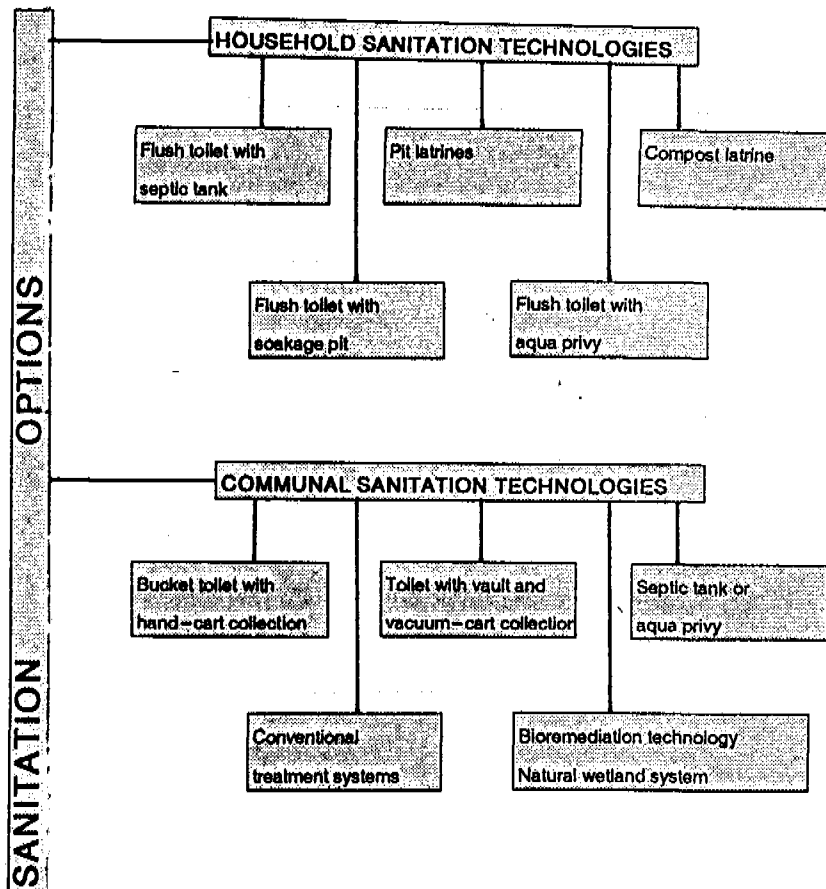
4.Septic Tank

The septic tank is a local "treatment plant" which can receive domestic waste water. The solids will decompose after settling whilst the effluent must be continuously disposed of, usually by seepage into ground. It may be characterized as "Wet system based on water conveyance, with treatment on site".

5.Waterborne Sewerage

Domestic wastewater is discharged from the premises into a sewerage system where treatment is provided at a central site. Such systems are often referred to as "conventional" sewerage. It may be characterized as "Wet system based on water conveyance, with central treatment".

A basic distinction could be made between sanitation techniques which can be used independently by individual households and systems which depend on the services and infrastructure of a large community. Accordingly the sanitation scheme types can be classified as follows:



3. SANITATION DEVELOPMENT PLAN

3.1 Target Setting

The low cost sanitation programme must be acceptable to consumers, politicians, local leaders, planners and the agencies that fund them. The careful targeting of the initial promotion can ensure that *demonstration potential is exploited to maximum effect*. In order to facilitate the most effective demonstration the following models are proposed:

- * Construct demonstration sanitation for the promotion workers
- * Construct demonstration sanitation for public institutions such as clinics and health centres
- * Construct demonstration sanitation for schools, especially for primary schools.

After the completion of institution latrines the implementation and promotion should focus on households. In most societies, the first ones to take advantage of the new technology, credit, government subsidies, and opportunities to improve their standard of living, are the relatively well-off members of the population. Anyhow, it is proposed that the promotion should concentrate on and give the priority to the low-cost technology by targeting at the poorest population groups.

3.2 Demand and Marketing

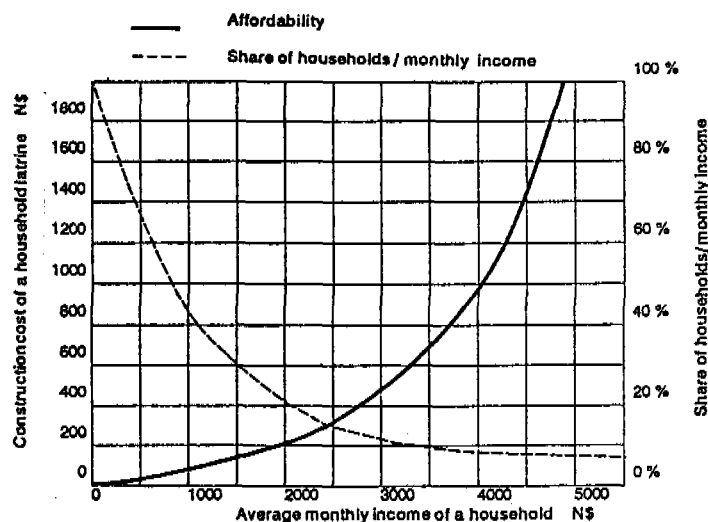
The experience gained in the WSSPOR indicates that a demand exists, but it is not very strong. Therefore the first priority for the sanitation programme is to develop the demand. The perspective must be marketing rather than providing a service. At the most basic level, effective marketing requires:⁶

- * A product that is attractive enough and cheap enough for people to want pay for it
- * A market whose characteristics are determined by market research and test marketing
- * A delivery system to make the product accessible to potential purchasers
- * Promotion to inform customers about the product and develop demand
- * Service to build customer confidence that the product will be useful for a reasonable time

The difference between marketing and promotion is that the marketer is mainly interested in selling the product, while the promoter is also concerned with ensuring that it is correctly used. Sanitation is a process, not just a product.

The WSSPOR has concentrated so far on the improvement of institution sanitation. Facilities with an investment cost varying from N\$ 500 to N\$ 1500 have been made available for the households. Anyhow the affordability for these facilities is limited to the households with above the average monthly income. Therefore, in order to attract the majority of the people, the main effort is to develop demand and products for low-income population. The figure 3 below illustrates the demand and affordability of low-cost sanitation among the rural population.

Figure 3. Illustrative demand and affordability of sanitation



3.3 Support Services and Sanitation Promotion

The support services comprise two main activities, namely technical support services and user education. The extension officers ensure that the users are involved in all stages of the sanitation scheme. A support service for technical advice and assistance during the construction, commissioning and operation stages should be made available. Special attention is to be paid to the training of informal user representatives to enable them to maintain their individual sanitation schemes. Health education is important for the promotion of the scheme implementation and for its proper use. A distinction is made between technical support services and user education, the latter referring mainly to the health aspects and sanitation promotion. A latrine is part of its owner's house, largely built at owner's expense and frequently with the owner's labour. This means that greater commitment by the user is needed for a latrine to be installed than for a water supply. Considerable persuasion is therefore required in most successful sanitation programmes, whether it is called health education or salesmanship.

People need to be convinced of the advantages of owning a toilet. Therefore the promotion of sanitation generally requires a cadre of well trained people in the field. To train, establish and manage such a cadre of field workers is a far greater challenge than simply to manufacture and sell latrine components.

The use of Community Health Workers (CHW) as promotion workers is proposed to be encouraged. Female promotion workers are more likely to convince other women of the advantages of sanitation; and women as the guardians of health, cleanliness, and children's welfare in most households, are most likely to be interested in sanitation and committed to its use.⁶ Anyhow CHWs may be too burdened with their existing tasks to undertake new responsibilities in sanitation. Where an existing promotion cadre is not available, one solution is to train the builders (contractors) in promotion. The extension services should serve not only for marketing the improved sanitation facilities, but also for monitoring the progress of the program and diagnosing problems.

To the extent that water and sanitation programmes seek to achieve health benefits, all promotion of them is a form of health education. In health education the participatory techniques are proposed. There is a particular advantage in demonstrating the health benefit to children, since they tend to carry the largest burden of worms and to suffer most frequently from diarrhoeal disease. The children can also play a key part in introducing new habits to the family. More powerful than persuasion or exhortation is the strength of example. Any cadre of promotion workers must be seen to own and use sanitation facilities they are promoting, if their words are to be taken seriously.

3.4 Maintenance

The VIP latrine built almost entirely of locally available materials does not last very long if it does not receive appropriate attention and maintenance. In the rural areas a latrine with a full pit can simply be demolished and replaced. In semi-urban areas, lack of space makes it very difficult to dig new pits safely, so they must be emptied. Pits can be emptied by mechanical means, using vacuum tanker trucks wherever possible, but in many settlements the labour-intensive option of emptying by hand may be preferred. Practically latrine maintenance means the periodical change of wooden parts or replacement of corrugated iron sheets, re-plastering and repair of soil erosion caused by rains.

3.5 Role of Women in Sanitation

Participation of women in a sanitation programme is of crucial importance. Not only because usually women are more motivated to have sanitation facilities for reasons of convenience and privacy, but also because they are the ones who keep the facilities clean, who maintain them, and who train their children to use them.¹¹ Women are also able to take part in the construction of a latrine. It is proposed that women's activities were treated as an integral component of local development rather than as a separate specialized activity. In Ukwanyama formation women's participation is accepted and it is possible to hold community meetings where both men and women are present. The following special steps are proposed to be taken:¹¹

- * inform the meeting (men) about the need for women's participation
- * see that women are informed and encouraged to attend the meetings
- * hold meetings at times and places suitable to women
- * help women to speak
- * ensure that poor women are also present and speak up

3.6 Use of Contractors

The key results of the WSSPOR are to:

- * develop local construction capacity by training local individual contractors
- * develop local material supply through local private sector
- * develop local transportation through local private sector

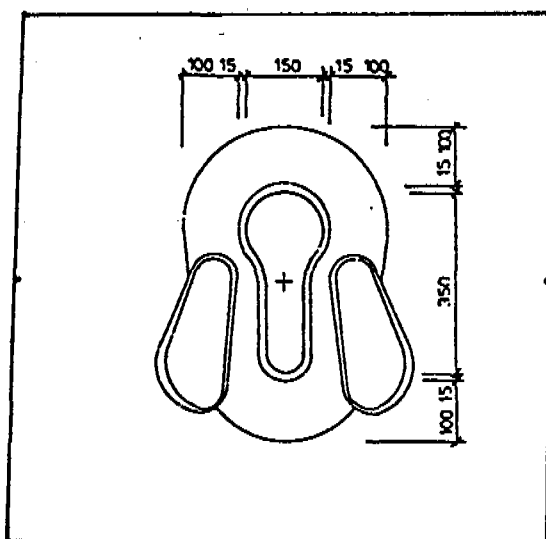
Therefore the implementation of the physical facilities could be done with these private contractors. Anyhow the erection of the latrine by households themselves should be encouraged as it is increasing the affordability.

3.7 Proposed Technology

Household sanitation technology

The **Ombili Plat (The Sanplat System)** low-cost sanitation system is recommended as a rapid and most affordable improvement of the traditional latrines in rural areas. The Ombili Plat is a concrete slab installed on top of the pit. With this method the hygiene, smell and fly control is improved and it provides complete child safety. The use of wooden logs to support the slab shall be avoided. The principle plan of the Ombili Plat is presented in Figure 4.

Figure 4. Principle plan of Ombili Plat



The **VIP latrine** constructed either with locally made bricks or with some other local materials is recommended mainly for the individual households with an income above the average. The VIP latrine is convenient for rural areas as well as for semi-urban areas.

The **flush toilet** is recommended for semi-urban areas only, where piped water and sewerage are available. The flush toilet can be aqua privy or septic tank type, or connected to the sewerage system if available. The principle layouts of a VIP latrine and an aqua privy latrine are presented in Figures 5 and 6 respectively.

Figure 5. Layout of a VIP latrine

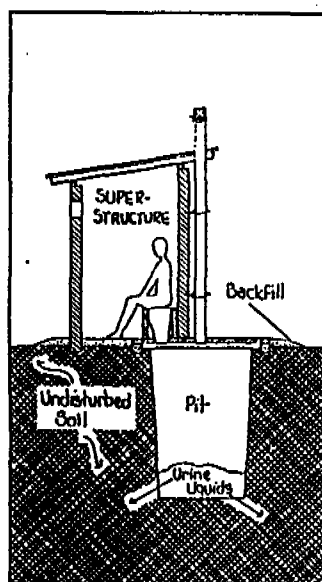
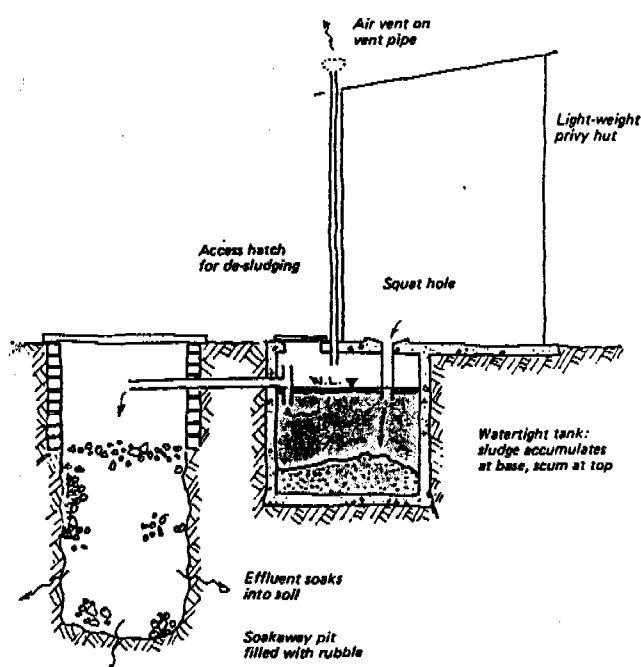


Figure 6. Layout of an aqua privy latrine¹³



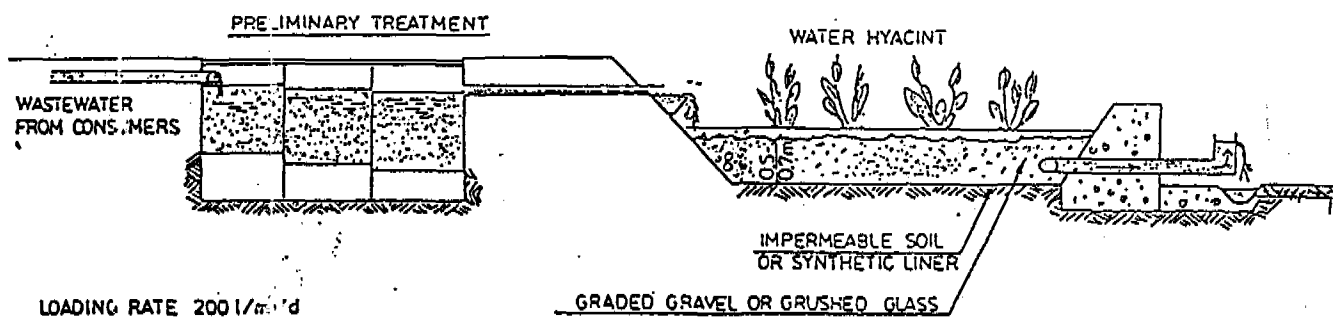
Institutional Sanitation Technology

The VFP latrine is recommended for the schools and clinics in the rural areas. Only in the semi-urban areas where piped water is available the flush toilets are applicable. For flush toilets the septic tank or aqua privy systems are recommended.

Waste Water Discharge

For the semi-urban areas at Omungwelume, Ohangwena and Eenhana, as well as at Engela and Eenhana hospitals, the treatment facilities are required. A relatively simple, low-cost alternative biotechnology has shown its ability to restore the environment. Bioremediation is a technology that introduces no additional chemicals into the environment it is designed for. It is performing water purification tasks at about half the cost of a conventional technology. Natural wetland system can offer an effective, economical system for wastewater treatment of the above mentioned semi-urban and hospital areas. See the Figure 7 below.⁷

Figure 7. The possible type of a constructed wetland system



3.8 Implementing Agency

Based on the WASP document the Department of Water Affairs will be the focal agency also in sanitation issues. However, it is proposed that the Government do not implement sanitation projects by themselves. The Government should plan for the projects and create conditions for them to succeed. It is proposed that local NGOs or donor projects that have an interest in developing a sanitation programme and a vocation for the task will take the responsibility for implementation of the projects.

3.9 Phasing and Time-Frame

It is proposed that the programme is built gradually. The process of the programme can be divided into three phases:⁶

- 1) Technology Development; 1994
- 2) Pilot Programme; 1995
- 3) Expansion; 1996 - 2005

The first phase shall focus on listening and studying the needs and problems of the local population in order to build the technical solutions based on the existing situation. The pilot phase is to test the marketing, to define organizational approach, extension service methods, payment arrangements, etc. and to serve as a demonstration to agencies that might consider funding the full-scale programme. A phased expansion is recommended because it allows time to make further refinements to the programme strategy and to build capacity in an orderly way. The imposed time-frame of two to three years is too short for the perspective of 10 years or more to be seen in many successful programmes. Promotion of water and sanitation for low-income communities is a creative, interactive process. Each project is a learning process, in which every staff member accumulates experience that can contribute to improvements in the project design. The project must be able to evolve and grow as the best approach to implementation is being identified, developed and refined.⁶

4. SANITATION DEVELOPMENT PROGRAMME

4.1 Criterias and Assumptions

Size of the household

According to several socio-economic studies available from the Northern Namibia it is assumed that an average of 8 people are living in one household.

Sanitation demand/household

The use of same latrine is accepted among the Uukwanyama formation. Therefore it is assumed that only one latrine unit/household is required.

Sanitation demand/schools

Based on the experience gained in WSSPOR the school community is not able to provide free labour and sand for a big latrine complex. Therefore it is assumed that 6-units latrine complex is adequate for each school, two units for teachers and four for pupils. This means 125 pupils/unit with an average school size of 500 pupils.

Sanitation demand/clinics

It is assumed that one unit for staff and two units for patients are required.

Community participation and use of local materials/institution sanitation

It is assumed that all sanitation facilities will be constructed with a high grade of community participation. Labour, sand, water, storage, security, operation and maintenance will be provided by the community. Bricks and slabs are made at site.

Community participation and use of local materials/household sanitation

It is assumed that most of the work as well as materials required is organized and paid by the beneficiaries.

Lifetime

It is estimated that one person will produce waste 0,003 m³/year. Accordingly the average family of 8 people will produce waste 0,24 m³/year. If the effective volume of one pit is 3 m³ (diameter = 1m, depth = 4 m), the lifetime of a household latrine is 12 years.

Coverage

The school and clinic sanitation coverage target is 100 %. Individual household coverage target is set to 80 % by the end of 2005. It is assumed that the present average household coverage is 10 %.

Share of the proposed technology

<u>Rural areas</u>		<u>Semi-Urban areas</u>	
*	Flush toilet 2 %	*	Flush toilet 20 %
*	VE ² latrine 6 %	*	VIP latrine 70 %
*	Ombili Plat 92 %	*	Ombili Plat 10 %

Construction capacity

It is assumed that one contractor can complete 4 VIP latrine units or 30 Ombili Plats in one month. Due to the school holidays, rainy seasons and national holidays the average annual construction period is 10 months. Therefore the construction capacity of one contractor is 40 VIP latrine units or 300 Ombili Plats in a year.

Semi-Urban Areas

The construction of sewerage and waste water treatment systems for semi-urban areas or for hospitals are not included in this development plan. The town planning for Eenhana is already going on in Windhoek.

Required construction and supervision resources

It is assumed that about 20 contractors, 2 supervisors and 2 extension officers are required to fulfil the construction demand during the 12 years period in the planning area. The required number of promoters is not estimated.

4.2 Sanitation Construction Programme

The present and future sanitation situation and demand and proposed sanitation construction programme 1994 - 2005 based on the above assumptions for the Western part of Ohangwena Region is summarized in annex 2.

The total population of the planning area at present is 127 600 people of which 115 200 live in rural areas and 12 400 in semi-urban areas. With a rural population growth rate of 2 % and semi-urban population growth rate 7,5 % minus migration the total population at 2005 will be about 165 000 people of which 135 000 live in rural areas and 30 000 in semi urban areas. The latrine construction does not end when every household has a latrine. The activity has to continue indefinitely due to the population growth and the need to replace latrines that fill up or collapse.¹²

It is also assumed that new schools and clinics constructed during the planning period will have the sanitation facilities included.

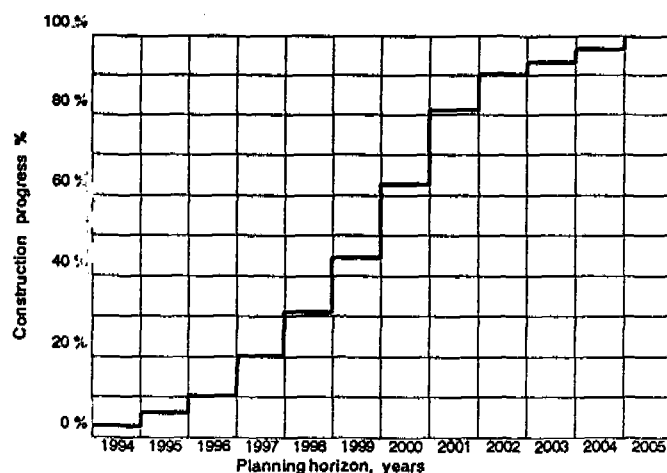
Based on the assumptions and surveys made the household, school and clinic sanitation coverages are at present 10 %, 14 % and 86 % respectively. In order to achieve 80 % household and 100 % school and clinic sanitation coverage at 2005 about 11 500 Ombili Plat latrines, 3 300 VIP latrines and 700 flush toilets need to be constructed. It is also proposed that the school and clinic toilets will be completed during 1994 - 1996 before the full-scale Ombili Plat latrine construction promotion will take place.

There are two construction options proposed:

- Start with a number of communities scattered over a wide area, to provide the greatest possible demonstration effect
- Start the demonstration and promotion in one constituency. Use all resources for one constituency in order to increase the coverage before moving on to another constituency and repeat the process

As proposed in paragraph 3.9 the construction progress in the beginning of the period is slow but will accelerate after two or three years. The figure 8 illustrates the proposed construction progress.

Figure 8. Proposed construction progress



4.3 Costs

The following principles have been used in cost calculations:

- * one latrine lifetime is 12 years
- * discount 10 %
- * interest of maintenance costs 2 %
- * construction costs include materials, transportation and labour (contractors)
- * overhead costs include the direct supervision, administration, training, demonstrations and promotion costs
- * technical assistance costs are not included
- * community contribution includes labour costs (N\$ 25/day/person), sand, water, storing and security
- * operation and maintenance costs have been estimated as follows:
 - + Ombili Plat and VIP latrines: 2 % from investment costs annually
 - + Aqua Privy: 5 % from investment costs
 - + Septic tanks with infiltration: 10 % from investment costs
- * construction costs of aqua privy and septic tank systems are estimated 6 and 8 times higher than the construction cost of a VIP latrine, respectively¹³
- * investment costs include construction costs and overheads
- * share of flush toilets: Aqua Privy 70 %, Septic Tank 30 %

According to the above principles the investment, community and operation and maintenance costs of each proposed option have been calculated in table 2 below.

Table 2. Total and Unit Costs

ITEM	UNITS	CONSTRUCTION		OVERHEADS		COMM. CONTRIB.		OPERAT. & MAINT.		
		Unit cost	Cum. cost	Unit cost	Cum. cost	Unit cost	Cum. cost	Unit cost	Cum. cost	
		pcs	N\$	N\$	N\$	N\$	N\$	N\$	N\$	
HOUSEHOLD LATRINES										
Ombili Plat	11,500	100	1,451,000	20	290,000	80	1,161,000	20	292,000	
VIP	2,530	700	2,234,000	100	319,000	700	2,234,000	50	160,000	
Aqua Privy	530	4,000	2,674,000	400	267,000	3,000	2,006,000	300	202,000	
Septic Tank	230	5,000	1,451,000	600	174,000	4,000	1,161,000	600	175,000	
INSTITUTION LATRINES										
VIP	700	1,000	883,000	200	177,000	1,000	883,000	100	89,000	
GRAND TOTAL	15,490		8,693,000		1,227,000		7,445,000		918,000	

Accordingly the following summary of total costs for 80 % sanitation coverage during 12 years time can be concluded:

- * total construction costs N\$ 8,700,000
- * total investment costs N\$ 10,000,000
- * total community contribution N\$ 16,000,000
- * cumulative maintenance costs N\$ 830,000 (households only)
- * proposed subsidy N\$ 2,100,000
- * annual investment costs N\$/year 830,000
- * annual O & M costs N\$/year 76,000
- * average constr. cost/capita N\$/capita 50
- * average investment cost/capita N\$/capita 60
- * average constr. cost/household N\$/household 370
- * average comm.contr/capita N\$/capita 45
- * average comm.contr./household N\$/household 720 (incl. constr.& maint.)

4.4 Financing

The Government of Namibia should contribute to the cost of sanitation programmes. A subsidy to low-cost sanitation programmes derives from equity considerations. Sewerage projects, which rarely serve low-income communities, usually fail to recover their capital costs from the beneficiaries. It is suggested that a subsidy is kept to the minimum concentrating to the indirect costs such as research, administration, training and overheads. If the subsidy is limited to these items, the level of funding need not constrain the programme's growth.

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SANITATION

FUNCTIONS TO BE UNDERTAKEN	CONSUMER	FARM						COMMUNITY					
	LAND OWNERSHIP	PRIVATE			STATE			PRIVATE			STATE		
	SCHEME TYPE	PIT LATRINE	AQUA PRIVY	SEPTIC TANK	PIT LATRINE	AQUA PRIVY	SEPTIC TANK	PIT LATRINE	AQUA PRIVY	SEPTIC TANK	PIT LATRINE	AQUA PRIVY	SEPTIC TANK
NEED IDENTIFICATION		CR	CR	CR	CR	CR	CR	CR	CR	CR	CR	CR	CR
NEED ASSESSMENT		CR/HS	CR	CR/HS	RD	RD	RD	CR/HS	CR/HS	CR/HS	RD	RD	RD
GEOHYDROLOGICAL INVESTIGATION								WA	WA	WA	WA	WA	WA
SCHEME DEVELOPMENT		CR	CR	CR	CR	CR	CR	CR	CR	CR	CR	CR	CR
SCHEME MANAGEMENT OPERATION AND MAINTENANCE		CR	CR	CR	CR	CR	CR	CR	CR	CR	CR	CR	CR
HEALTH AND ENVIRONMENTAL		HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS
TARIFF POLICY FORMULATION		CR	CR	CR	RD	RD	RD	CR	CR	CR	RD	RD	RD
TRAINING : OPERATION AND MANAGEMENT													
USER EDUCATION		HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS
TECHNICAL SUPPORT		CR	CR	CR	RD	RD	RD	CR	CR	CR	RD	RD	RD

CR = INFORMAL CONSUMER REPRESENTATIVES

DW = WORKS

LA = LOCAL AUTHORITY

WA = WATER AFFAIRS

LG = REGIONAL AND LOCAL GOVERNMENT AND HOUSING

HS = HEALTH AND SOCIAL SERVICES

RD = RURAL SANITATION DEVELOPMENT

UM = USER MINISTRY

SANITATION

CONSUMER LAND OWNERSHIP SCHEME TYPE FUNCTIONS TO BE UNDERTAKEN	VILLAGE				GOVERNMENT CENTRE					TOWN (Not Proclaimed)				
	STATE				PRIVATE OR STATE					STATE				
	CONSERVANCY TANK	PIT LATRINE	AQUA PRIVY	SEPTIC TANK	CONSERVANCY TANK	PIT LATRINE	AQUA PRIVY	SEPTIC TANK	WATER-BORNE	CONSERVANCY TANK	PIT LATRINE	AQUA PRIVY	SEPTIC TANK	WATER-BORNE
NEED IDENTIFICATION	CR	CR	CR	CR	DW	DW	DW	DW	DW	CR/LG	CR/LG	CR/LG	CR/LG	CR/LG
NEED ASSESSMENT	RD	RD	RD	RD	DW	DW	DW	DW	DW	LG	LG	LG	LG	LG
GEOHYDROLOGICAL INVESTIGATION	WA	WA	WA	WA	WA	WA	WA	WA	WA	WA	WA	WA	WA	WA
SCHEME DEVELOPMENT	CR	CR	CR	CR	DW	DW	DW	DW	DW	CR/LG	CR/LG	CR/LG	CR/LG	LG
SCHEME MANAGEMENT OPERATION AND MAINTENANCE	CR	CR	CR	CR	DW	DW	DW	DW	DW	CR/LG	CR/LG	CR/LG	CR/LG	LG
HEALTH AND ENVIRONMENTAL	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS.WA
TARIFF POLICY FORMULATION	RD	RD	RD	RD	DW	DW	DW	DW	DW	LG	LG	LG	LG	LG
TRAINING : OPERATION AND MANAGEMENT									DW					LG
USER EDUCATION	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS
TECHNICAL SUPPORT	RD	RD	RD	RD	DW	DW	DW	DW	DW	LG	LG	LG	LG	LG

CR = INFORMAL CONSUMER REPRESENTATIVES

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DW = WORKS

WA = WATER AFFAIRS

HS = HEALTH AND SOCIAL SERVICES

UM = USER MINISTRY

SANITATION

CONSUMER LAND OWNERSHIP SCHEME TYPE FUNCTIONS TO BE UNDERTAKEN	TOWN (Proclaimed)					MUNICIPAL TOWN				
	PRIVATE OR STATE					PRIVATE OR STATE				
	CONSERVANCY TANK	PIT LATRINE	AQUA PRIVY	SEPTIC TANK	WATER-BORNE	CONSERVANCY TANK	PIT LATRINE	AQUA PRIVY	SEPTIC TANK	WATER-BORNE
NEED IDENTIFICATION	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA
NEED ASSESSMENT	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA
GEOHYDROLOGICAL INVESTIGATION	WA	WA	WA	WA	WA	WA	WA	WA	WA	WA
SCHEME DEVELOPMENT	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA
SCHEME MANAGEMENT OPERATION AND MAINTENANCE	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA
HEALTH AND ENVIRONMENTAL	HS	HS	HS	HS	HS/WA	HS/LA	HS/LA	HS/LA	HS/LA	HS/LA/WA
TARIFF POLICY FORMULATION	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA
TRAINING : OPERATION AND MANAGEMENT					LA					LA
USER EDUCATION	HS	HS	HS	HS	HS	LA	LA	LA	LA	LA
TECHNICAL SUPPORT	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA

CR = INFORMAL CONSUMER REPRESENTATIVES

LA = LOCAL AUTHORITY

LG = REGIONAL AND LOCAL GOVERNMENT AND HOUSING

RD = RURAL SANITATION DEVELOPMENT

AG = AGRICULTURE

DW = WORKS

WA = WATER AFFAIRS

HS = HEALTH AND SOCIAL SERVICES

UM = USER MINISTRY

ANNEX 2. PRESENT SANITATION SITUATION 1993

PROJECT AREA	PRESENT SITUATION, 1993												
	Constituency	Area km2	Population 1993	Popul. Density people/km2	Households Number	Schools Number	Clinics/hosp. Number	Number of Latrine Units			Coverage		
								Households Units	Schools Units	Clinics Units	Households %	Schools %	Clinics %
Eenhana Rural	1,655	12,000	7	1,500	24	3	190	26	3	10	16	33	
Eenhana Semi-Urban	2	2,300	1,150	266	1	1	29	6	3	10	100	100	
Eenhana; Total	1,657	14,300	1,157	1,766	25	4	179	32	6	10	21	50	
Endla Rural	370	19,300	52	2,413	20	4	241	21	12	10	18	100	
Endla Semi-Urban	0	0	0	0	0	0	0	0	0				
Endla; Total	370	19,300	52	2,413	20	4	241	21	12	10	18	100	
Engela Rural	417	22,900	55	2,663	24	1	266	3	3	10	2	100	
Engela Semi-Urban	3	3,700	1,233	463	1	1	46	1	3	10	17	100	
Engela; Total	420	26,600	1,288	3,126	25	2	312	4	6	10	9	100	
Changwena Rural	174	14,200	82	1,775	9	1	178	13	3	10	24	100	
Changwena Semi-Urban	2	3,200	1,600	400	2	1	40	12	3	10	100	100	
Changwena; Total	176	17,400	1,682	2,175	11	2	218	25	6	10	38	100	
Ondobe Rural	741	18,300	25	2,266	22	4	229	2	12	10	2	100	
Ondobe Semi-Urban	0	0	0	0	0	0	0	0	0				
Ondobe; Total	741	18,300	25	2,266	22	4	229	2	12	10	2	100	
Ongenga Rural	225	10,200	45	1,275	14	2	128	8	3	10	10	50	
Ongenga Semi-Urban	2	3,200	1,600	400	2	1	40	0	3	10	0	100	
Ongenga; Total	227	13,400	1,645	1,675	16	3	168	8	6	10	8	67	
Oshikango Rural	269	18,300	63	2,266	13	1	229	0	3	10	0	100	
Oshikango Semi-Urban	0	0	0	0	3	1	0	18	3		100	100	
Oshikango; Total	269	18,300	63	2,266	16	2	229	18	6	10	19	100	
TOTAL RURAL	3,671	115,200	30	14,402	126	16	1,440	73	39	10	10	81	
TOTAL SEMI-URBAN	9	12,400	1,378	1,551	9	5	155	37	15	10	69	100	
TOTAL	3,680	127,600	33	15,953	135	21	1,595	110	54	10	14	86	

WATER SUPPLY AND SANITATION PROJECT IN CHANGWENA REGION

ANNEX 2. THE FOCUSED SANITATION DEMAND AND PROPOSED CONSTRUCTION PROGRAMME 1994 - 2005

PROJECT AREA	SANITATION DEMAND FOCUSED TO 2005						SANITATION CONSTRUCTION PROGRAMME 1994 - 2005							
	Constituency	Area	Populabn	Popul. Density	Households	Schools	Clinics/hoosp.	Household, Coverage 80 %			Schools, Coverage 100%		Clinics, Coverage 100%	
		km2	2005	people/km2	Number	Number	Number	Ombll/Plat	VIP	Flush	VIP	Flush	VIP	Flush
Eenhana Rural	1,655	14,300	9	1,798	24	3	1,184	77	26	118		0		
Eenhana Semi-Urban	2	5,400	2,700	675	1	1	49	340	97					
Eenhana; Total	1,657	19,700	2,709	2,463	25	4	1,233	417	123	118	0	0	0	
Endbe Rural	370	22,700	61	2,636	20	4	1,660	123	41	99				
Endbe Semi-Urban	0	0	0	0	0	0				0				
Endbe; Total	370	22,700	61	2,636	20	4	1,660	123	41	99	0	0	0	
Engela Rural	417	26,700	64	3,338	24	1	2,211	144	48	141				
Engela Semi-Urban	3	8,500	2,833	1,093	1	1	77	535	153	5				
Engela; Total	420	35,200	2,897	4,400	25	2	2,288	680	201	146	0	0	0	
Changwena Rural	174	16,800	97	2,100	9	1	1,301	91	30	41				
Changwena Semi-Urban	2	7,300	3,650	913	2	1	66	460	131	0				
Changwena; Total	176	24,100	3,747	3,013	11	2	1,457	551	162	41	0	0	0	
Ondobe Rural	741	21,500	29	2,668	22	4	1,781	116	39	130				
Ondobe Semi-Urban	0	0	0	0	0	0				0				
Ondobe; Total	741	21,500	29	2,668	22	4	1,781	116	39	130	0	0	0	
Ongenga Rural	225	12,300	55	1,536	14	2	1,019	66	22	75			3	
Ongenga Semi-Urban	2	7,300	3,650	913	2	1	66	460	131	12				
Ongenga; Total	227	19,600	3,705	2,450	16	3	1,085	527	154	88	0	0	3	
Oshikango Rural	269	21,500	74	2,668	13	1	1,781	116	39	78				
Oshikango Semi-Urban	0	0	0	0	3	1				0				
Oshikango; Total	269	21,500	74	2,668	16	2	1,781	116	39	78	0	0	0	
TOTAL RURAL	3,871	135,800	35	16,976	126	16	11,246	733	244	683	0	0	0	
TOTAL SEMI-URBAN	9	26,500	3,167	3,564	9	5	257	1,796	513	17	0	0	0	
TOTAL	3,880	164,300	42	20,540	135	21	11,503	2,530	758	700	0	0	0	