Republic of Namibia **Kingdom of the Netherlands**

Reformulation mission: Ogongo - Okalongo and Oshakati - Omakango water schemes

Report

December, 1992.

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Abbreviations

CHW	Community Health Worker
CWCO	Central Water Committee of Owambo
DARD	Department of Agriculture and Rural Development
DEA	Directorate of Environmental Affairs
DRD	Directorate of Rural Development
DVS	Directorate of Veterinary Services
DWA	Department of Water Affairs
EIA	environmental impact assessment
EPU	Environmental Planning Unit
FINNIDA	Finnish International Development Agency
GIS	geographic information system
GON	Government of Namibia
GTZ	Gesellschaft fur Technische Zusammenarbeit
ha	hectare
IRC	International Water and Sanitation Centre
KfW	Kreditanstalt für Wiederaufbau
km	kilometre
l	litre
LWC	Local Water Committee
m	metre
m^3/h	cubic metres per hour
m^3/s	cubic metres per second
MAWRD	Ministry of Agriculture, Water and Rural Development
MLGH	Ministry of Local Government and Housing
mm	millimetre
MWCT	Ministry of Wildlife, Conservation and Tourism
NISER	Namibian Institute for Social and Economic Research
NLG	Netherlands Guilders
NPC	National Planning Commission
PSC	Public Service Commission
R	Rand
t	tonne
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WASP	Water supply and sanitation policy
WHO	World Health Organisation
WPC	Water Point Committee
WWF	World Wide Fund for Nature

Summary

1 The Ogongo - Okalongo and Oshakati - Omakango water schemes have been proposed for funding by the Netherlands. Following initial queries in The Hague about the environmental impact and sustainability of the schemes, it was agreed that a joint reformulation mission would be fielded to investigate them in more detail; assemble all the information required for final appraisal by the Netherlands Government; and recommend any remedial or complementary measures that would enhance the environmental impact and sustainability of these schemes and of rural water supply generally in Owambo and Namibia. The joint Namibia/Netherlands mission worked in Namibia from 18 November to 2 December, 1992.

2 The mission faced an unusual task in that it was not simply reviewing project proposals. The two schemes are already being implemented. Furthermore, they are being implemented in a rapidly changing policy environment. Assessment of the schemes needs to take these complex circumstances into account. Rigid application of standard appraisal criteria may not always be appropriate.

3 At present the Owambo Water Supply System operated by the Department of Water Affairs (DWA) consists of 900 km of pipelines, 92 km of canals, 31 pump stations and nine purification plants. This relatively sophisticated system, which uses water from the Cunene River in Angola, is in strong contrast to traditional use of local water sources and indigenous technology.

4 Following the Onaanda and Okahao South schemes, the Ogongo - Okalongo and Oshakati - Omakango schemes are among the early efforts by DWA to add rural water supplies to its traditional bulk water supply function. Officially, responsibility for the rural water sector remains with the Directorate of Rural Development (DRD), although it is expected to be transferred soon to DWA.

5 The Ogongo - Okalongo and Oshakati - Omakango schemes were both originally designed as bulk transfer schemes, but have been redesigned to provide local supplies to rural communities. Oshakati - Omakango also retains an important bulk transfer function.

6 A contract for construction of the Ogongo - Okalongo scheme has been awarded. Work will begin in January, 1993 and is expected to take 12 months. Total project cost is estimated to be R 16,5 million (1992 prices).

7 The main line for the Oshakati - Omakango scheme was built by DWA and completed in November, 1992. The pump station is also ready. Branch lines are being dug by user communities and are 73% complete. Final completion is scheduled for August, 1993. Total capital cost is budgeted at R 16,0 million (1992 prices).

8 Construction of the two schemes will have no significant adverse impact on the natural environment. Environmental conditions of contract are adequate. So far, DWA, contractors and consulting engineers have shown sensitivity in pipeline routings and specifications. However, the decision not to undertake an environmental impact assessment for the Ogongo - Okalongo scheme is regrettable.

9 The availability of grazing, rather than the availability of water, is the primary determinant of livestock movements and numbers in the vicinity of the schemes. The scheme areas are not at risk from land degradation induced by the new water supplies. Some areas elsewhere in Owambo, however, are at risk from uncoordinated water development, particularly where this is done for drought relief purposes. Borehole and pipeline development in southern and eastern Owambo may be perceived as necessary relief in the current drought; but their longer term implications need more careful assessment,

informed by a better understanding of local environmental conditions. Land enclosure and poorly planned water development in traditional grazing areas of southern and eastern Owambo, together with restrictions on transhumant livestock movements, may also intensify land degradation in the scheme areas.

10 The overall impact of the schemes on public health will be positive. However, there is a significant risk that they could cause additional incidence of malaria, unless standing water caused by wastage at water points and by pipeline leaks is kept to a minimum.

11 In the two and a half years since independence, good progress has been made in establishing institutions and procedures which enhance user participation in the development and operation of rural water supplies. A Central Water Committee operates in Owambo, together with Local Water Committees established for each scheme (including the two reviewed by this mission). Below these, Water Point Committees also exist or are being established. In terms of user participation, good foundations have been laid for sustainability of the schemes. Building on these foundations will be a long term process, which deserves support.

12 There is an urgent need for Namibia's draft Water and Sanitation Policy (which has been under review at high level for 18 months) to be approved. The sanitation sub sector is currently a grey area. Steps need to be taken at all levels to achieve proper integration of the water and sanitation sub sectors.

13 Women are in a familiar situation with regard to the development of rural water and sanitation in Owambo. They have the strongest motivation to improve these aspects of rural life, and form the large majority of participants in voluntary construction work such as trench digging. At the same time, they are under represented in the institutions set up to organise such participation.

14 The technical sustainability of the schemes will depend upon appropriate water point design, on which the mission made recommendations. It will also depend on user participation in operation and maintenance, for which DWA is developing policy and procedures. User representatives are aware of this strategy and are preparing themselves for it. However, intensive support will have to be provided to water committees over the transitional period during which the necessary institutional development takes place. The duration of this period, and the amount of support required, should not be underestimated.

15 Training for village level Water Point Committees is being developed with UNICEF support. But there is as yet no formal training programme for the Central Water Committee or Local Water Committees in Owambo. Such a programme is urgently needed. The artisanal training curricula and facilities at DWA's Von Bach Training Centre should be developed to provide training programmes for Water Agents and caretakers.

16 The sustainability of the schemes will also depend upon the development of appropriate institutional capacity in the Government of Namibia. The integration or harmonisation of the water supply functions of the Directorate of Rural Development and DWA, and of technical and non technical approaches to rural water and sanitation, will be critical in this regard. If it is formally to adopt the rural water supply portfolio, DWA will have to undergo some restructuring and develop significantly new approaches. Plans exist for both these tasks, but additional Netherlands assistance may be appropriate. It will be necessary to retrain or reorientate existing planners, managers and engineers who work in the rural water supply sector, in order to help them to move from a top-down first world technology approach to a community based appropriate technology approach.

17 In addition, training programmes will be required for more engineering staff to support the rural water sector, preferably drawn from the rural communities they are to serve.

18 With its well established expertise and training capacity in the water sector, the Netherlands would be well placed to provide high level professional training to current and future DWA personnel. The mission recommends that a special programme of Netherlands training support at the technical and professional levels be developed. If a long term Netherlands commitment to the Namibian water and sanitation sector is developed, training should be a major component.

19 DWA has drawn up plans and procedures for charging all rural water users for at least the operation and maintenance costs of their supplies. Rural water points and local infrastructure are to be considered the property of the communities that use them. In the case of communal users, charges will be levied through water committees. The mission calculates that affordability will not be an obstacle. It is hoped that Cabinet approval of the draft Water and Sanitation Policy will permit DWA to proceed with implementation of its plans. A major extension and training effort will be required to support this process.

20 Imposition of water charges will be the best way to redress the current curious situation in which some 60% of the purified water reticulated in Owambo is consumed by livestock, and to reduce the widespread and unhealthy wastage of water at tap points and stock troughs. It will encourage rural people to reassess the option of using other, local water sources, particularly for stock.

21 A genuine and growing commitment to environmentally sensitive planning can now be identified at many levels in the Government of Namibia. The GON is developing a number of environmental profiling, natural resource management and regional planning programmes.

22 The mission found that the two schemes would require reformulation in the same ways. These additional actions and design modifications have been termed remedial measures:

22.1 Revised water point design (estimated additional cost R 625 000).

22.2 Subject to overall scheme capacity, maximum flexibility in water point location, to be determined in consultation with user representatives.

22.3 One of the Netherlands supplementation expert posts already assigned to DWA Namibia should be allocated to the DWA Planning Division in Owambo, to assist in coordination and development of the rural water supply function there.

22.4 There should be an explicit commitment to ongoing review of operating experience on the two schemes. This monitoring function should be given higher priority than is normal for rural water projects.

22.5 The participation of Community Health Workers in Water Point Committees should be promoted.

23 Most of the policy issues which arise from a review of the two schemes relate to the rural water supply sector in Owambo and Namibia overall. The schemes, and the rural water sector, interface at many points with a range of environmental and development planning concerns. To be most effective, review of and support for the two schemes should take this broader context into account. To the extent possible, the mission has identified salient issues in the broader environmental and development planning fields. It has then proposed complementary measures in the water and environmental sectors which the Namibian and Netherlands Governments might consider in more detail:

23.1 Provision of a Netherlands funded supplementation expert to work at DWA headquarters on rural water supply policy and institutions.

23.2 A special programme of Netherlands training support at the technical and professional levels should be developed. The programme should include support to curriculum development at DWA's Von Bach Training Centre, as well as scholarships for professional studies at institutions elsewhere in Africa or the Netherlands. A joint Namibia/Netherlands mission should be fielded to design this programme.

23.3 Development of a computer model of the water reticulation system in Owambo. Dutch support could include short term technical assistance, computer software and training.

23.4 A study of agricultural land use and traditional management of natural resources in Owambo, to be carried out in 1993.

23.5 Support to the Government of Namibia's programme of regional environmental profiles. The Owambo land use and resource management study would feed into an environmental profile for the Owambo regions. A longer term input of Netherlands support to the environmental profile programme around the country would directly enhance the sustainability of rural water development in the communal areas. The rural water sector is just part of a complex of factors, forces and trends which shape livelihoods and environment in these areas. A broader programme of support for Namibian efforts to enhance natural resource management would therefore be appropriate.

What happens to cost recovery in the scheme if Cabinet does not approve the WSS policy or if decision is postponed (indefinitely)? Can introduction of some form of cost-recovery be made a condition?

JB 11/

What is the issue of cattle having priority water having dealt with?

1 Introduction

1.1 The Ogongo - Okalongo and Oshakati - Omakango water schemes have been proposed by the Government of Namibia for funding by the Netherlands. Following initial queries in The Hague about the environmental impact and sustainability of the schemes, it was agreed that a joint reformulation mission would be fielded to investigate them in more detail; assemble all the information required for final appraisal by the Netherlands Government; and recommend any remedial or complementary measures that would enhance the environmental impact and sustainability of these schemes and of rural water supply generally in Owambo and Namibia. The mission's terms of reference were approved at a meeting with DWA on 19 November, 1992 and are shown at Annex 2.

1.2 The joint Namibia/Netherlands mission[1] worked in Namibia from 18 November to 2 December, 1992, visiting Owambo from 22 -27 November, 1992. On completion of the mission's work in Namibia, an aide memoire was agreed, summarising its findings and recommendations. The aide memoire is shown at Annex 1. This report sets out the findings of the mission in more detail.

1.3 In accordance with the terms of reference, the mission has assembled the information that will be needed for appraisal of the two schemes. This information is given in sections 2 - 6 below.

1.4 The mission faced an unusual task in that it was not simply reviewing project proposals. The two schemes are already being implemented; current status is shown in section 2.6. Furthermore, they are being implemented in a rapidly changing policy environment (paras. 2.3.27 - 2.3.28). Assessment of the schemes needs to take these complex circumstances into account. Rigid application of standard appraisal criteria may not always be appropriate.

1.5 The mission found that the two schemes would require reformulation in the same ways. These additional actions and design modifications have been termed **remedial measures** and are set out in section 8.

1.6 Most of the policy issues which arise from a review of the two schemes relate to the rural water supply sector in Owambo and Namibia overall. The schemes, and the rural water sector, interface at many points with a range of environmental and development planning concerns (see section 7). To be most effective, review of and support for the two schemes should take this broader context into account. To the extent possible, the mission has identified salient issues in the broader environmental and development planning fields. It has then proposed **complementary measures** (section 9 of the report) which the Namibian and Netherlands Governments might consider in more detail.

[1] W. Bayer (livestock/range management consultant); H. Drews (Department of Water Affairs, Windhoek); H. Goetze (Department of Water Affairs, Oshakati); A. Marsh (environmental consultant); S.D. Turner (mission leader). The mission was accompanied by J. Blom (water sector specialist, DGIS, The Hague).

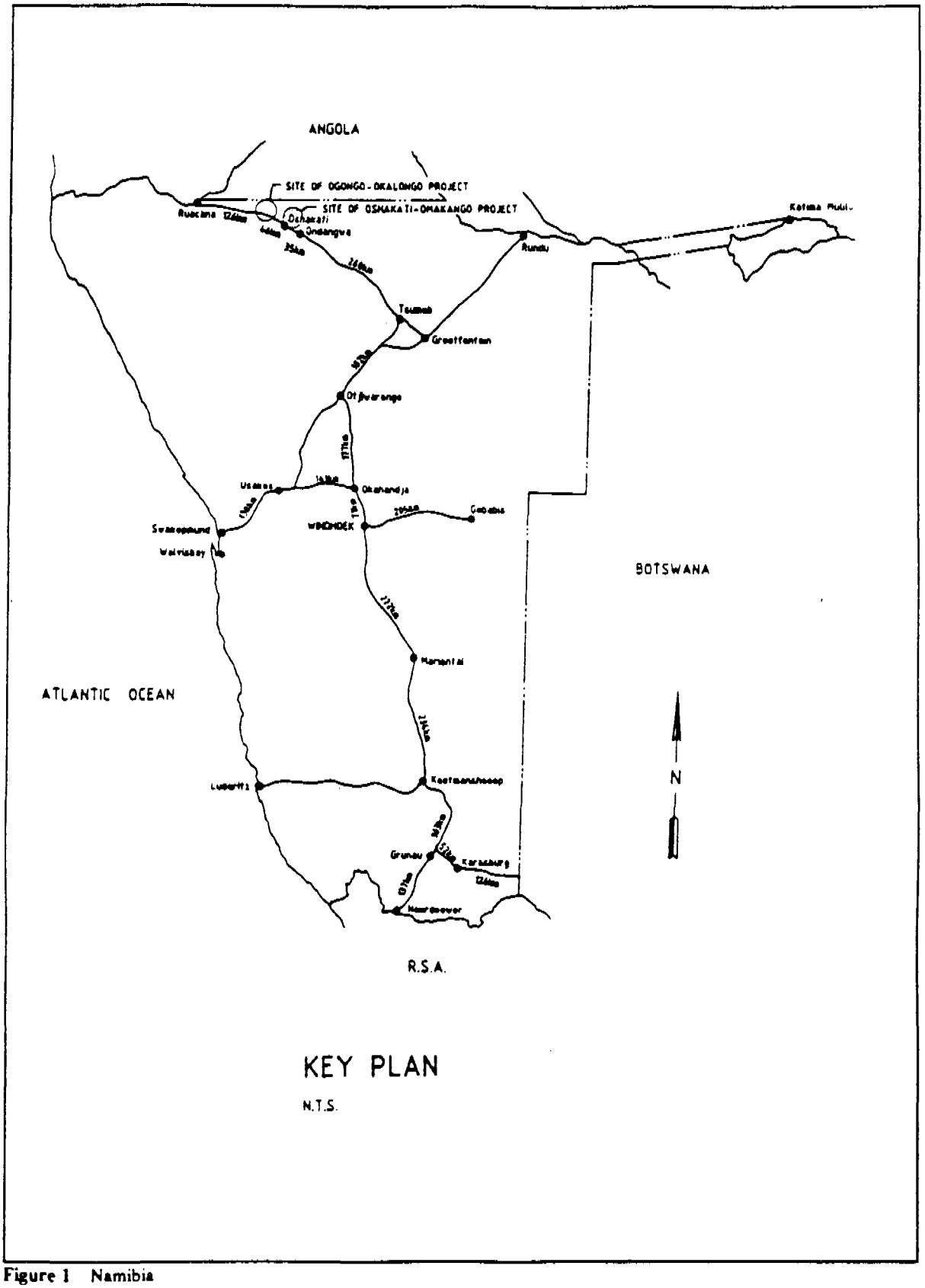

Figure 1 Namibia

2 Background

2.1 Owambo

Administrative and economic history

2.1.1 'Owamboland' was proclaimed as a Native Reserve in 1929 (Hubbard, 1992, 2). Under the South African system of segregated land use and administration, it thus formed a 'homeland' for the Owambo people, who had already been divided by the colonial border between Angola and the then South West Africa. Owambo's southern boundary divided it from areas of white occupation which enjoyed a different administrative structure and superior levels of infrastructural development. Economic development in the Owambo and other homelands was given little priority. Instead, the area was expected to function as a labour reserve from which workers would migrate to economic centres elsewhere in the country. Agriculture was practised on a largely subsistence basis, often to supplement migrant incomes. Owambo's southern border formed part of the 'Red Line' across which livestock movements are strictly controlled. To the south, higher animal health standards permit beef exports; areas like Owambo to the north of the line remain unable to export meat to the more lucrative overseas markets.

2.1.2 Namibia's colonial history of *apartheid* administration ensures that Owambo, like other communal areas, suffers structural poverty. Land use, economic and settlement patterns have been severely distorted by the administrative practices of the colonial era. At the same time, some features of Owambo's infrastructure reflect the economic and professional resources which the South African regime was able to deploy. Many infrastructural developments served the South African war effort in the 1970s and 1980s. While Owambo is now better served by some forms of infrastructure than most rural areas in Africa, its economy was further distorted, and its society gravely destabilised, by the independence war. Rural and infrastructural development now proceed in an economic, social and historical environment very different from those prevailing in most of rural Africa.

2.1.3 The ethnically based administrative structure was dismantled at independence. The traditional system of administration by chiefs and headmen (many of whom were coopted as collaborators by the South African authorities) remains in place and maintains its jurisdiction over local land allocation and natural resource management. The effectiveness of these traditional leaders varies, according to personality and the legitimacy accorded to them by local people (often in terms of their record in the independence war). Land use thus continues to be managed on a communal basis. In central Owambo, effective common property management regimes apply. On the southern and eastern peripheries, there has never been such clear authority over land use, and the situation now more resembles open access.

2.1.4 In 1992, Namibia was divided into 13 regions. The old Owambo is divided into four of these regions: Omusati, Ohangwena, Oshana and Oshikoto. Oshikoto region contains some areas south of the communal area boundary, including the mining centre of Tsumeb. In this report, the term 'Owambo' is used to describe the communal areas in these four regions.

Economy, population and settlement

2.1.5 The natural environment of the project areas is summarised in section 3.1 below. Owambo in general provides marginal conditions for crop production, which is combined in an agrosilvipastoral system with livestock production and use of a wide range of tree species (EEAN, 1992, 29). In the Ogongo - Oshakati area of central Owambo (close to the two schemes reviewed by the mission), the average

number of cattle owned per household is estimated at 5,58, and the average number of goats at 17 (NISER, 1992, 1). 73% of surveyed households owned cattle, and 87% goats. There are very few formal sector employment opportunities, and almost no industrial production. Some employment is provided by the service sector in the growing urban areas, notably Ondangwa and Oshakati. Migrant labour to other parts of Namibia remains an important source of income for the population of Owambo, which was swelled by nearly 80% of the 45,000 exiles repatriated to Namibia in 1989 at the end of the independence war (NISER, 1992, 47).

2.1.6 According to the 1991 census, **the population of Owambo** was 615 000 or about 44% of the national total. The **growth rate** between 1981 and 1991 was 3,03%. Male **absenteeism** because of migrant labour is shown in a **sex ratio** of 0,81 males to 1 female (NISER, 1992, 41). In the Ogongo - Oshakati area, **mean rural household size** was estimated as 8,3 by a recent survey (NISER, 1992, 1). Most of the population is concentrated in the flood plain of the Cuvelai basin in central Owambo, where the two schemes reviewed by the mission are located. The Cuvelai river system, originating in Angola, provides seasonal flooding to this central area through *oshanas* (wide, shallow channels and pans: see para. 3.1.1). Some 80% of Owambo's population is estimated to be rural, but the main urban complex of Oshakati - Ongwediva - Ondangwa - Oluno is also located in the central area, close to the two schemes (EEAN, 1992, 28). Oshakati and Ondangwa grew rapidly during the war and are now estimated to have a combined population of 80 000 - 90 000, or 7% of the total (NISER, 1992, 73).

2.1.7 Rural settlement patterns were traditionally dispersed. **Population densities** in central Owambo, where the schemes are located, are typically 30/km^2 and rise in places to 100/km^2 (Marsh and Seely, 1992, 21). Nucleated settlement began to develop around mission stations, hospitals and other service centres. Ondangwa grew around the major administrative and labour recruiting centre of Owambo. Oshakati was established when a hospital was built there in the 1970s; it subsequently became the administrative headquarters (EEAN, 1992, 29). South African regional development planners identified a number of 'growth points' in Owambo, where urban development and formal sector employment were expected to focus. Okalongo is one of the designated 'growth points' where little such development is yet apparent.

2.1.8 In preparation for the KfW funded construction of a canal or pipeline between Ogongo and Oshakati, the Namibian Institute for Social and Economic Research (NISER) undertook a socio economic survey. This produced an estimated median annual rural **household income** for the canal area of R 1 872. The mode was R 1 200; the mean, skewed by a few very high incomes, was R 2 789 (NISER, 1992, Vol. 2, 58)[2]. A UNICEF survey of three rural areas in Owambo produced an estimated mean annual rural household income of R 1 540 (NISER, 1992, 48). Both these surveys probably underestimated income in kind, notably from barter of livestock.

2.1.9 The prevalence of migrant labour means that **women play a major role in household economic management and agricultural production.** The 1992 NISER survey in Owambo found 26,4% of households interviewed to be 'female centred', i.e. 'based on a woman with or without children or relatives' (NISER, 1992, 138). Women are responsible for most crop cultivation, and have played a major role so far in community construction of water supply lines.

[2]These data are quoted from a draft report so might still be subject to revision.

2.2 The Department of Water Affairs and the Directorate of Rural Development

2.2.1 The **Ministry of Agriculture, Water and Rural Development** (MAWRD) consists of two Departments i.e. the **Department of Agriculture and Rural Development** (DARD) and the **Department of Water Affairs** (DWA). Within the Ministry, responsibility for the supply of bulk water to towns is vested with the Department of Water Affairs while the supply of water to rural communal areas currently still lies with the **Directorate of Rural Development** (DRD) within the Department of Agriculture and Rural Development. However, this situation is expected to change in the near future when the Department of Water Affairs will become responsible for both the bulk and the rural water supply functions.

2.2.2 As shown in Figure 2, the Department of Water Affairs is divided into five Directorates. The **Directorate of Investigations and Research** undertakes the planning of water schemes as well as the investigation, development, monitoring and control of water resources. The **Directorate of Works** is responsible for the design and construction of water schemes while the **Directorate of Water Supply** is in charge of the operation and maintenance of water supply installations. It is the function of the **Directorate of General Services** to carry out all personnel and administrative duties. A recent addition to the personnel structure is the **Directorate of Rural Water Development** which is currently acting in an advisory capacity to the DRD, but which is expected to take over the rural water supply function from the DRD in the near future.

2.2.3 A detailed personnel structure has already been drawn up should the rural water supply function be transferred to the Department of Water Affairs. Since the approach to rural water supply is community based and hence differs considerably from that of bulk water supply, it was proposed that a separate Directorate be responsible for all rural water supply functions rather than incorporating these into existing Directorates. The **Directorate of Rural Water Supply** would thus contain a Rural Engineering Division responsible for planning, design and construction; a Rural Geohydrology Division in charge of source investigations, source development and source management; and three Rural Water Supply Divisions (South, North West and North East, including Owambo) to support the operation and maintenance of rural water schemes. This proposal is currently being reviewed by the Public Service Commission, together with the option of incorporating these new functions into existing Directorates. The organogram for the new Directorate, as proposed by DWA, shows a total staff complement of 781, most of whom are already employed in existing Directorates. It also shows an additional 22 staff who would be needed in existing Directorates to support the new function.

2.3 Water supplies in Owambo

Local sources

2.3.1 Traditionally, the people living in central Owambo relied on pans and hand-dug pits and wells as water sources for humans and animals.

2.3.2 The *oshanas* in central Owambo, which are a system of shallow river courses and pans, are flooded by waters originating mainly from the Cuvelai catchment area in southern Angola during the main rainy season (January to March). However, the frequency of flow in the oshanas is erratic and often they receive only small quantities of local runoff. When full, the *oshanas* usually carry water until the end of June. Due to their ephemeral nature, the water in the *oshanas* cannot be considered as a reliable long term water source for Owambo.

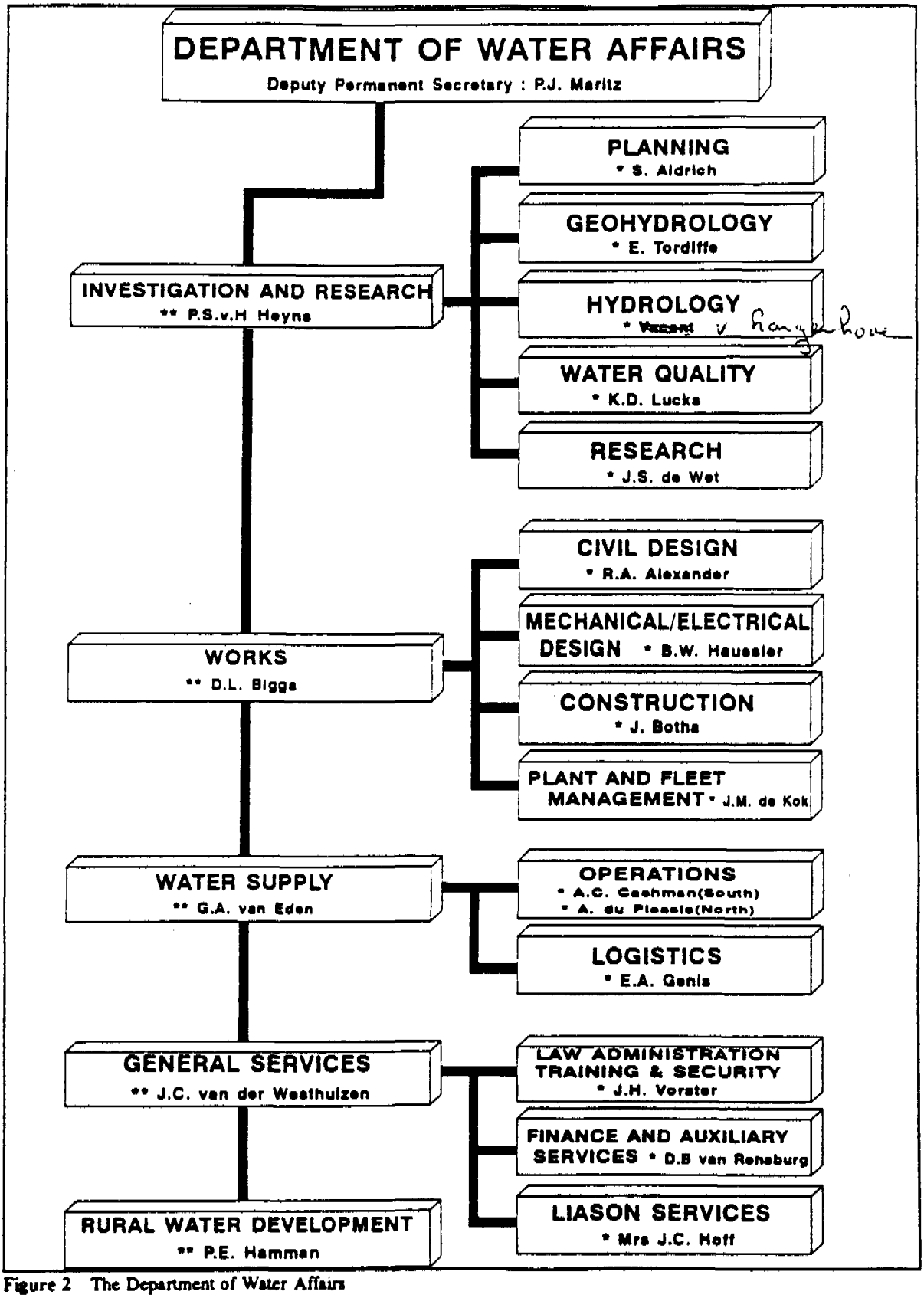

Figure 2 The Department of Water Affairs

2.3.3 Within the *oshana* area of central Owambo, groundwater of the deeper, regional aquifer is unsuitable for consumption due to the high concentrations of dissolved solids varying from 3 000 to 33 000 mg/ℓ. The main shallow aquifer occurs at depths below 25 metres while small lenses of potable groundwater are found in perched aquifers at depths of between 5 and 20 metres. However, these pockets of fresh water are small and yields from wells tapping these sources are low at between 1,0 to 2,0 m^3/day. Furthermore, these wells often turn brackish or dry up completely during periods of drought. As population increased and was contained within Owambo during the period of South African administration, it became clear that water from both the *oshanas* and the wells was not adequate to meet the demands of the region.

2.3.4 It was for this reason that in the mid 1950s the construction of excavation and pumped storage dams was started to utilize the run-off in the *oshanas*. In total more than 300 dams were constructed over a ten year period. Clear water was provided at many dams by a simple sand filter construction which led to a well fitted with a handpump. Alternatively, in cases where larger communities near schools, clinics and villages had to be served, simple batch purification plants were built which involved chemical dosing, coagulation, settling, slow filtration and chlorination. These dams supplied water to communities all over Owambo but further construction of such dams was later discontinued due to the high unit cost of water.

2.3.5 Most water development efforts in Owambo are currently directed to the reticulation of water by DWA from external sources, as outlined below. However, some programmes are working on the improvement of local water sources, typically by the enhancement of existing technology. Concrete linings for wells and the provision of various types of pumps for boreholes are prominent activities. The programmes include the FINNIDA funded Water Supply and Sanitation Project in Ohangwena Region, based at Ongwediva; the UNICEF assisted Uukwaluudhi Integrated Area Based Programme at Tsandi; and the Diocesan Water Project of the Anglican Church, based at Odibo. These projects are mainly orientated towards the participatory village level rural water supply and sanitation programmes currently being developed by DRD, although they also collaborate with DWA. They have created an Ad Hoc Water Supply and Sanitation Technical Committee for Owambo, on which DWA is represented. This collaboration has led to an agreed design standard and procedures for water point construction or improvement, aimed mainly at wells and boreholes. Latrine construction is another important activity, with various types being piloted and tested in consultation with users.

2.3.6 These programmes are important because they are piloting the functional integration of water supply and sanitation services and the integration of technical and non technical approaches at which the GON itself must aim. The Ohangwena and Uukwaluudhi projects both aim at integrated development plans and programmes for the water and sanitation sectors in their respective service areas, coordinated as required with DWA and DRD. The Ohangwena project, for example, is consulting with DWA on upgrading all the DWA water points in its area. The Uukwaluudhi programme has been working with DWA and local communities on extending the reticulation network in the Tsandi area.

External sources: the present system

2.3.7 As the towns of Oshakati and Ondangwa continued to grow, the local water supply from pump storage dams proved insufficient to supply the increasing demand. By the beginning of the 1960s it therefore became necessary to channel water towards Oshakati by means of a ground canal designed to catch the flow of the *oshanas* to the west of the town. As demand for water at growth points continued to increase, however, it became more and more necessary to import water from the Cunene River and to distribute this water via a network of pipelines to such centres. It was during the 1970s that the Calueque dam and pump station, the concrete-lined canal between Olushandja and Ogongo, the Ogongo

purification plant, the Ogongo - Oshakati pipeline, the Oshakati - Ondangwa pipeline, the Herringbone network, the Southeast pipeline, the Olushandja purification plant and the Olushandja - Okahao pipeline were built.

2.3.8 At present the Owambo Water Supply System (see Figure 3) consists of 900 km of pipelines, 92 km of canals, 31 pump stations and nine purification plants. A more detailed description of the major components of the system follows below.

2.3.9 **Calueque Dam and Pump Station:** The dam and raw water pump station are situated within Angola, about 16 km north of the Namibian border. The construction of the dam was never fully completed due to hostilities in Angola and therefore has virtually no storage capacity. The pump station can deliver 2.5 m^3/s of raw water.

2.3.10 **Cunene River - Olushandja Pipeline and Canal:** The pump station at Calueque feeds into a short 2,4 km long pipeline section which then opens into a trapezoidal concrete canal with a capacity of 6,0 m^3/s.

2.3.11 **Ruacana Pump Station, Purification Plant and Pipelines:** Raw water can also be drawn by the Ruacana pump station at a rate of 0,6 m^3/s and pumped to the concrete canal via a 700 mm diameter pipeline. Due to the large static head of $\pm$ 300 m, pumping water from Ruacana is considerably more expensive than pumping from Calueque, which has a static head of only 23 m. The Ruacana pump station was mainly used during the war years when supply from Calueque could not be sustained.

2.3.12 A small purification plant with a capacity of 1 600 m^3/day supplies the town of Ruacana and vicinity with potable water.

2.3.13 **Olushandja Dam:** The concrete canal partly feeds into Olushandja Dam. which has a storage capacity of 42 million m^3. The dam is used as emergency storage should the supply from Calueque be interrupted.

2.3.14 **Olushandja - Ogongo Canal:** A concrete canal runs between Olushandja and Ogongo with capacities decreasing from 3,2 to 1,9 to 1,5 m^3/s along the route.

2.3.15 **Olushandja Batch Plant and Olushandja-Okahao Pipeline:** A batch process purification plant is situated at Olushandja which can produce 1 600 m^3/day. The treated water is transported to Tsandi and Okahao by a 250 to 300 mm fibre-cement pipeline. Water points for people and cattle exist along this pipeline.

2.3.16 **Ombalantu Batch Purification Plant:** The batch process purification plant at Ombalantu is fed with raw water from the canal and has a capacity of 600 m^3/day. It supplies Ombalantu and the surrounding areas.

2.3.17 **Ogongo Purification Plant:** The purification plant at Ogongo is the largest in the region and has a capacity of 1 200 m^3/h. At present it is the major supplier of treated water to Owambo. The plant has been upgraded recently with financial assistance from the Netherlands Government.

2.3.18 **Ogongo-Oshakati Pipeline:** From Ogongo, treated water is pumped to Oshakati via a 600 to 800 mm fibre-cement pipeline. Several larger settlements en route are supplied from short branch lines. Water points for use by the rural population and their livestock have been constructed along the pipeline.

2.3.19 **Ogongo - Okahao Pipeline:** This pipeline supplies water to the village of Okahao and will also service the two rural distribution pipe networks of Onaanda and Okahao South which are currently still

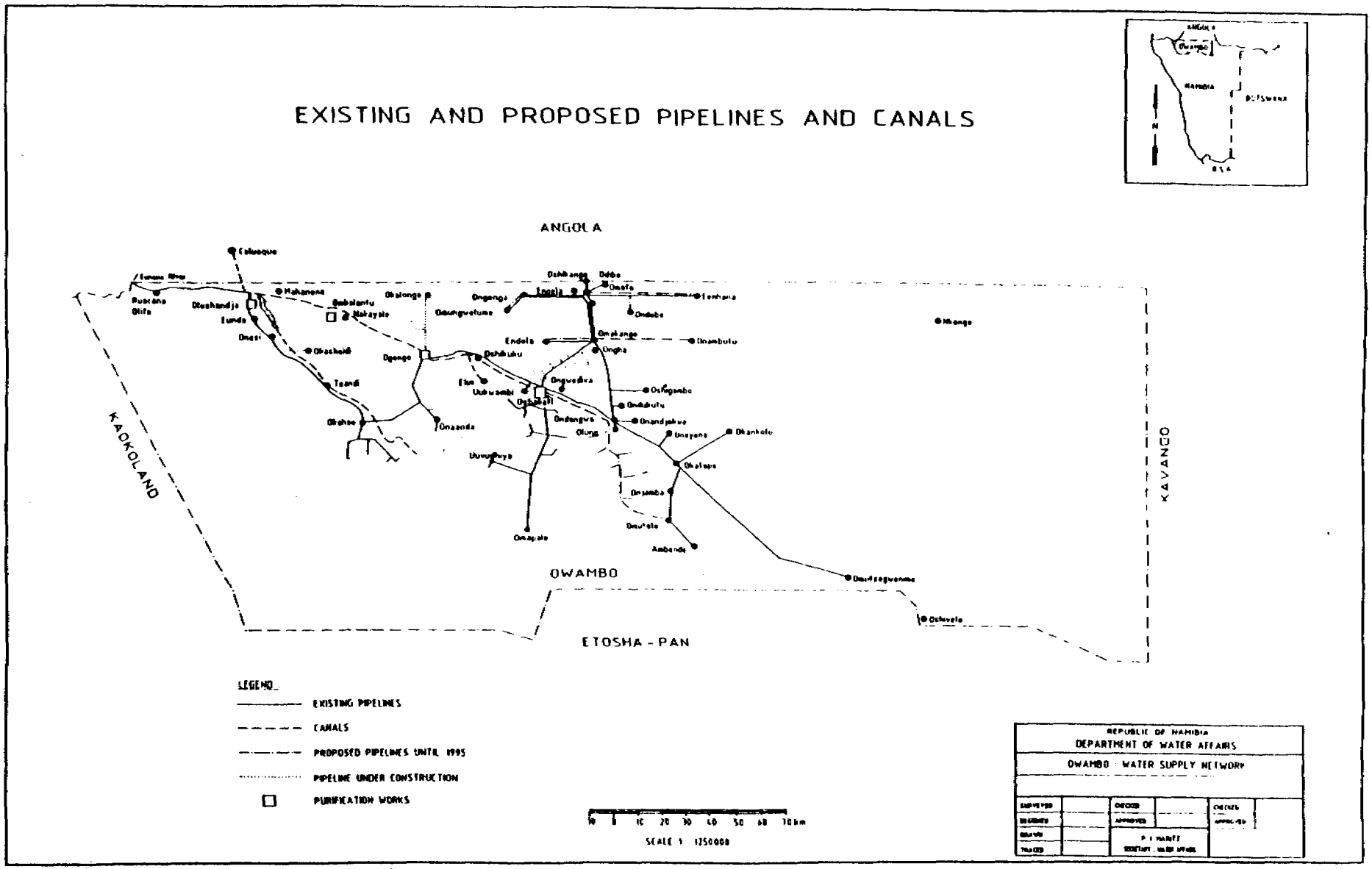

Figure 3 Existing and proposed pipelines and canals

under construction. Water can also be supplied from Okahao to Tsandi along the existing Olushandja - Okahao pipeline.

2.3.20 **Onaanda and Okahao South Rural Schemes:** Construction of these two schemes will be completed by the end of 1992. The two schemes were the first constructed with the prime purpose of supplying water to rural communities rather than to towns or growth points. The two schemes were planned, designed and constructed using a community based approach.

2.3.21 **Ogongo - Oshakati Ground Canal:** From Ogongo, the concrete canal changes to a ground canal which runs to Oshakati. The canal, which supplies raw water for the two Oshakati purification plants, is currently being rehabilitated. **The existence for several decades of a canal from Olushandja to Oshakati has had a significant impact on water and land use in central Owambo, including the southern parts of the areas of influence of the two schemes reviewed by this mission.** The canals have provided a perennial, though untreated, supply which was open for public use. Livestock watering, and to some extent grazing patterns, adjusted accordingly. So did settlement patterns and local human and livestock movements.

2.3.22 **Oshakati Purification Plants:** These two purification plants have a combined capacity of 12 000 m^3/day, but are dependent on a regular supply of raw water via the ground canal from Ogongo. One plant is 28 years old; the other was built as an interim measure and will be used for four years.

2.3.23 **Oshakati - Ondangwa Pipeline:** From Oshakati, treated water is pumped to Ondangwa in a 500 mm fibre-cement pipeline. Several larger settlements such as Ongwediva town and mission are supplied en route. Water points for people and livestock are also found next to this pipeline.

2.3.24 **Oshakati - Omapale Pipeline:** The Oshakati - Omapale pipeline runs to the south from Oshakati and is currently being constructed under the drought relief programme. It supplies water to livestock using grazing areas in the southern part of Owambo.

2.3.25 **Herringbone Scheme:** The 'Herringbone' pipeline network comprises a main pipeline running from Ondangwa in the south to Oshikango in the north. Three pump stations and pressure towers occur along the route of the main pipeline. A number of pipelines branch off from this pipeline in easterly and westerly directions. Water points for people and livestock exist along the pipeline network.

2.3.26 **Southeast Pipeline:** This 300 to 400 mm fibre-cement pipeline, which also originates in Ondangwa, runs along the main tar road and delivers water to various settlements, private consumers, stock watering points and agricultural projects.

Changes in design philosophy

2.3.27 As noted in para. 2.3.1, human settlement and economic activity in Owambo originally depended on local water sources, exploited with indigenous technology. The first phase of externally administered water supply continued this exploitation of local water resources (including the *oshana* systems). During this period of colonial administration, as nucleated settlements and ultimately small urban areas developed, the bulk reticulation of raw and treated water from external sources was gradually expanded. Thus, a rural African region came to have a comparatively sophisticated piped water system. But this system was designed only to serve the administration and social services, together with the urban settlements that were growing up in association with them. There was no intention to provide a rural water supply, although offtake points were usually provided along the bulk pipelines (partly to deter stock owners from breaking them to water their herds). As a regional planning philosophy of identifying 'growth points' was adopted in the last decade of South African rule, bulk

water reticulation was designed to serve these supposed urban centres of the future. There was still no intention to pipe water to rural communities.

2.3.28 Two years after Independence, DWA still officially has no rural water supply function (para. 2.2.1, 2.2.3). It maintains the basic design principle that rural communities should exploit local water sources, using sustainable technology, before piped external supplies are considered. It rejects the suggestion that Government should deliver an adequate water supply to a citizen regardless of where s/he chooses to live. But there is now a clear public assumption that rural people near pipelines are as entitled to the supposed benefits of a piped supply as the inhabitants of the larger settlements to which the pipelines run. Many people are asserting their perceived rights to this resource by breaking DWA pipelines. Some lay their own branch lines to distant private water points; others flood spectacular areas (to the cost of users down the pipe or canal) in order to water livestock or promote grass growth. The existence of the bulk reticulation system in the region makes it unrealistic to expect that other water supply options will be ranked and exploited in the order of priority which strictly technical considerations might suggest. In Owambo, DWA is now therefore fulfilling a rural water supply function, using water piped from another country.

Problems experienced and solutions adopted

2.3.29 Given this rapid transformation of the design philosophy for water supply, the shortage of potable water at the two distribution centres of Oshakati and Ondangwa is currently the most important water supply problem faced in the region. As a result, the far ends of the pipeline systems originating at these centres often do not receive sufficient water and sometimes receive no water at all. This situation is exacerbated by the many illegal connections along the pipeline routes and the fact that water is supplied to community consumers free of charge. At present, all the water distributed by these two centres is produced at the Ogongo purification plant, which cannot fully satisfy the demand of the entire pipeline system. Furthermore, the pipeline from Ogongo to Oshakati and the pipeline from Oshakati to Ondangwa operate close to their design capacity and the quantity of water being pumped through these pipelines hence cannot be increased significantly.

2.3.30 The considerable need for additional raw water treatment capacity at either Oshakati or Ondangwa was recognised, and since only Oshakati has a supply of raw water via the ground canal, an interim purification plant was recently constructed at the town. The plant will produce drinking water at a rate of 400 m^3/hour and will greatly supplement the 600 m^3/h received from Ogongo. Work is currently under way to clean the ground canal to ensure sufficient raw water flow to feed this plant. As the name suggests, the interim plant will only be able to bridge the gap until such time as the new purification plant (see para. 2.3.33) comes on stream at Oshakati in 1996.

2.3.31 Furthermore, the Oshakati - Omakango pipeline which is currently under construction will provide a direct link between Oshakati and the Herringbone network. Supply of the Herringbone network from Ondangwa will hence stop and more water will be available for the Southeast pipeline, the far end of which often experiences supply shortages.

2.3.32 Steps are currently being taken to legalise all unauthorised connections and to provide them with water meters in order to be able to charge for the water. DWA expects that water wastage will be decreased considerably through this programme.

Future developments

2.3.33 **Ogongo - Oshakati Canal and Oshakati Purification Plant:** Design is presently under way for lining of the existing Ogongo - Oshakati ground canal as well as for a 40 000 m^3/day purification plant at Oshakati. The construction phase of the project is expected to commence in September 1993. The project is largely funded by KfW and it is expected that it will relieve the drinking water shortage which is currently experienced throughout the system downstream from Oshakati. Capital costs of the project are estimated at R 94 million.

2.3.34 **Ogongo - Okalongo Rural Water Scheme:** This pipeline network will consist of a main pipeline running north from Ogongo to Okalongo with several branch lines to the east and west. Its primary function is to supply drinking water to rural communities. A more detailed description of this project is given in paras. 2.6.2 - 2.6.9 below.

2.3.35 **Oshakati - Omakango Pipeline System:** This pipeline system, which is currently under construction, will create a direct link from Oshakati to the Herringbone pipeline scheme and will greatly relieve the demand pressures placed on the Oshakati - Ondangwa pipeline. Although it is mainly a bulk water carrier, the branches from the pipeline will also supply water to rural communities in the area. A more detailed description of this project is given in paras. 2.6.13 - 2.6.18 below.

2.4 Netherlands support to date

2.4.1 Within the water sector, the Government of the Netherlands has assisted the Namibian Government with the funding of two projects, both of which form part of the water supply system in Owambo.

2.4.2 **Calueque Pump Station:** The rehabilitation of the Calueque pump station (Phase 1), which was damaged during hostilities, was completed in early 1991 at a total cost of R 2,26 million of which the Dutch Government contributed R 2,03 million. The project included repairs to the pump station building, the reinstallation of one pump set, the reinstatement of the power supply and the construction of a small local potable water supply system.

2.4.3 **Ogongo Purification Plant:** The Government of the Netherlands has also provided financial support for the upgrading of the Ogongo Purification Plant, which involved a complete renewal of the chemical dosing system and the flash mixer, rehabilitation of the sludge lagoons and the connection of the pump station to the electricity grid. The total cost of the project was R 2,43 million of which R 1,66 million was provided by the Netherlands. The upgrading of the purification plant will be completed by March, 1993.

2.5 Other development assistance

2.5.1 A number of other development cooperation agencies are supporting the water sector in Owambo. These include KfW, which will fund a new canal or pipeline from Ogongo to Oshakati. French aid was provided for reconstruction of a section of the Herringbone pipeline north from Omakango to Omafo, and will also be given for an additional pipeline from Omafo to Eenhana. The involvement of the Anglican Diocese, FINNIDA and UNICEF in rural water and sanitation programmes in Owambo was outlined in para. 2.3.5. Indian assistance is proposed for a rural water programme in eastern Owambo.

AOB Refl ook on project

2.6 The two schemes

2.6.1 The two projects which are currently under consideration for financial assistance by the Government of the Netherlands are the **Ogongo - Okalongo** and the **Oshakati - Omakango** piped water supply schemes. The location of the two projects is shown in Figures 1 and 3.

Ogongo - Okalongo water scheme

2.6.2 Planning for the Ogongo - Okalongo water supply project was started in 1988. **The scheme was initially planned as a bulk water supply pipeline between Ogongo and the village of Okalongo.** Okalongo was identified as a 'growth point' at that time. A Planning Report was compiled for the scheme which compared the costs and benefits of several pipeline routes and investigated the various possibilities of connecting the pipeline to other existing pipelines (DWA, 1988).

2.6.3 This scheme was submitted for Netherlands funding in May, 1991, with a budget of R 11 170 000. At the exchange rate of June 1991, when a Netherlands Government Identification Memorandum was prepared, this converted to NLG 7 819 000. At current exchange rates[3], the amount shown in the identification memorandum converts to approximately R 13 032 000. The submission and Identification Memorandum were based on the 1988 Planning Report and a revised cost estimate by DWA dated April, 1991.

2.6.4 Based on the 1988 Planning Report, terms of reference were prepared in mid 1991 and local engineering consultants were invited to put forward financial and technical proposals for the engineering services. A firm of consultants was then appointed.

2.6.5 Subsequent to the appointment of the consultants, however, **it was decided that the emphasis should be changed from a bulk water supply project to one supplying the rural areas within a 10 - 12 km radius from the main pipeline.** This decision resulted in a significant increase in the number of people and livestock to be served by the project and hence influenced aspects like water demand, pipeline routes and pipe diameters. It was also decided that since it was a rural water supply project, the communities should be involved in the project right from the start. A Local Water Committee was therefore formed.

2.6.6 The consultants were therefore required to undertake substantial redesign of the scheme. The Preliminary Design Report submitted in April 1992 (DWA, 1992a) therefore effectively replaces the 1988 Planning Report. It gives a total project cost estimate, in April 1992 prices, of R 16,545 million (including contingencies and professional fees).

2.6.7 The project site lies to the north of Ogongo, with an influence area of 683 km^2 (Figure 4). The total population of the area was determined to be 34 200 people, with an average population density of 50 persons/km^2. The project area includes 46 settlements, of which 30 have schools.

2.6.8 In calculating water demand, a 15 year planning horizon was adopted and provision was made for livestock. Average daily demand by the year 2008 was estimated to be 2 330 m^3, with a daily peak of 3 490 m^3.

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[3] In this report, an approximate exchange rate of R 1,00 = NLG 0,60 is used.

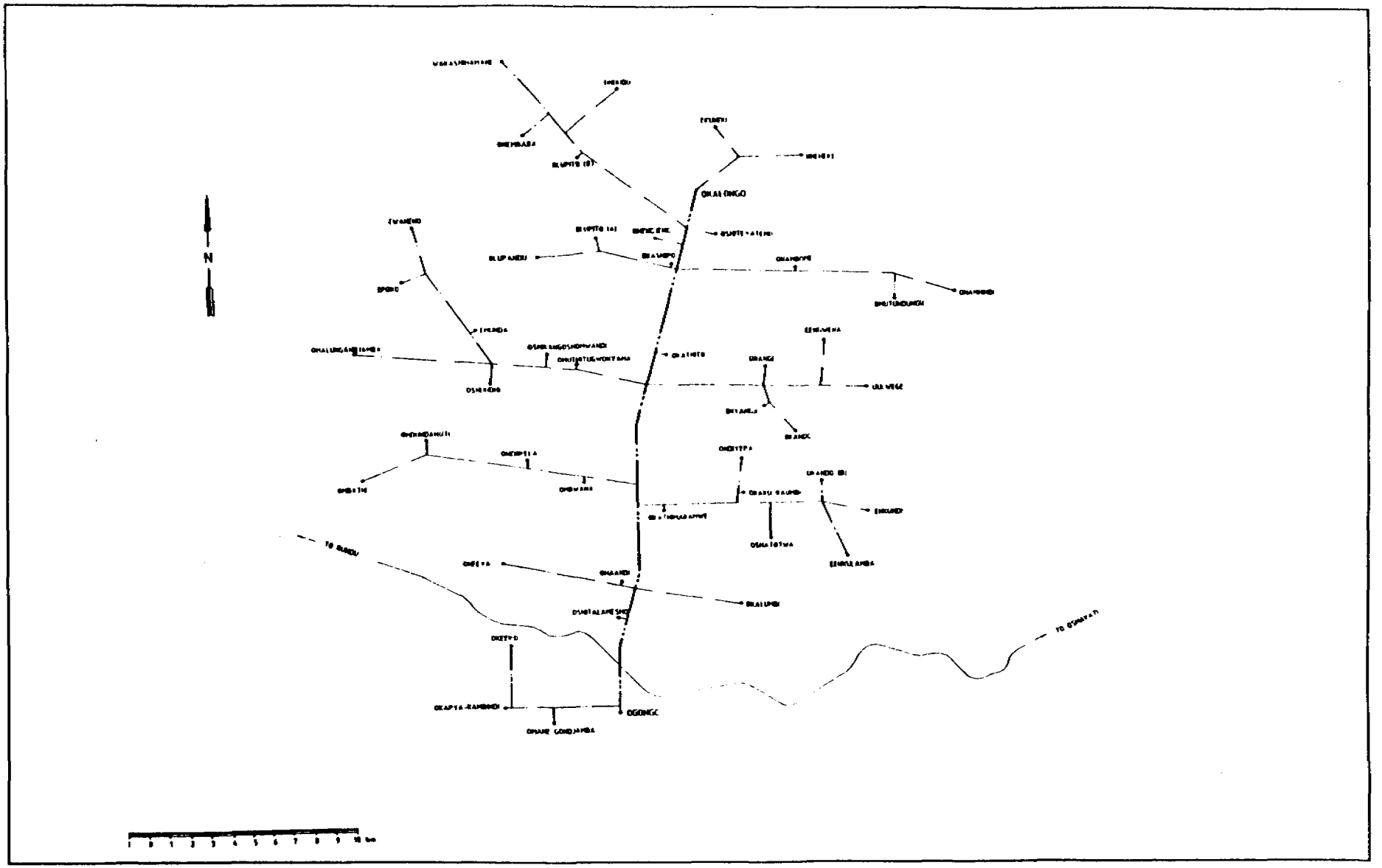

Figure 4 The Ogongo - Okalongo water scheme

2.6.9 As now designed, the Ogongo - Okalongo water supply system consists of a 26 km long fibre-cement main line running directly from Ogongo in the south to Okalongo in the north (see Figure 4). Ten lines branch off from the main line, running in either easterly or westerly directions. The branch lines are constructed from uPVC and have a total length of 139 km. A total of 169 water points and 46 cattle troughs are to be set up at the 46 settlements along the pipeline routes. Each water point also has a water meter and a wash basin for clothes associated with it. Provision is made at each water point for storage capacity equal to one day's consumption in the peak month after five years at each of the settlements. Storage for schools and clinics will be elevated above ground, while storage for rural and stock consumption will be provided at ground level.

2.6.10 **Contrary to original intentions, an environmental impact assessment (EIA) was not carried out for this scheme.** The consulting engineers state that this was because EIAs had recently been carried out for the Onaanda - Okahao and Ogongo - Oshakati schemes, and that 'the results are a good indication of results that can be expected for this [Ogongo - Okalongo] area' (DWA, 1992a, 1). A second reason they give is that 'the National Planning Commission [NPC] is at present investigating the implementation of an extended Environmental Impact Assessment of the region' (DWA, 1992a, 1). In an appendix they reproduce a statement by an NPC officer recommending that the NPC initiate an EIA of the Ogongo - Okalongo scheme, and that the NPC 'compile a survey of all institutions which are involved in... development projects in Owambo, and a description of the projects' (DWA, 1992a, Appendix B, 2). In fact, the NPC did not initiate an EIA. The engineers' suggestion that a nearby EIA would provide adequate information reveals ignorance about the EIA process.

2.6.11 At bilateral consultations with The Netherlands in November, 1991, the Government of Namibia (GON) stressed the urgency of this scheme. In 1992, it decided to invite tenders and award a contract for construction of the scheme, although no decision on the proposed Netherlands funding had yet been received.

2.6.12 The contract for the construction of the pipeline scheme was awarded to Vermeydu Construction in November, 1992. The contractor is expected to start work in January, 1993. Construction of the main pipeline and the water points is expected to take 12 months. Completion of the branch lines will depend on the progress made in their excavation by the communities. The contract sum is R 13,5 million.

Oshakati - Omakango water scheme

2.6.13 Planning for the Oshakati - Omakango pipeline was completed in November 1990. The Planning Report (DWA, 1990) proposed that **the pipeline would function primarily as a bulk water carrier between Oshakati and the pump station and water tower at Omakango.** This bulk pipeline was mainly intended to supplement the existing supply in the Herringbone network, and provision was made for rural water supply to serve only a 4 km zone on both sides of the pipeline.

2.6.14 Tenders were invited in mid 1991 for consultancy services in connection with the project. In October 1991, before the closing date, an Amendment Notice was issued altering the scope of design considerably. **The project was extended to include a larger rural area, and secondary pipelines to major consumers in the area between Oshakati and Omakango were added.** These are to be constructed in two phases (see Figure 5). As part of the second phase, the Oshakati - Omakango line will be linked to Endola via Ehafo. Endola's current supply via a line from Omakango is unreliable. The situation will improve once this ring feed is in place. Additional branch lines to communities around Endola are also under review.

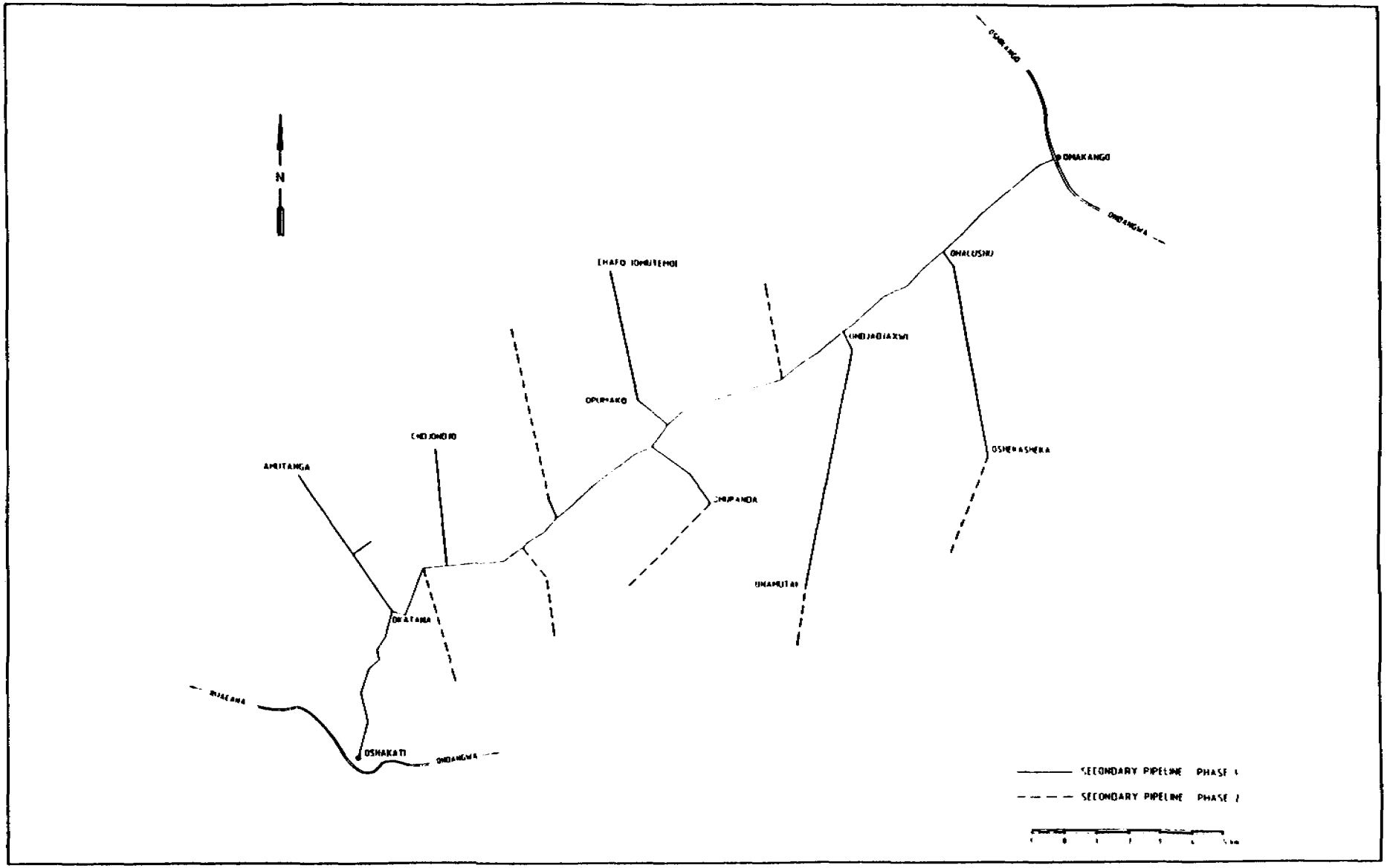

Figure 5 The Oshakati - Omakango water scheme

2.6.15 Furthermore, it was decided that the main pipeline should cater for the entire demand north of Omakango and not only supply the shortfall, thereby relieving the present demand on the Ondangwa pump system to Omakango. The Oshakati - Omakango pipeline thus serves a dual purpose, i.e. that of a bulk water carrier to the Herringbone network and that of a local supplier to the rural areas to the north and south of the pipeline route.

2.6.16 The project area lies to the north east of Oshakati and is about 350 km^2 in size (Figure 5). The total population to be served by branch lines amounts to approximately 34 600 people. 32 settlements with 13 schools and four clinics will be served by the main line and branch lines.

2.6.17 The water demand placed on the pipeline amounts to 9 500 m^3/day, of which 65 % is supplied to the Herringbone network, 20 % to the rural branch lines and 15 % to the village of Endola. Provision is also made for livestock watering.

2.6.18 The main bulk water pipeline has a length of 32 km and the material is fibre-cement. The combined length of all the Phase 1 and Phase 2 branch lines is 57 km. uPVC pipes are used for the branch lines. A total of 85 water points are to be constructed, of which 15 will have elevated storage. Ground level storage is to be provided at all other water points. In addition, each water point will have a water meter, washing basin and cattle trough associated with it.

2.6.19 In the bilateral consultations of November 1991, the Government of Namibia advised the Netherlands delegation that the Oshakati - Omakango project had the highest priority among the schemes proposed for Dutch funding. GON stated that an official request for the funding of the project would be submitted through the National Planning Commission (NPC). In the same month, DWA was instructed to proceed immediately with construction. DWA plant and construction crews were available in Oshakati, and work began on site in December 1991. As the consultants had only been appointed on 29 October, this meant that detailed design and construction proceeded almost simultaneously.

2.6.20 The main pipeline to Omakango was built by the Department, while the communities are responsible for the excavation, laying and backfilling of the branch lines. For this purpose, a Local Water Committee has been formed. By the end of November, 1992, the main line and the pump station at Oshakati had been fully completed, while 73 % of Phase 1 of the branch lines had already been laid by the communities. The construction of water points by a contractor will start in January, 1993. Construction of the entire scheme (Phases 1 and 2) is expected to be complete by August, 1993.

2.6.21 The capital costs budgeted for both phases of the project amount to R 16,0 million, of which R 9,0 million had been spent by the end of November, 1992. A Netherlands Government Identification Memorandum prepared in August 1992 proposes a Dutch contribution of R 15,0 million (NLG 9,0 million).

3 Environmental impact

3.1 Current environmental conditions

Ogongo - Okalongo

3.1.1 The region from Ogongo to Okalongo is situated along the western edge of the active *oshana* area in Owambo. This is a very flat floodplain (average gradient of 1:3000 (Stengel, 1963)), the dominant feature of which is a series of interconnected, shallow channels and pans (collectively known as *oshanas*) interspersed with slightly higher, sandy regions. During the rainy season, water may collect and flow through the *oshanas*. As the *oshanas* dry out so grass grows in the moist substrate, enriched with nutrients brought in by the floods and from manure deposited directly by livestock (Marsh & Seely, 1992). The *oshanas* thus become a valuable grazing area for livestock. Farms, comprising homesteads, crop fields and reserve grazing fields, are located in the raised regions between *oshanas* where the soil is less saline and flood waters are unlikely to reach (Elonheimo, 1991). Thus the area consists of a mosaic of communal grazing land in the *oshanas* and parts of the raised regions; fenced-off grazing reserves; and crop fields for use by occupants of the farms.

3.1.2 The *oshanas* are moderately wide, up to about 300 m in places but generally less than 100 m. The *oshana* surface is characterized by a superficial layer of dark clay, the presence of which is most noticeable in the main channel and the lowest points of any depressions. In general, some water will flow and collect in depressions in the *oshanas* every year. However, the magnitude of water flow is very variable, depending on both localised rainfall as well as rainfall events in the Angolan highland catchment area (Marsh & Seely, 1992).

3.1.3 The mission took place at the end of the dry season in the midst of a drought and the *oshanas* were dry and barren except for the occasional evidence of closely cropped grass stubble. The land in between the *oshanas* is raised one to several metres above *oshana* level and is dominated by pale, leached, aeolian sand with low water retaining capacity. The edges of the *oshanas* support palm trees (*Hyphaene petersiana*) and mopane woodland (*Colophospermum mopane*). Wild fruit trees such as fig (*Ficus sycomorus*) and marula (*Sclerocarya birrea*) are rare in this area, occurring occasionally within fenced fields.

3.1.4 The destructive collection of palm sap for producing palm-wine is a common practice in the area. Many of the palm trees have ladders attached and palm stumps, the remains of over-exploited trees, are common.

3.1.5 Mopane woodland is the dominant vegetation type on the raised sandy regions. Some fairly large trees (approx. 4 m) are in evidence, but in general poor soil conditions support 1 - 2 m high scrub. Signs of heavy exploitation of large mopane are shown in much of this area by coppicing trees and dead stumps.

3.1.6 During the mission's visit, very little grass was evident in the raised sandy regions. This was due to grazing and trampling activities of livestock. In places where rainfall had recently occurred, a flush of green was evidence that grass in the form of seed and/or perennial stubble was present below the sand surface. During the survey period such patches were rare but nevertheless indicative of the production potential and resilience of the ecosystem.

3.1.7 *Oshana* runoff water is traditionally used for livestock and people and its capture and storage are facilitated by pits (*Omafima*) dug into the *oshanas* (Marsh & Seely, 1992). During the site visit all *Omafima* were dry and people were either obtaining water from the canal if it was within walking distance from their settlement, or were trucking it in. An excavation dam (*gat dam*) for the capture

and storage of *oshana* water is located near Okalongo but was dry during the time of the survey. Traditional wells that make use of the very limited ground water located in shallow perched aquifers in the raised sandy regions between *oshanas* probably occur in the area but were not observed.

3.1.8 Farms are widely dispersed throughout the area. The majority of farms have large fenced-off fields; strand wire fencing using locally cut mopane fencing posts having largely replaced the traditional all-wood fence and/or scrub fence found in some parts of Owambo. Some of the fields are surrounded with expensive diamond mesh fencing. With the exception of some millet stubble, crop fields were barren at the time of survey. Very few livestock were in evidence as most had been moved to cattle posts elsewhere, northwards into Angola or southwards onto the Andoni flats. The dominant farming activity during the survey period was spreading cattle manure onto the crop fields.

Oshakati - Omakango

3.1.9 With a few qualifications, the description of the Ogongo - Okalongo region applies to that of the Oshakati - Omakango region as well. This region is situated in the centre of the active *oshana* area and some *oshanas* are up to 500 m wide. The first half of the main pipeline route from Oshakati runs next to or in *oshanas* whereas the remaining route to Omakango is largely across higher ground.

3.1.10 In comparison to the Ogongo - Okalongo area, farms are as common but fewer fenced units occur in this area (active herding being used instead of fencing to protect crops). Mopane trees are larger (often up to 10 m) although areas of scrub mopane also occur and there are more wild fruit trees. Palm trees occur on the edges of most *oshanas* and are scattered throughout the area. The mopane and palm trees have been subjected to considerable exploitation and patches where very few trees remain are common. Few livestock were present in the area at the time of survey.

3.1.11 *Omafima* and wells are common and although the *omafima* were dry during the mission's visit, the wells appeared to have water despite the drought. Okatana has a well developed, functional water catchment, storage and purification system that will be made redundant once piped water becomes available. Currently, *oshana* water is captured in an excavation dam and then pumped into a circular earth storage dam. Water is then fed to a batch purifier and on into the Okatana Mission's reticulation system. Considerable water remained in the storage dam during the site inspection despite the drought.

3.2 Physical impact of scheme construction

Construction impact

3.2.1 **Direct impacts incurred during the construction phase will be of minor significance.** At the time of the mission, the main pipeline and several branch lines of the Oshakati - Omakango water supply scheme were already installed and construction work was under way on some branch lines facilitating the assessment of impacts in this region as well as for the Ogongo - Okalongo region.

Oshanas

3.2.2 **No significant impacts to the functioning of *oshanas* will occur.** Pipelines crossing *oshanas* are buried and no valves or manholes occur within *oshanas*. Backfilling will initially result in a slightly raised ridge directly above the pipeline. At most this ridge will be 150 mm high and will settle and become flush with the surface during the rainy season. Impedance to the flow of water through

oshanas will thus be minimal and downstream environmental impacts inconsequential. Furthermore, in view of the existing design specifications (DWA, n.d., 20) for stronger pipes for *oshana* crossings than are used elsewhere, pipeline breakages, repair work and therefore disturbance of the *oshana* surface will be minimal during the operation and maintenance phase. During the dry season the surface of *oshanas* is suitable as an access road and no road construction will be needed in *oshanas*. In addition to the above considerations, the route selected for the Oshakati - Omakango pipeline was deliberately made slightly longer and therefore more expensive in order to reduce *oshana* crossings. The route selected cut out four *oshana* crossings (DWA, n.d., 2).

Land clearance

3.2.3 Land clearance, especially in the raised sandy and wooded areas is one inevitable and negative impact of construction activity. Land clearance will specifically result in the removal of trees within a narrow corridor (approximately 10 m wide for the main pipeline and narrower for the branch lines). During the operation phase of the project, a 3 m strip will remain cleared as an access road but the remaining area will be allowed to regrow naturally (Koegelenberg, pers. comm.). The logistics of artificially revegetating the strip in this arid environment are prohibitive.

3.2.4 The Oshakati - Omakango main pipeline was deliberately routed to avoid large trees (DWA, n.d., 3) and resulted in a relatively small number of large mopane trees being felled in areas where it was not practical to deviate around the trees. The environmental impact of losing these construction, fuelwood and fodder trees is not very great and provided the community has access to the felled timber, the social impact is considerably reduced. Losing wild fruit trees, valuable sources of vitamins and energy, would be of much greater significance. This message was conveyed to the DWA construction engineer via the water committee and taken into account during the laying of the Oshakati - Omakango pipeline. The pipeline route was fine tuned on site to avoid wild fruit trees and no such trees were removed over the entire distance. Land clearance for the Ogongo - Okalongo scheme would have similar, minor impacts to those described above.

Settlement crossings

3.2.5 It is not feasible to route pipelines across free access land only. Crossing settlement fences and crop fields is inevitable. If done in consultation with the land occupiers minimal social impacts will result. This was the case with the Oshakati - Omakango main pipeline.

Access roads

3.2.6 The access road for the Oshakati - Omakango main pipeline has had minimal impact on the environment. For most of its length the road standard conforms to that of existing informal tracks with the use of impacted hard material being confined to exceptionally soft, sandy stretches (Koegelenberg, pers. comm.). Borrow pits were thus also kept to a minimum. During the dry season, the surface of oshanas is acceptable as an access route. A decision not to construct berms across oshanas was taken (DWA, n.d., 20) and there will thus be no negative impact on water flow. Furthermore, access roads were routed around and not through fields, thus minimising impacts on the local farming communities. The minimal standard of the access road will not facilitate enhanced deforestation by commercial loggers. Although the 1991 Terms of Reference for the Ogongo - Okalongo pipeline refer to the construction of an all-weather access road using a calcrete weathering course, the decision was later taken to make a similar access road to that used for the Oshakati - Omakango scheme (Koegelenberg, pers comm).

Environmental conditions of contract

3.2.7 Design specifications employed by Namibian construction engineers conform to those laid down by the South African Bureau of Standards. From an environmental point of view, the most relevant specifications concern those for land clearance (SABS 1200 C-1980 as amended 1982) and for earthworks (pipe trenches) (SABS 1200 DB-1989). The land clearance specification specifically deals with the removal of vegetation from the construction site. It invests the site engineer with the responsibility of making decisions concerning which trees to fell, which to leave in place and the location of the disposal site for felled timber. All grubbed sites are to be backfilled. Furthermore, any project specifications to preserve certain flora, including if necessary their removal and subsequent reestablishment, are part of the contractor's conditions.

3.2.8 In the case of the Oshakati - Omakango pipeline and Ogongo - Okalongo pipeline projects, no specifications were laid down with regard to the preservation of important flora, e.g. wild fruit trees. Nevertheless, a consultative approach between the affected communities and the engineer for the Oshakati - Omakango scheme resulted in the preservation of wild fruit trees. Compliance with the other specifications mentioned above also took place.

3.2.9 The earthworks (pipe trench) specifications require that, across commonage and private property, the finished surface after backfilling shall be no more than 150 mm above the surrounding ground and that any settlement below existing ground level shall be made good by the contractor. This specification is particularly important in terms of maintaining *oshana* flow and has been complied with.

3.2.10 Thus the standardized specifications employed by DWA appear to pay reasonable attention to sensitive issues in the Owambo environment and the local engineers implementing the construction have shown good faith in complying to these standards.

3.3 Impact on land use and land degradation

Present land use system

Cropping

3.3.1 **The indigenous land use systems and indigenous knowledge about the use of land, water and vegetation in northern Namibia are among the most important resources of the country which are not yet fully appreciated by the Government.**

3.3.2 In the densely settled zone, the system of land use revolves around the *oshanas*, the "wetlands in drylands". Use of the *oshanas* and their immediate surroundings allows the local people to grow crops with relatively good success, despite the fact that the level of precipitation (see below) would indicate that the area is very marginal for cropping. As a rule of thumb, a minimum of 500 mm annual precipitation is needed for successful and sustainable rainfed cropping in the tropics.

3.3.3 Most of the cropland has already been fenced for a long time (Soini 1981). The predominant crop is pearl millet (*mahangu*). Other crops include sorghum, beans, pumpkins, watermelons and groundnuts as traditional crops, as well as vegetables such as red peppers, tomatoes and onions. Intercropping is still common (Soini 1981), allowing efficient use to be made of space and soil fertility. The actual cropping practices are poorly documented thus far and need to be further studied.

3.3.4 The richness of the indigenous cropping systems is shown by the fact that more than 900 local varieties of pearl millet could recently be collected by the Mahanene Research Station in Owambo. Of these, 750 are now being tested on the research site (MAWRD 1991). However, it must be kept in mind that attempts to replace the present diversity with a small number of scientifically tested cultivars can be counter productive. The present wide range of genetic resources enables people to exploit a wide range of agro ecological conditions and niches. Furthermore, varietal mixtures stabilise yields and are thus an important element for yield security. Rather than replacing the present varieties, new cultivars should be used as additional components in the mixtures.

3.3.5 The typical farmstead has 2-5 ha of fenced crop land, but some have up to 10 ha (Soini 1981). The estimated yield of 450-500 kg of grain per hectare in good years enables the people not only to cover their immediate consumption, but also to accumulate reserves for drought years. An average family requires 1-1.5 t of grain per year. Millet grain is supplemented by meat, fish, milk and various "bushfoods", such as wild vegetables and Mopane worms (Marsh & Seely, 1992). This combination yields a diet which is much healthier than the "modern" diet, in which bread is a major component (Soini 1981).

Livestock

3.3.6 The second important element of the Owambo economy is livestock. Whereas crops provide the major part of the diet, livestock provide security, since droughts and failure of *oshana* floods are common. Furthermore, cropping and livestock keeping interact in various ways. Farmers commonly apply manure to their crop land; however, the extent and frequency of manure application are thus far poorly documented. Animals are frequently used for ploughing and other forms of traction. Oxen are preferred for this, but poorer people use donkeys. Other livestock kept by local households are goats, sheep, poultry and pigs. A survey carried out in 1990 indicated that over 90% of the households in Owambo keep livestock (Bayer et al., 1991). However, contrary to common belief, not all households keep cattle (para. 2.1.5).

Livestock numbers

3.3.7 In contrast to other parts of Namibia, livestock statistics for Owambo are only approximate. Some of the apparent trends may be difficult to explain, e.g. the increase in livestock numbers during the last two years, despite the present drought. The drop in cattle numbers from 1970 to 1982 may be largely due to droughts in the early 1970s. Cattle numbers in Owambo are greatly influenced by migration from and to Angola. Migration is probably a major cause of the increase in cattle numbers from 1990 to 1992. Earlier in 1992, cattle population estimates obtained during a vaccination campaign suggested that there were 485,000 head in Owambo (DVS 1992). The prospect of drought relief may have tempted some farmers to give rather generous estimates of their cattle holdings.

3.3.8 Judging by the poor availability of official data, donkeys and - to a lesser degree - goats are neglected species. Goat numbers are likely to fluctuate greatly with seasonal kidding and subsequent use of young stock for meat. The Owambo themselves seem to give little attention to their free-roaming donkeys. All officials interviewed agreed that the donkey population in Owambo has increased greatly in recent years. However, no reliable statistics are available.

Table 1. Livestock populations in Owambo according to official statistics (excluding Manengetti), in thousands

Year	Cattle	Goats	Donkeys
1970	567	n.a.	n.a.
1982	399	341	n.a.
1990	350	360	120
1992	422	370	124

Source: Bayer et al., 1991; Odiawo (pers. comm.), 1992.

In addition, there are an estimated 12,000 sheep, 20,000 chickens, 4000 horses and 2000 pigs in Owambo.

3.3.9 These statistics say nothing about regional distribution. The Directorate of Veterinary Services (DVS) has divided Owambo into seven districts, which correspond with the tribal boundaries. In principle, each district should be administered by a stock inspector. However, as the districts are very unequal in size and livestock population, the eight stock inspectors redivided some of the districts and one inspector may be in charge of several districts or parts of them, whereas others are in charge of only one district. Direct contact with the livestock keepers is by assistant stock inspectors, of whom there are 65 at present. These officials report to the state veterinarian in Ondangwa.

3.3.10 The livestock inspectors compile the regular livestock census. Since the districts include zones of both dense and sparse human population, the veterinary statistics according to "stock inspector districts" are still too crude to be able to make meaningful statements about regional livestock distribution in relation to human population.

Livestock productivity and marketing

3.3.11 Thus far, no comprehensive study of livestock productivity in Owambo has been made. Fertility is said to be in the order of 40%, but some data from adjacent Kaokoland suggest a much higher fertility in the indigenous Sanga cattle (Paskin 1990). Rates of calf mortality are also unknown. It is assumed that cattle offtake for slaughter is in the order of only 4-5%. It is still common practice to slaughter only one or two cattle at a time and then sell the meat on the spot or at nearby markets. In this way, one animal may bring R 1 000 or more, despite the small size of the indigenous breed. The only "commercial" outlet is the slaughterhouse and meat factory in Oshakati, now run by Meatco. The prices which can be offered by Meatco cannot compete with the "bush butcheries". Therefore, in the first ten months of 1992, the Meatco slaughterhouse in Oshakati was able to buy only 2 066 cattle from Owambo, or 14.2% out of the total of 14 580 cattle slaughtered there (Meatco statistics).

3.3.12 The productivity of cattle in Owambo is not restricted to meat production, as in the commercial areas. Sour milk products are consumed and also sold on markets; however, no data on milk extraction for human consumption are available. Even small amounts of milk per cow for human consumption will substantially increase the total amount of food produced per cow. An extraction of 100 kg of milk per year (less than 0,3 l/day) can - in terms of nutritional energy - raise the amount of food produced by that cow by 50%.

3.3.13 Further products of cattle in the agropastoral system of the Owambo include draught power and manure. Calculations from Botswana show that, if the various products actually used are taken into account, a cow under traditional management yields as much as, if not more than, a cow on commercial ranches, even though the calf growth rates and cow fertility levels are lower and calf mortality is higher than under commercial management (de Ridder & Wagenaar 1986). This is because the range of products used is greater under traditional than commercial management. However, we are not aware of any detailed study of traditional management and processing of different cattle products in Owambo, nor of studies of the value of these products.

3.3.14 The productivity of goats is even less well documented than that of cattle. In other African countries, goat fertility is high - 1.5 to more than 2 kids born per doe - and sustainable offtake rates are in the order of 20-25 %.

3.3.15 In view of the great dearth of data, detailed studies of animal productivity in Owambo should be given high priority to provide a better base for development planning. As a first step, rapid techniques such as herd inventories, life histories and 12 month recall of calving could be used.

Grazing management

3.3.16 Detailed studies of grazing management in Owambo are also lacking. However, in view of the great variability of rainfall and subsequent variability in forage yield, it can be assumed that flexibility is an important element in the grazing management system.

3.3.17 The general pattern is that cattle are kept close to the homestead during the growing season and graze in the immediate surroundings of the farms. After harvest (April/May) some crop residues are grazed, and already at this time herds are divided and the majority of cattle are taken on transhumance. Cattle which stay behind are mostly oxen and some lactating cows. Some cattle owners, particularly in the northern part of Owambo, take their cattle to southern Angola, whereas others take theirs to the grasslands of southern Owambo.

3.3.18 Under this transhumant system, pastures in the central zone of Owambo, where the two schemes are located, are grazed year round by only a small part of the herd. During the dry season, most of the cattle are sent away from this zone to graze in pasture areas to the north, east and south. In these areas, a new growth of grass has been produced by the previous wet season, and some water remains available in pans and wells. Some water remains available in the central zone too, but most of the herd is moved out to superior grazing areas. **The availability of grazing, rather than the availability of water, is thus the primary determinant of livestock movements and numbers in the vicinity of the schemes.**

3.3.19 Large tracts of land elsewhere in Owambo are thus used only during the dry season. Other parts, e.g. close to Etosha, are rarely used, on account of a lack of water in the dry season. Water supply through pipes could open up these areas to grazing. However, there is a danger that these areas will then be occupied permanently by outsiders, thus making transhumance by the Owambo more difficult or even impossible. This would not only force the people in the densely settled central part of Owambo to reduce their cattle numbers but would also lower the total cattle population. Recent construction of the 'drought relief' pipeline to Omapale in southern Owambo is a case in point. If water is supplied to such areas, great care must be taken that this does not encourage a "land grab", but rather that the pastures are used only for dry season grazing and that the livestock keepers from central Owambo can still bring their cattle there when necessary.

3.3.20 The transhumant movements require great herding and organisational skills. Therefore, during the period of transhumance, the herders are often specialists, either Owambos from Angola or San people who, over the last few decades, have been largely absorbed into the Owambo ethnic groups. Herding during the transhumance is done exclusively by men. Male outmigration and loss of herding skills will endanger the seasonal movement of cattle and thus reduce the productivity of the cattle in Owambo. The formal educational sector has done nothing thus far for maintaining livestock-keeping skills. In fact, the attitude towards traditional agricultural practices appears to have been rather negative. In connection with the re-opening of the Ogongo Agricultural College, it should be examined whether such an institution could contribute to reversing these trends and helping maintain traditional herding skills.

3.3.21 Because cattle are kept in a transhumant system, it is necessary to examine the system of resource use and the condition of the range not only in the vicinity of the farmsteads but also at the dry-season grazing sites. In this respect, the unhindered enclosure of parts of the southern rangelands and the establishment of permanent settlements in that area will jeopardise the entire cattle production system of Owambo, if they reduce the scope for herds from the central areas to graze there in the dry season. Another restrictive factor is the new fence now being built along the Angolan border for veterinary control purposes. It is these processes, rather than the introduction of perennial piped water in the vicinity of the two schemes, that threaten to intensify land degradation in the scheme areas.

3.3.22 Whereas cattle are mainly the responsibility of men, it is unclear who manages the smallstock. However, it is likely that women are considerably more involved and have greater influence in managing small stock than cattle. Since many men leave the area to seek work elsewhere and many households are female headed, one would expect that the importance of smallstock would increase. However, this cannot be proven with the available livestock statistics.

Land and water rights

3.3.23 Apart from urban plots for building houses, there are no private land rights in a strict sense in Owambo. Traditionally, sub headmen (the lowest level of the traditional communal organisation) allocate land to farmers within their jurisdiction. During the allocation process, a fee has to be paid. An allocated piece of land remains with that person for life. After his or her death, the heirs usually take over the land. In this case, another fee is paid to the sub headman, who is expected to use the money for the community.

3.3.24 Grazing lands in the vicinity of the fenced farms are communal, but access is limited to members of the group with the same sub headman. Further afield, the limits to grazing access become less stringent. In some of the dry season grazing areas, access is limited to tribal groups; in others, it appears to be free to all Owambo.

3.3.25 In essence, limitations of access to water follow the same principles as access to the land where the water is found. Wells on private land are private; access to wells on land near the fenced farms is restricted to people with grazing rights there. If outsiders want to use a particular water source, they have to ask permission and often have to pay a fee. The only truly open access water sources are the canals built by the government to transport bulk water (Kreike, pers. comm. 1992).

Carrying capacity of grazing lands

3.3.26 The official estimate of carrying capacity of the range in the whole of Owambo is 8-10 ha/livestock unit. A livestock unit is usually defined as 1 cow or 6 small ruminants. However, such overall figures are not very useful for livestock management in such a vast area, for various reasons.

3.3.27 Firstly, mean annual rainfall ranges from more than 550 mm in the north east corner of Owambo to less than 300 mm in the south west. Secondly, soil conditions vary. Thirdly, because the central part, containing the *oshanas*, receives substantial sheet water flows, the vegetation composition and annual yields will vary greatly between different parts of Owambo. These local differences are not reflected in the overall carrying capacity figures.

3.3.28 Furthermore, carrying capacity is influenced by a range of factors such as vegetation type; competition between domestic livestock and other consumers of the primary production of the range, e.g. wildlife or insects; livestock species; aims of livestock keeping; variability of rainfall and acceptable risk; and livestock keeping system.

3.3.29 **Vegetation type.** In conventional range management, it is often assumed that half of the annual vegetation growth can be used as forage (e.g. van Soest 1982). For browse, Le Houérou (1980) suggested a use factor of 30%. However, trials in Australia suggest that in some ecosystems even a 10% use factor may lead to degradation of the range under continuous stocking, whereas other areas can be grazed much more heavily. Therefore, the particular type of ecosystem must be known, and the permissible level of vegetation use will vary according to ecosystem.

3.3.30 Schwartz (1989) differentiates between the herbaceous and the tree/shrub layer of the vegetation and also varies the use factor according to rainfall. He gives a range from 30% at 100-200 mm annual rainfall to 50% at 400 mm and more for the herbage layer, and a range from 25% at 100-200 mm to 50% at 400 mm and more for the tree/shrub layer. However, this approach assumes a fairly uniform vegetation structure and yield in the different layers.

3.3.31 As Scoones (1989) points out, wetlands in dry areas are common (e.g. the *oshanas* in Owambo, the fadamas in northern Nigeria, the inner delta of the Niger River in the Sahel). These wetlands have a much higher vegetation yield and a better water supply than the surrounding uplands and can often be more heavily exploited. The access to wetlands is often the most crucial factor in pasture systems in drylands. These differences are not accounted for by overall carrying capacity figures.

3.3.32 **Competition between domestic livestock and other consumers of the primary production of the range.** Wild ruminants, such as antelopes, are not major consumers of the range in Owambo. However, a factor often overlooked is the insects. In the West African savanna, the biomass of termites per unit area is sometimes several times that of domestic animals. These insects consume a correspondingly high portion of plant dry matter. The population of grasshoppers and rodents can vary between years; in extreme cases, they may leave less feed for domestic animals in wet years than in dry ones. However, as studies of insect populations in the Owambo rangelands are not known, the influence of these competitors on carrying capacity of domestic stock on the range cannot even be estimated.

3.3.33 **Livestock species.** Different animal species prefer different plants. Cattle are grazers, whereas goats tend to browse more. As shown in the commercial areas of Namibia, grazing by cattle alone can result in more shrub and tree growth. This, in turn, suppresses grass growth and lowers the amount of feed available to cattle. Goats (and some wildlife species such as the kudu) will eat more of the shrubs, keep the vegetation more open and thus encourage grass growth. Therefore, range can be stocked at a higher rate if grazers and browsers use it together than if only one species of animals is kept. The

complementarity of goats and cattle and the resulting higher carrying capacity is not reflected in conventional carrying capacity estimates.

3.3.34 **Aims of livestock keeping.** Another factor not taken into account by such carrying capacity estimates is the *different* aims of livestock keeping. The following argument is based on liveweight gain. In evaluating a range of grazing trials, Australian scientists found that, in most cases, liveweight gain per animal declines with increasing stocking rates, if changes in the stocking rate do not induce major changes in botanical composition of the range. However, at low stocking rates, increasing the rate causes relatively little decline in liveweight gains per animal, with the result that the liveweight gains per hectare increase. In fact, it was found that increasing the stocking rate five times reduces annual liveweight gain per animal by only 50%. Only if stocking rates are increased further do the annual weight gains both per animal and per unit area decline.

3.3.35 This relationship has important implications for the relationship between stocking rate and production aim. If the aim is to produce fat animals at a young age, the stocking rates have to set so that maximum liveweight gain per animal can be achieved. If a herd is kept mainly for reproduction, higher stocking rates are possible, since there is not much difference between cows in good and fair condition as far as fertility is concerned. If animals are kept primarily as capital and saving accounts, the animals need to be only in fair condition, and even more animals per unit area can be kept.

3.3.36 **Variability of rainfall and acceptable risk.** In temperate areas with reliable rainfall and, therefore, little variation in plant growth, the stocking rate can be predetermined with a high degree of confidence. The pasture can be well utilised so that little or no forage is wasted, and it can be stocked in such a way that the composition of vegetation remains relatively constant and productivity is not negatively affected.

3.3.37 By contrast, semi arid areas such as Owambo have highly variable rainfall. Predetermining the stocking rates will therefore result in either leaving forage unused (i.e. wasting it) if rainfall is better than expected, or running into serious problems of feed shortage if rainfall and pasture yield are less than expected. The consequences of this are demonstrated by using 49 years of rainfall data from Okatana, near Oshakati. It is assumed that wastage of forage occurs when the rainfall is 150% or more of the level shown in the left-hand column of Table 2, if the stocking rate was predetermined for that level; and that shortage of feed or "drought" occurs when less than 70% of the expected rainfall is received. Under such circumstances, calculations of carrying capacity would depend on the level of risk of feed wastage or feed shortage which the livestock keeper is willing to assume.

3.3.38 **Livestock keeping system.** The above calculations refer to a sedentary system of livestock keeping. Rainfall is patchy in semi arid areas: one site may receive good rainfall and another site only little rain in the same year, yet in the next year the reverse may be true. **Maintaining high mobility of livestock is one way of coping with such rainfall variability.** Data from Kenya suggest that, by moving stock between areas in an appropriate way, carrying capacity can be raised by 50% (Sandford 1983). These calculations do not take into account the possibility of using additional areas where livestock can be kept only seasonally, such as in the transhumant system of the Owambo.

3.3.39 These considerations lead to the following conclusions with respect to the carrying capacity of pasture. **In a complex grazing system in a semi arid area, it is not appropriate to define and determine carrying capacity as one value** (see also Behnke & Scoones 1991). Fixed carrying capacities assume stability of vegetation yields. The large fluctuations in rainfall and, subsequently, in vegetation yields between years mean that semi arid rangelands are in a constant state of "non-equilibrium". Such rangelands usually have a high degree of resilience and can therefore recover very rapidly after

drought. They are best exploited in an opportunistic and mobile way. Policies for management of arid and semi arid rangelands should not restrict this mobility.

Table 2. Mean annual rainfall, percentage of years when different rain fall levels were exceeded, and number of years of feed wastage or shortage if stocking rates were adjusted to those levels.

Percentage of years in brackets. Rainfall records available for 49 years. For further explanation, see text.

	Years of	
Annual rainfall	feed wastage	feed shortage
494,5 mm (mean)	5 (10,0%)	8 (16,0%)
Annual rainfall was higher than:		
457 mm in 50% of the years	6 (12,2%)	6 (12,2%)
376 mm in 70% of the years	12 (24,5%)	2 (4,0%)
266 mm in 90% of the years	33 (67,0%)	0

Source: Own calculations, based on rainfall data supplied by the DWA and the Meteorological Services of Namibia.

3.3.40 Furthermore, it is of utmost importance that the grazing systems be regarded as *systems* and that the relative importance of the different grazing resources be appreciated. In particular, pastures used seasonally should be protected against year round use, since this would endanger the entire grazing system and may even lead to the inability to use other marginal lands for grazing.

3.3.41 As shown above, a realistic and meaningful assessment of carrying capacity would have to take so many factors into consideration - including factors about which little or no information exists - that, in practice, such an assessment cannot be done. Instead of concentrating on trying to determine carrying capacity, policies should aim at:

- making it clear to livestock keepers that rangeland is a finite resource, i.e. that only a limited number of animals can be kept, even though these limits vary between years and are, in most cases, higher than the official "carrying capacity";
- promoting and supporting the continuous monitoring of rangeland conditions by livestock keepers and local officials and joint decision making to adapt grazing strategies accordingly;
- setting a framework, e.g. with respect to land use rights, within which stock keepers can react flexibly to changing vegetation conditions.

Water requirements for livestock

Capacity of water points

3.3.42 The appropriate capacity of water points cannot be deduced from figures on the year round carrying capacity of pasture. Rather, it should be related to maximum livestock demands. In transhumant systems, this means that, if a certain area is used for only three months by four times the animals which could be kept there year round, the capacity of the water points has to correspond to four times the average stocking rate over the year.

3.3.43 The present figures used for planning in Owambo are rather generous with respect to the daily water needs of animals (45 litres per livestock unit or head of cattle per day). With heavier animals than found in Owambo, Payne (1988) recommends the amounts listed in Table 3.

Table 3. Water requirements of livestock in semi arid areas

Type of livestock	Average liveweight (kg)	Average requirement (l/day)	Dry season requirements (l/day)
Zebu cattle	350	25	30 - 40
Sheep	35	5	4 - 5
Goats	30	5	4 - 5

Source: Payne (1988)

3.3.44 The necessary capacity of a water point will also depend on how large an area it is meant to serve. In the case of cattle in pastoral areas, a water point can attract animals from within a radius of 10 km, if the animals are watered daily. In some parts of Africa the radius is increased by watering animals every second or even every third day (King 1983). In such cases, it is also important whether all animals arrive the same day or whether the watering is equally distributed over time.

3.3.45 If water is piped into an area where cattle are kept only seasonally (3 - 4 months), the capacity of water points must be adjusted to this practice (see above). If we assume that a strip of 10 km on each side of a pipeline can be used for grazing and that the water points are spaced 5 km apart, a water point would have to serve an area of 5 x 20 km or 100 km^2.

3.3.46 If the year round carrying capacity is defined as 12 ha/head, then animals would require 1 ha per month of sojourn in the area. If the animals stay on average for four months, the required grazing area per animal would be 4 ha/beast. Thus, 100 km^2 could hold 2 500 animals.

3.3.47 If the generous Owambo norm is applied, then each water point would need a capacity of 2 500 x 45 l = 112,5 m^3 of water/day. Keeping a two day reserve in tanks would require a storage capacity of 225 m^3. If water points are spaced differently the capacity must be adjusted accordingly.

Water quality

3.3.48 As animals can adapt to salty water, water for livestock can have a higher salt content than water for human consumption. Purification may also not be necessary. Table 4 gives some rough guidelines for permissible salt content. The values will also depend on the quality of salt: they can be even higher when the calcium carbonate content of the salt is high, whereas other elements are toxic at much lower levels.

Table 4. Tolerance of different livestock species to salty drinking water (salt concentration in mg/l)

Livestock species	Healthy animal growth	Acceptable animal conditions can be expected up to	Can be tolerated for limited period
Sheep	6 000	13 000	13 000 - 20 000
Goats	6 000	13 000	15 000
Beef cattle	4 000	5 000	10 000 - 15 000
Horses	4 000	6 000	7 000 - 9 000
Donkeys			10 000

Source: Bayer et al 1991

3.3.49 It is important that water ownership is clearly delineated and, in the case of piped water, that the water pipeline does not encourage permanent settlement where such settlement does not presently exist, since this would put the system of transhumance under severe stress. This would mean that the pipeline would have to be shut down during the rainy season. Otherwise, water as the limiting factor to animal density and grazing in peripheral areas currently used for transhumance would be removed. If no active range management can be pursued, this would lead to a higher grazing pressure and to consumption already during the wet season of vegetation intended for dry-season grazing. This would also remove one means of coping with drought and would make the land use system as a whole much more drought-prone.

Trees and shrubs

3.3.50 The third important element of the land use system, besides natural range and water, are trees and shrubs. Despite the importance of agroforestry and the existence of a still functioning agrosilvopastoral production system in Owambo, the uses of trees and their functions within the production system have received little attention by government services and formal research. Where agroforestry trials have been initiated, this is being done with trees which, under the conditions of Owambo, need to be irrigated (e.g. *Leucaena leucocephala*). Some surveys (Soini 1981, Jensen 1990) and some summary reports point to a number of local agroforestry practices such as protecting trees of economic value when clearing, planting of (mainly exotic) fruit trees, lopping of trees and allowing regrowth of woody species. Furthermore, trees may serve as storage places for millet stover.

3.3.51 Leaves and pods of trees and shrubs are also important sources of fodder. As in the case of other elements in the land use system, the role of trees and shrubs needs to be better documented, if only to ensure that the present, probably very efficient system of resource use is appreciated and maintained.

Impact of the proposed water schemes

3.3.52 In view of the limited supply of water foreseen, no impact of the proposed water schemes on cropping patterns should be expected. The impact on exploitation of trees will be very limited. Traditionally, wood is used for lining wells, but, in comparison with other uses of tree products, the wood requirement for wells is minimal.

3.3.53 The most severe impacts of the proposed water schemes could have been feared in the livestock sector. However, as shown in para. 3.3.18, the seasonal movement of livestock out of the densely settled zone in which the schemes are located is driven primarily by forage shortage. It should be noted that much of the Ogongo - Okalongo scheme area already has access to a perennial DWA water supply, from the raw water canal. It can therefore be expected that the two water schemes will have very little impact on livestock management and that neither the time which animals spend in the area nor the total numbers of animals will increase as a result of the new water points. This is also suggested by observations that some farmers already keep their cattle permanently away from the densely settled zone (Jensen 1990.)

3.3.54 Elsewhere in Africa (e.g. Somalia) it has been observed that the establishment of water points led to an increase in numbers of small ruminants. In the case of Owambo, the lack of data allows no judgement on whether this is likely to happen. Since the turnover in goats is faster than in cattle, an increase in goat population need not be viewed negatively, particularly as the income many well be going to women. Furthermore, such an increase could also be due to increased outmigration of the men and higher numbers of female-headed households.

3.3.55 **The scheme areas are thus not at risk from land degradation induced by the new water supplies. Some areas elsewhere in Owambo, however, are at risk from uncoordinated water development, particularly where this is done for drought relief purposes. Borehole and pipeline development in southern and eastern Owambo may be perceived as necessary relief in the current drought; but their longer term implications need more careful assessment, informed by a better understanding of local environmental conditions.**

A complex system

3.3.56 Land use issues have been presented in some detail here in order to stress their complexity. Environmental conditions are not uniform in Owambo. Their variability is not fully understood; nor are the relationships between the many environmental processes and land use practices which are at work in the area. Stressing the complexity of these issues should also make clear the current risk of oversimplification in assessing their relationship to water sector planning: for example, determining carrying capacities, appropriate stocking rates or stock watering requirements. **As demographic and land use pressure intensify in Owambo, the need for a better understanding of natural resource management systems and land degradation processes becomes more urgent. This would permit more effective planning in the water and regional development sectors than is currently possible. The mission recommends that Netherlands support be considered for a study of these issues, which would provide an adequate data base and clear planning guidelines (para. 9.5.1).**

3.4 Impact on health and sanitation

Current status

Health

3.4.1 Water related diseases are serious causes of debilitation and death in Owambo. The most significant disease is malaria, with more than 100 000 patients treated for malaria at Oshakati State Hospital in 1992 (T. Tueumuna, pers. comm.). Diarrhoea (amoebic or flagellate), in particular childhood diarrhoea, is also a major health hazard in the region. Malaria is approximately five times more common than diarrhoea, according to both Oshakati hospital (Tueumuna, pers. comm.) and Oshikuku hospital[4] records (Potschka, pers. comm.). The simultaneous infection of an individual with both diseases is common and, in combination, these two diseases are often fatal, especially amongst children.

3.4.2 Hepatitis A, a water-borne disease, also occurs in the area but is not as common as malaria and diarrhoea. Cholera outbreaks can occur but their incidence in recent history has been low. Schistosomiasis (bilharzia) does not occur naturally in Owambo but has recently been recorded amongst people associated with the Olushandja dam which receives its water from the Cunene River. Over 70% of the children from this area tested positive for schistosomiasis (T. Tueumuna, pers. comm.). However, the intermediate host snails for schistosomiasis require conditions that are not found in habitats created by piped water. It is highly unlikely that this disease will spread to other regions of Owambo. It will therefore not be important in the two scheme areas.

Sanitation

3.4.3 The vast majority of people do not have access to a toilet and simply use the surrounding land for ablutions. Ventilated pit latrines are in use at some homesteads and increasingly at schools in the areas of concern. Water-borne sewerage does not currently occur in the appraisal areas but is an objective of the Ministry of Education and Culture for schools in general.

Hygiene

3.4.4 Little is known about the hygiene practices of the people of Owambo. Certain obvious unhygienic practices relate to the current use of piped, purified water. Frequently, people and livestock share the same offtake infrastructure for drinking water.

Impact of pipeline schemes

Health

3.4.5 Piped, purified water could have a positive impact on health in the sense that if people use the water correctly the incidence of diseases such as diarrhoea, hepatitis A and cholera will decrease. Piped water could however increase the incidence of malaria if standing pools of water are created through the inappropriate use of the water. A recent survey by the Ministry of Health and Social Welfare suggests that approximately one third of malarial mosquito breeding sites in Owambo are

to a certain extent

[4]Oshikuku hospital is the closest hospital to the Ogongo - Okalongo area.

currently created by piped water (Tueumuna, pers. comm.). The potential of piped water schemes to increase the distribution of malarial mosquitos and to maintain a dry season reserve population of mosquitos is high. Measures to minimize the creation of mosquito breeding sites should accompany any piped water project.

Sanitation

3.4.6 Piped water would have little impact on sanitation in the short term. In the longer term, piped water would mean that water-borne sewerage would become a possibility. This would have positive health impacts provided the sewerage treatment plants were adequately designed. The sewerage works would, however, inevitably increase the availability of mosquito breeding sites, especially during the dry season, and thereby could increase the incidence of malaria. Water-borne sewerage would also increase water demands considerably and thereby shorten the effective lifespan of the scheme. Furthermore, the capital and recurrent costs of water-borne sewerage would be immense and from a sustainability point of view undesirable until such time as considerable economic development has occurred in the region.

3.4.7 Design of both the Ogongo - Okalongo and the Oshakati - Omakango schemes provides for supply of 25 l/child/day to schools, on the assumption that water-borne sanitation systems will be installed there (para. 3.4.3). This may be inadvisable, because:

- installation of water-borne sanitation systems in schools will be very expensive;
- use of simpler latrine types at schools could have a valuable extension effect in surrounding communities;
- treatment of water-borne sewage from schools would be an additional heavy cost and could cause serious health risks if poorly implemented.

Schools could use similar quantities of water for other purposes, such as nurseries or gardens.

Hygiene

3.4.8 Piped water offers greater possibilities for hygienic practices than the use of traditional water sources. Realizing these potential benefits, however, will depend on the nature of the infrastructure provided and on increasing awareness of the value of hygienic behaviour.

Responses to impact on health and sanitation

3.4.9 **Water wastage and associated standing water should be reduced as far as possible.** This could be effected by integrating several remedial and complementary measures (see also sections 8 and 9):

Socially acceptable water point design, by facilitating the visit of water point committee members to a range of existing water points and then designing a new water point in consultation between DWA and Water Point Committees (WPCs);

Instituting a water tariff system;

Producing a WPC booklet that is contextualized for the region with information that will promote responsible behaviour with regard to water point maintenance, cost recovery, health, hygiene, sanitation and environment;

Linking a health worker to the WPC, either as a full or co-opted member, to ensure a broad understanding of the impacts of water wastage and standing water;

Informing other sectors of DWA activities, to encourage cooperation and discourage duplication or conflicting developments. For example, the Ministry of Education should ideally promote the level of sanitation at schools that is applicable to the water situation in the region. A regular newsletter from DWA for other national and regional sectors would be one way of initiating better communication;

Promoting the use of local water sources for livestock. Serious consideration should be given to improved designs that could enhance the collection and storage of runoff and ground water in wells, *omafima* and *gat damme*. The availability of such water would reduce pressure on piped water, would primarily focus on indigenous traditions, and should be cost effective using low-tech construction approaches.

4 Community impact and sustainability

4.1 Introduction

4.1.1 *Experience has shown that where [drinking water and sanitation] facilities are provided without organised support and involvement on the part of the user community, the facilities soon break down and will not be used to best effect.*

(Government of the Netherlands, 1989, 6)

The technical and non technical sustainability of the two schemes under review will depend in large part on the successful involvement of rural water consumers and their local institutions in the planning, installation and operation of the local water supply systems. This participation is in turn related to the social and economic impact of the water schemes on affected rural communities. As noted in sections 1 and 2, the schemes under review are being developed at a time of transition and flux in the Namibian water sector. Nevertheless, **in the two and a half years since independence, tangible progress has been made in establishing institutions and procedures which enhance user participation in the development and operation of rural water supplies.** Most of this progress has been made in Owambo and is therefore directly relevant to these two schemes. This section of the mission report reviews issues of community impact and sustainability arising from the two schemes, in the broader context of regional and national developments.

4.2 Water supply and sanitation policy

4.2.1 Many of the issues covered in sections 4 - 6 of this report are reviewed in the government's draft **Water Supply and Sanitation Policy (WASP).** This document was prepared in June 1991 but is still under review by Cabinet. The mission is therefore unable to quote it, and government departments are unable to commit themselves officially to the policy recommendations it makes. Given the pace of policy development in Namibia since independence, it is clear that the WASP document has been overtaken by events in some aspects. Mechanisms and institutions for rural water supply have been developed which are broadly consonant with the draft WASP principles, but are not specifically mentioned in the document. It remains to be seen whether the WASP recommendations on allocation of departmental responsibilities for rural water supply will be adopted.

4.2.2 In terms of a 1991 financing agreement between the GON and KfW, DWA produced a policy statement on rural water supplies, covering such issues as community participation, cost recovery and environmental management (DWA, 1992b). This document summarised the draft WASP proposals and explained how DWA was proceeding to implement them. It is strongly recommended as the clearest written summary of DWA's commitments in the rural water sector.

4.3 Rural water sources and supply methods

4.3.1 As noted in paras. 2.3.1 and 2.3.27 - 2.3.28, rural people in Owambo traditionally depended on local water sources and indigenous water technology and management systems. Local responsibility for water supply was total; user participation was a function of local administrative institutions. Now, as in many other developing countries, following a period of rapid technological, political and economic change, local participation and responsibility must be recreated if the sustainability of rural water supply is to be assured.

4.3.2 Much of the government involvement in communal area water supplies relates to boreholes. Issues of community involvement and responsibility relate to the training and payment of pumpers, the provision of fuel, maintenance of pumps etc. While many such rural boreholes are supported by DRD in eastern Owambo, central Owambo (where the two schemes are located) is atypical with its far greater dependence on piped water supplies.

4.4 User participation

Institutional development to date

4.4.1 Because of the region's peculiar administrative, social and technological history, as summarised in paras. 2.3.27 - 2.3.28, the conditions for recreating participatory institutions and community responsibility are difficult. Rural people see that their government has the resources to put 'first world' piped water systems on their doorsteps. Politically, they perceive that they now have the long denied right to benefit from these systems. **A strict technical and economic ranking of available water sources and supply methods would give greater emphasis to local and non piped supplies than is likely to be feasible in Owambo.** Rural perceptions of the need to contribute time and effort to the planning and management of local water supplies may be weakened by perceptions that government should now provide what was previously denied. On the other hand, local commitment in Owambo may be strengthened by the political awareness and unity developed during the independence struggle.

4.4.2 Demography and the history of the independence struggle ensure that Owambo has a high profile in the development and implementation of policy for the rural areas. It has led the way in the establishment of institutions for user participation in water planning and management. The process began in 1991 as a drought crisis was identified in the area. In a move which was probably related to the urgent prioritisation of the Oshakati - Omakango scheme (para. 2.6.19), H.E. the President inaugurated the first meeting of the Central Water Committee of Owambo (CWCO) on 14 October, 1991 (DWA, n.d., 4). DWA initially had the impression that this committee had been formed with special reference to the Oshakati - Omakango scheme. At the second meeting held with the committee, on 18 January 1992, this misunderstanding was cleared up and it was decided that the committee would be known as the CWCO (DWA, 1992c, 2).

4.4.3 Also in October, 1991, DWA produced a *Proposal for Phase 2 of the Improvement of Rural Water Supply in Owambo*, which stated that

> *The basic principle that will apply to this phase of the project is that the communities who will benefit from the project should fully participate in its establishment. They should be involved in the planning and participate on a self-help basis in certain aspects of the construction and execution of the project, as well as in the subsequent maintenance and management of the pipeline systems and watering points. The advantages of this approach will be that the local communities can develop and implement their own goals and objectives as well as the fact that the people will gain a sense of value and ownership due to their involvement and active participation.*
>
> (DWA, 1991, 1)

4.4.4 This policy had been developed during 1991 as DWA focused on its first two community based rural water supply schemes in the Okahao South and Onaanda areas of Owamboland. These schemes were launched by H.E. the President on 17 and 18 July, 1991 (DWA, 1992d, 2). The concept of a water committee to represent user interests and responsibilities was developed during planning of these projects. The terms of reference of the Water Committee were confirmed by DWA in October 1991 (see also Boxes 1 and 2):

> *A Water Committee, which is a representative body elected by the community in the particular water supply area, will play a crucial role in the planning of the water supply scheme, assist by organising the local population to supply labour and undertake management and maintenance functions after completion.*
>
> (DWA, 1991, 1)

4.4.5 Following the establishment of the CWCO as a body with regional responsibility, a separate committee was established specifically for Oshakati - Omakango. These 'Water Committees', created for each scheme, were then renamed **Local Water Committees (LWCs)**. For the CWCO itself, the mission could only obtain draft terms of reference (January 1992), which are shown in Box 3.

4.4.6 A third tier of user representation was developed at the local, or 'community' level in the form of **Water Point Committees (WPCs)**. These were primarily supported by DRD, as the agency officially responsible for village water supply. DWA initially envisaged that WPCs would 'be responsible for water supply points which are not part of the bulk water supply responsibility of the Department of Water Affairs. These water points include wells and boreholes' (DWA, 1992b, 14). However, they have since developed as the bottom layer of the institutional hierarchy in DWA piped schemes as well. This was confirmed by DWA in its proposals for operation and maintenance of the Onaanda and Okahao South schemes (DWA, 1992e, 5). Thus, a WPC has been established for each water point in these two schemes. WPCs have been established for each 'community' involved in the Oshakati - Omakango scheme. They report to the LWC for the scheme. An LWC exists for the Ogongo - Okalongo scheme, but no WPCs have been formed there yet.

4.4.7 With the assistance of UNICEF, **DRD is developing a national programme for the establishment, training and support of WPCs.** It is clear that this must be a major and long term operation. A key element must be the training of WPCs (section 4.7; Box 4). DRD's WPC programme is part of a broader effort to stimulate community participation in rural development - a concept which was virtually unknown in Namibia until independence in 1990. Being also responsible for the installation and operation of non piped rural water points (with technical support from DWA), DRD had intended to follow a programmed approach in promoting participatory concepts in communities where new water points were to be installed, and supporting the establishment of WPCs in the process. However, during the 1992 drought emergency, rural water points have been established much faster than DRD could implement its community mobilisation programme. At present, DRD is only establishing WPCs at water points where it, rather than the drought relief programme, has installed the supply (normally a borehole). DRD is thus not yet responsible in practice for the WPCs being established in connection with piped water schemes in Owambo.

4.4.8 In the Onaanda and Okahao South schemes, successful use has been made of **'Water Officers'**, one of whom was selected for each scheme by its respective LWC. These officers worked as technical assistants to the LWCs; assisted DWA and the consulting engineers in local liaison; and were trained in setting out pipe routes. Later, they were also given the role of supervising community labour on trench excavation. To date they have worked without pay. Their input is considered to have been a success (DWA, 1992d, 7), and DWA now proposes that

> *...a Water Agent be put in charge of each of the two schemes respectively. These two Water Agents will be appointed and supervised by the two Local Water Committees and should initially receive a monthly allowance from the Department of Water Affairs for their work. Over the longer term it is envisaged that this allowance will be paid from revenue collected by the Local Water Committees and not the government. The functions and responsibilities of the Water Agents include the operation and maintenance of the schemes, revenue collection and bookkeeping,*

THE WATER COMMITTEE

1. PURPOSE AND RESPONSIBILITIES

The Water Committee will be a representative body elected by the community of a particular area with the aim to:

(i) identify the water needs of the people and stock of such an area and to determine the priority of supply to the respective settlements, schools etc.,

(ii) assist the responsible Government institution with the planning of a water supply scheme which normally comprises of a bulk water supply scheme and a distribution system with a local water reticulation network which may be developed in phases as funds can be raised and will become available to execute the plans,

(iii) do the necessary negotiations to obtain all rights of way and plots needed for the water scheme at no cost to the Government and to see to it that these rights will be respected;

(iv) assist by organising the necessary labour requirements where necessary to construct the water distribution system at no cost to the Government,

(v) organise and manage the eventual operation and daily maintenance of the water distribution system,

(vi) promote the judicious utilisation of water by the various consumers and to guard against any wastage of water,

(vii) to make recommendations on a water tariff structure to be levied to compensate or partially compensate the water supply authority for the operational cost of the bulk supply of water, and

(viii) if so agreed, the Water Committee will also become responsible for the collection of monies due for the supply of water in order to pay the monthly water account to the water supply authority.

DWA, 1991, Annexure 1

Box 1

THE WATER COMMITTEE [continued]

2. *Duties during the planning and design stages of the project:*

   (i) The Water Committee determines the water needs and priorities of pipeline extensions and water supply points,

   (ii) decides, in collaboration with the water supply authority, on pipeline routes,

   (iii) informs and mobilises the community to participate actively in the water project, and

   (iv) forms labour brigades to execute the work for the community's own benefit.

3. *Duties during the construction stage:*

   (i) The Water Committee supervises and controls the participation of labour brigades in trench digging, pipe laying and backfilling,

   (ii) provides safe storage facilities for and guards over materials and tools,

   (iii) organises, in collaboration with the water supply authority, the training of the labour force,

   (iv) organises construction teams for erecting water storage facilities at settlements, and

   (v) initiates the construction of local reticulation networks.

4. *Duties after completion of the project:*

   (i) The Water Committee takes full responsibility for day to day operation and maintenance of the distribution scheme and local reticulation networks,

   (ii) sees to it that water is used with care and that it is not wasted,

   (iii) collects and pays to the water supply authority monies due for water supplied and

   (iv) liaises with the water supply authority on all matters of mutual interest.

DWA, 1991, Annexure 1.

Box 2

A CENTRAL WATER COMMITTEE FOR THE OWAMBO REGION

POSSIBLE ASPECTS TO BE CONSIDERED

1. PURPOSE, RESPONSIBILITIES AND FUNCTIONS

The Central Water Committee may

1.1 Assist mainly in an advisory capacity with all aspects of the planning and development of water supply infrastructure, by being involved in

- *drafting of planning policy*
- *assessment of water needs*
- *determination of water supply priorities*
- *liaison and communication between the population and the State on water matters.*

1.2 Act as the co-ordinating body for all Water Committees, involving

- *formulation of policy regarding functions and responsibilities of Water Committees*
- *establishment of new Water Committees*
- *monitoring and guidance of Water Committees*

1.3 Be involved in applications for water supply, by

- *assisting with drafting of a policy for application procedures*
- *determining of priorities for larger applications*
- *monitoring of progress in handling of applications*

1.4 Assist in solving operational (water supply) problems, by

- *providing liaison between Department of Water Affairs and water consumers*
- *assisting in drafting of policies regarding operational aspects*
- *assisting in managing water supply emergencies*

2. REPRESENTATION, STRUCTURE, WORKING PROCEDURE

1. The Central Committee should be properly representative of the population, and take into account

- *sex*
- *coverage of Owambo area*
- *standing of members in their communities*
- *ability of members to attend regular meetings....*

(DWA, 1992b, Annexure 2)

Box 3

storekeeping and inventory control, training of Water Point Committees and the recording of watermeter readings.

(DWA, 1992e, 5)

4.4.9 It is intended that each water point should have a **caretaker** (DRD, 1992, 34). The caretaker would be appointed and supervised by the WPC. In the case of boreholes, caretakers would be responsible for the operation and maintenance of the machinery. In the case of piped supplies, DWA proposes that they would be responsible for 'ensuring the cleanliness of the water point, promoting the judicious use of water as well as the collection of water tariffs' (DWA, 1992e, 5). Caretakers are already in post for some boreholes, but not at piped water points in Owambo.

Operation of Water Committees to date

4.4.10 The CWCO now has approximately 20 members, of whom one is a woman. It has strong political connections with the ruling party and central government. It liaises with DWA in Oshakati and Windhoek, but some members are also in direct contact with the Deputy Minister for Emergency Water Supply and H.E. the President. Its members have not been elected through any comprehensive democratic process; rather, they represent the generally recognised leadership in the various parts of Owambo. They have had considerable influence in the selection of LWC members for the various water supply schemes.

4.4.11 Valuable consultations have taken place between the Committee and DWA, although the relationship between them during 1992 is best described as a learning process. Misunderstandings have arisen, for example when the CWCO disapproved of DWA's proposal for rehabilitating water points along the south eastern pipeline to Omutsegwonime. Members of the CWCO are primarily concerned with the drought relief programme, and frequently express frustration with what they perceive as the slow progress made by DWA in installing new pipelines and facilities.

What is our work as a water point committee?

Here is a list of some of the work our committee has to do:

- *hold regular meetings*
- *collect information*
- *sensitize the community*
- *work together to build a water point*
- *make rules*
- *work with the community*
- *keep records*
- *take care of money*
- *work with the government, other organisations and water point committees*
- *monitor and evaluate our activities*
- *take care and maintain the water point.*

From draft DRD Handbook for Water Point Committees (DRD, 1992, 18).

Box 4

4.4.12 Despite the friction, the learning process to date has been a valuable one. The representatives of the rural population are able to express their views directly to a technical Department, and have helped to prioritise DWA's 1992 construction programme for Owambo. They have begun to realise the nature of DWA's technical planning and operations, although further training of Committee members would be valuable in this regard. At the same time, DWA has begun to work face to face with a new type of consumer representative, whose priorities are typically very different from those with which the Department has been familiar. Stronger representation at CWCO meetings of the government agencies responsible for health and sanitation would be beneficial.

4.4.13 In an interview with the mission, the vice chair of the CWCO said he expected the Committee would continue to operate after the drought. **The long term role and formal status of the CWCO need to be clarified.** A formal statement on the role of the Committee vis-a-vis DWA and other GON agencies would facilitate the CWCO's work for all concerned. Explicit inclusion of sanitation in the Committee's terms of reference would help promote the much needed integration of the water and sanitation sectors at both community and government levels.

4.4.14 LWCs have been operating longest (since mid 1991) on the **Onaanda and Okahao South** schemes. In an interview with the mission, members of the Okahao South LWC (which comprises three women and six men) stated that they had not been elected, but had been appointed by H.E. the President. Although DWA expects that the LWCs will continue to function in the operations phase of the schemes, the members interviewed seemed to expect that new committees will be formed for that purpose. Their advice on the formation of LWCs elsewhere was that locally popular figures were needed to mobilise the people. A combination of traditional leaders and educated people should be sought. In a review of progress to March 1992, the consulting engineers for these schemes stated that:

> *The fundamental limitation on the function of the WC's is the fact that the members are volunteers, all the members have other occupations and usually the most active members have full-time jobs. This fact limits the time WC members can devote to their project responsibilities.*
>
> *The WC's were not democratically elected by the community, rather they were nominees pushed into their roles at a public meeting when the President himself was present. Thus, some of the WC members "elected" at the project's launch have been unwilling participants, bound by a public duty which was thrust upon them by their peers. Fortunately for these projects the WC members have proved in the main to be responsible and willing representatives of their communities.*
>
> *WC elections should be approached with more caution and community involvement in future projects. Project implementation has been hindered in Okahao and Onaanda by the lack of real WC influence over their communities. Unless a WC is truly respected by the community and headmen it cannot hope to fulfil its main role of mobilising their community to provide voluntary labour, or to settle any disputes about project implementation methods or planning...*
>
> *A further constraint on the efficacy of WC's is their lack of transport. Although the communities have effective traditional communication methods, WC members in Okahao South and Onaanda have been restricted in the number of project sub areas they can visit in a given time period. Once again, careful project initiation could minimise this problem, by ensuring that each project sub-area is represented on the WC. The transport issue severely limits the time WC members can spend on community mobilisation. Both communities have openly criticised the WC's for not visiting some project sub-areas, or for WC members being unknown to them.*

(DWA, 1992d, 7 - 8)

The consultants went on to recommend training programmes for LWC members.

4.4.15 For the **Oshakati - Omakango** scheme, as noted in para. 4.4.2, there was from the outset a strong link between the CWCO and the LWC. The former had a strong influence over the selection of members of the latter (DWA, n.d., 30). The scheme supply area was divided into four sub regions, each of which sent two representatives to the LWC. WPCs were appointed for each community served. According to a member of the LWC interviewed by the mission, there are also committees for three of the four sub regions. Most LWC members are school teachers. It appears unlikely that the LWC provides even representation for all consumers in the supply area. 'Some discontent was voiced when excavation for the secondary lines started and the proposed phasing of construction became evident' (DWA, n.d., 30).

4.4.16 Establishment of an LWC for the **Ogongo - Okalongo** scheme, with the support of the CWCO, was problematic. The CWCO only managed to contact some communities in the supply area at first, and 'it took three meetings to ensure that all settlements in the project area were represented on the committee, and it is still not certain that all are' (DWA, 1992a, Appendix G, 3). No WPCs have been created for this scheme yet. A consultant appointed by the engineers to review socio economic aspects of this scheme reported that

> *For a range of historical reasons, including the war and the autocratic nature of traditional leadership structures, there is not a strong tradition of community participation in the Ovambo region. The DWA's approach, however, has implicitly assumed the existence of a broad based community democracy, without prior knowledge of the area. Although the community may indeed rise to the challenge and participate fully in the project, the process could as easily prove to be partial and incomplete, as certain interest groups are excluded or fail to participate.*
>
> *Considerably more effort would seem to be required to understand the dynamics of the community in which the scheme is to be introduced. The DWA's approach, thus far, is one of "non-interference" in that it believes that the community itself will order its own priorities and will democratically select its own representatives in the interests of all. This may prove to be the case, but it may equally prove to be the converse. Committee members, for example, will have a significant say in the routing of pipelines and could, conceivably, discriminate against unfavoured (or politically voiceless) groups.*
>
> (DWA, 1992a, Appendix G, 4)

4.4.17 At least some sections of the communities in the Ogongo - Okalongo area were so enthusiastic about piped water supplies that they began to dig branch trenches before routes had been planned by DWA and the LWC. Some 15 km of trenches were dug in this way, but some were useless as they did not follow the routes eventually selected.

4.4.18 Predictably, **analysis of DWA's short experience with LWCs to date suggests that more care needs to be taken in ensuring that the committees are fully representative of communities in the service area.** It is becoming apparent that committee membership so far represents current rural power structures rather than any universal franchise or traditional pattern of administration or land management authority. The existing LWCs were created and put to work too fast for proper consultation to take place. This is not surprising. Attempts should certainly be made to slow down the committee creation process enough to enable community consultation, selection and preliminary

briefings to take place in a more orderly manner. More representative LWCs should then emerge, but it would be naive to suppose that totally democratic participation can be achieved through these bodies in the short term. That will be a function of local politics, not water planning.

4.4.19 The Onaanda and Okahao South LWCs worked with DWA and the consulting engineers in identifying water point sites and organising community participation in pipeline excavation. The Okahao South LWC told the mission that they had problems at first persuading people to work on the branch lines. They said that the authority of traditional leaders needed to be combined with more persuasive approaches. Young people were generally reluctant, wanting to be paid for their labour. An attempt by the secretary of the Okahao South LWC to form a 'brigade' of young men to work on trench digging was unsuccessful. On a branch line of the Oshakati - Omakango scheme, the mission met a group of about 30 trench diggers from the local community. Only two or three were men; the remainder were middle aged or older women. They said that younger people wanted water with which to wash, after which they would go to town. They were not interested in doing the digging.

4.4.20 Nevertheless, there was good progress on trench excavation at Onaanda and Okahao South in late 1991, after which participation fell off sharply as people went to their fields during the summer months. In the autumn it picked up again, but there was only a marked increase in the number of people digging after food for work (FFW) payments were introduced. The Okahao South LWC expressed satisfaction with FFW as a way of inducing participation. Participants in other Owambo rural water schemes have also been promised FFW, although not all have yet received it. **In many developing countries, however, FFW has been found to distort incentives for popular participation in rural development. For rural water supply construction in Namibia, it should be used only in cases of proven drought need.**

4.4.21 One important way in which DWA sought to initiate LWC participation in water scheme planning was to arrange socio economic data collection by LWCs. This was done on the Onaanda, Okahao South and Ogongo - Okalongo schemes. While the intention of promoting user responsibility for local planning was admirable, it was wrong to assume that rural people could collect and tabulate the demographic and other data required without significant prior training. Confusion arose in several cases, with survey instruments having to be redesigned and the exercise repeated. In the case of Ogongo - Okalongo, the allocation of the task to the LWC effectively superseded the original requirement for a socio economic baseline study by the consulting engineers (DWA, 1992a, 1); but the data ultimately gathered through the committee remain of dubious quality. The engineers' consultant concluded that:

> *Involvement of the community in establishing population numbers would seem a high risk operation if no other means is available to corroborate the information... Either more time (and possibly funds) must be allocated to the training of community members in data gathering (which is normally a relatively skilled activity) or the exercise must be left to the consultants who will then need to employ professionals to collect the information... Alternatively, once more accurate data becomes available* [from the 1991 Census], *the exercise could be viewed largely as part of the programme to involve communities in the planning of water schemes - that is to say, the data collected in this way will be of less importance than the actual process of community participation.* (DWA, 1992a, Appendix G, 6 - 7)

4.4.22 Because implementation of the Ogongo - Okalongo and Oshakati - Omakango schemes is already so far advanced, experience from the 'pilot' projects at Onaanda and Okahao South cannot simply be used in designing better approaches for these schemes. Rather, experience in all these schemes should be reviewed by DWA, DRD and the agencies supporting them. Further progress can then be made on the basis of the work of the first 18 months. Much will depend on the integration and rationalisation

of government capacity in the rural water sector (para. 2.2.1, 2.2.3). At present, DRD is in the early stages of a long term programme for developing, training and supporting WPCs. This programme has not yet linked up with the WPCs already formed on a preliminary basis for the DWA piped water schemes in Owambo. The CWCO and LWCs are better established in practice, but DWA does not yet have a coherent programme for reinforcing or replicating them in the longer term.

4.4.23 The first step in the rationalisation of policy to support these participatory institutions should be a review of the UNICEF rural water supply programme following the integration of DRD and DWA rural water capacity. A further important task is the **formalisation of LWCs' and WPCs' legal status.** This may be necessary if they are to enter water supply contracts with DWA and levy water charges on end users. Thirdly, as with the CWCO, it is important to **incorporate sanitation in the mandates of LWCs and WPCs,** as part of a programme to integrate the water and sanitation sub sectors.

4.5 Women

4.5.1 Women are in a familiar situation with regard to the development of rural water and sanitation in Owambo. They have the strongest motivation to improve these aspects of rural life, and form the large majority of participants in voluntary construction work such as trench digging. At the same time, they are under represented in the institutions set up to organise such participation. As noted in para. 4.4.10, only one of the 20 members of the CWCO is female. The Okahao South LWC fares somewhat better with three women out of nine members. The Ogongo - Okalongo LWC has two women among its 20 members (DWA, 1992a, Appendix G, 4).

4.5.2 As the socio economic consultant on the Ogongo - Okalongo scheme points out, this situation reflects the patriarchal nature of rural communities in the region (despite their matrilineal inheritance system). Some form of affirmative action could be attempted, to promote better representation of women as the leading participants in rural water and sanitation activities. But it is difficult, and potentially counter productive, for outside agencies to attempt this type of social engineering. Better results are likely to be achieved through the sort of long term sensitization and extension programmes which need to be developed by DRD and DWA in the rural water and sanitation sector.

4.5.3 Some progress in this regard is being made in the related sector of primary health care. A cadre of **Community Health Workers** (CHWs) is now being developed. These volunteers are given some training, and supplies of basic drugs. Development of the cadre is the responsibility of the Ministry of Health, but is also supported by the UNICEF Uukwaluudhi project at Tsandi. So far about 100 CHWs have been selected in the project area, covering about half of the area. 90 - 95% of them are women. The project also has a latrine construction programme. About 60% of the toilet builders trained in this project are women.

4.6 Technical sustainability

4.6.1 The technical sustainability of rural water schemes in Owambo, including the Ogongo - Okalongo and Oshakati - Omakango schemes, depends on three factors:

- The continuing capacity of DWA to operate and maintain the bulk treated water supplies. This issue is reviewed in section 5 below.

- Appropriate technical design of local water infrastructure, notably water points.

- The development of community capacity for the operation and maintenance of rural water supplies.

Technical design

4.6.2 **Most existing rural water points in Owambo are in poor condition.** Design failings and poor maintenance have combined with the absence of a local sense of ownership to ensure that many facilities are leaking, broken or disused. Livestock and human use of water sources is often combined. Most water points have a separate stock watering structure. Often either that or the standpipe(s) are out of action, so that animals and people share the functioning water supply point. Even where both are working, it is common to see stock watering from the standpipe and people collecting water from the stock trough. A number of improvements in water point design have already been achieved, notably in consultation with user communities in the Onaanda and Okahao South schemes. However, the mission identified the need for further improvements to be made to the existing water point design for the two schemes under review. Recommendations are presented in section 8.2.

Community operation and maintenance

4.6.3 As noted in paras. 4.4.4 and 4.4.6, **DWA has already developed the concept of rural water using communities taking responsibility for operation and maintenance through representative committees.** It is now planned that basic responsibility would rest with WPCs, guided by LWCs and with technical support from DWA. For the pilot schemes at Onaanda and Okahao South, DWA has developed an operations and maintenance management system (DWA, 1992e). LWCs would provide overall guidance; Water Agents (para. 4.4.8) would provide technical supervision; routine operation and maintenance tasks would be done by caretakers (para. 4.4.9). Further technical backup would be supplied as required by DWA or appointed local contractors. It is envisaged that Water Agents and caretakers will ultimately be paid from water tariffs levied on area consumers by LWCs and WPCs (DWA, 1992e, 10).

4.6.4 **A coherent strategy for ensuring technical sustainability through community operation and maintenance is thus in place. User representatives are aware of this strategy and are preparing themselves for it,** although in the case of the Okahao South LWC there was an expectation that the existing committee would be replaced by a new one for the operation and maintenance phase (para. 4.4.14). The structure of responsibilities proposed by DWA is reproduced in Table 5.

4.6.5 However, **successful implementation of the strategy for community operation and maintenance will depend on a number of factors.**

4.6.6 **First,** the rationalisation and integration of the rural water supply functions of DRD and DWA must be completed successfully.

4.6.7 **Secondly,** the water tariff policy planned by DWA must be implemented (section 6). LWCs and WPCs must be equipped to levy these charges and so generate the funds to meet local operation and maintenance costs.

4.6.8 **Thirdly,** committee members must be trained in the administrative and financial skills required for revenue collection and accounting, store keeping, materials procurement, etc. (section 4.4.7).

4.6.9 **Fourthly,** Water Agents and caretakers must be given technical training (section 4.4.7).

PARTY CONCERNED	Operation	Maintenance	Revenue Collection and Expenditure	Store Keeping	Training	Policy	Monitoring
Water Affairs (DWA)	- assist LWCs and WAs when requested (Ops N) - take bulk watr readings monthly (Ope N)	- assist LWCs and WAs when requested (Ops N)	- assist LWCs and WAs when requested (Ops N) - pay allowance to WAs initially (Ops N)	- assist LWCS and WAs when requested (Ope N)	- provide technical training to WAs (Constr)	- formulate tariff policy (Management) - formulate bulk water supply policy (Management) - formalize legal status of LWCs (Law Ad)	- monthly inspection visits of schemes (Ope N) - keep record of bulk water demand (Ops) - evaluation of management system (Planning)
Rural Development (RD)					- provide training to WPCs on management of water point	- promote tariff policy - formulate rural water supply policy	- evaluate success of training
Central Water Committee						- assist and advise DWA and RD on policy matters	
Local Water Committee (LWC)	- appoint and supervise WAs	- appoint and supervise WAs	- authorise expenditure - pay DWA for water and repairs - pay for tools and spare parts - book keeping	- appoint and supervise WAs		- implement tariff policy - formulate policy for scheme and offtakes	- ensure compliance with DWA agreement - keep record of water demand
Water Agents (WA)	- operate pipelines and storage facilities - take water meter readings	- maintain pipelines and storage facilities	- collect money from WPCs - buy tools and spares - book keeping	- keep records of inventory	- provide training to Water Point Committees	- implement tariff policy - implement scheme policy	
Water Point Committee (WPC)	- appoint and supervise CT	- appoint and supervise CT	- pay CT - authorise expenditure - book keeping			- implement tariff policy - formulate rules for water point	-keep record of water meter readings
Water Point Caretaker (CT)	- operate standpipes and water troughs - take water meter readings	- maintain water point	- collect money from consumers - buy tools and spares			- implement policies and rules of water point	
Private Consultant			- advise DWA on financial system		- prepare maintenance and management manuals - train LWCs in management aspects		- evaluate success of training

Table 5. Summary of responsibilities of parties concerned with operation and maintenance of Onaanda and Okahao South Water Schemes *Reproduced from DWA, 1992e, 14.*

4.6.10 Finally, intensive support will have to be provided to LWCs and WPCs by DWA over the transitional period during which the necessary institutional development takes place. The duration of this period, and the amount of support required, should not be underestimated (DWA, 1992e, 6).

4.7 Training

Training of Water Point Committees

4.7.1 As noted in para. 4.4.7, a programme for training WPC members is being developed with UNICEF support by DRD, which is currently the Department responsible for these Committees. Central to this effort is the draft ***Handbook for Water Point Committees in Namibia***. A first version of this was produced in October, 1991. It was then decided that this document was more appropriate for extension workers than for the intended readership, i.e. WPC members. A second, less complex draft has now been prepared. It is to be piloted from February 1993, and reevaluated in July of that year.

4.7.2 Although the central training instrument for WPCs should thus become available in the course of 1993, it will of course be a long term task to train WPC members in Owambo and elsewhere in Namibia, and to sustain the institutional development they achieve. Programme 6 (Rural Water Supplies) of the Namibia/UNICEF Country Programme of Cooperation (Annex 4) provides a framework for supporting this process. Although UNICEF has secured funding for this programme for the time being, it may be appropriate to negotiate Netherlands support for it at a later stage. The programme may have to be partially restructured if, as expected, DWA takes official responsibility for the rural water sector and thus becomes the counterpart agency for this UNICEF input.

Training for the CWCO and LWCs

4.7.3 At present, there are no formal training arrangements for members of the CWCO or LWCs in Owambo. These institutions have developed so fast that members have so far only received briefings at meetings from DWA officers. **The provision of structured training programmes for these committees is an urgent necessity if they are to be a permanent feature of sustainable rural water management.** Arrangements should be made for the UNICEF supported WPC training programme to be extended to cover the CWCO and LWCs. Additional Netherlands support may be appropriate in this regard.

Training for Water Agents and caretakers

4.7.4 In its proposals for an operations and maintenance management system for the Onaanda and Okahao South schemes, DWA states that

> *Until such time as a rural water supply training unit is established within either the Directorate of Rural Development or the Department of Water Affairs, the technical training required by the Water Agents and the Caretakers... is to be given by the Construction Division of the Department of Water Affairs. The Construction Division has already been involved with the training of Water Agents during the construction phase of the project.*
>
> (DWA, 1992e, 11)

4.7.5 In the long term, **the artisanal training curricula and facilities at DWA's Von Bach Training Centre, 60 km north of Windhoek, should be developed to provide training programmes for**

Water Agents and caretakers. At present, this centre has 12 instructors. Training is undertaken in clerical skills, security, operation of water works, operation of vehicles and earth moving equipment, concrete technology and bricklaying, pumps and engines, welding and electrical installations (Annex 5). A basis clearly exists for training Water Agents and caretakers, but curricula would have to be modified for this purpose.

Other training initiatives

4.7.6 DWA is currently reviewing plans for a two year project to support the development of a sustainable community based approach to improved rural water supply. The project would be funded by GTZ and would be implemented with the assistance of the International Water and Sanitation Centre (IRC) in the Netherlands. The objective of the project would be to assist the GON to:

- develop and test a community based approach to the development, operation, maintenance and financing of improved rural water supply systems;
- develop the necessary skills and capacity to support a community based approach to sustainable and cost effective rural water supply improvements.

The project is expected to begin in mid 1993. After three phases of sector review and development of strategies and methods, the final phase of the project would include a three month period for development and testing of skills development and training packages for extension staff, and a two week training of trainers workshop. Some adjustments may have to be made to project arrangements if DRD rural water supply responsibilities are merged with those of DWA. In any event, it will be important to harmonise the input of this project with that of the existing UNICEF programme.

5 Institutional issues

5.1. Capacity

5.1.1 **The sustainability of the schemes under review, and of rural water supplies in Namibia generally, will depend not only upon effective user participation but also upon the institutional capacity of government to support the rural water sector.** At present, this capacity is divided between two agencies - DWA and DRD - and some initiatives have already been taken to strengthen both. DWA and DRD have very different characters and backgrounds. DWA is well established and well resourced, but has traditionally been concerned only with bulk water supplies. It has little experience with the social, community and institutional aspects of rural water supply. DRD is a much smaller agency, dedicated to these latter types of issue but so far lacking the resources to support rural water development on a large scale. As has been noted, it is DWA rather than DRD which is effectively responsible for rural water supplies in Owambo. DWA is likely to be given formal responsibility for the rural water sector (paras. 2.2.1, 2.2.3), which implies that some of DRD's capacity and experience would be merged with DWA.

5.1.2 Issues of institutional capacity are thus likely to revolve around DWA (whose current establishment is shown in Table 6). This will necessitate **a major effort to retrain or reorientate existing planners, managers and engineers who work in the rural water supply sector, in order to help them to move from a top-down first world technology approach to a community based appropriate technology approach. In addition, training programmes will be required for more engineering staff to support the rural water sector, preferably drawn from the rural communities they are to serve. Furthermore, at the project and local level there will be a major need for extension workers skilled in participatory and community mobilisation techniques to work with user groups; health and hygiene educators to work with communities; and community level technicians to operate and maintain facilities.**

5.1.3 **One foundation for institutional sustainability will be laid when the current uncertainty about allocation of responsibilities between DWA and DRD is brought to an end and capacity is rationalised in accordance with the decisions reached.** As noted in paras. 2.2.1, 2.2.3, DWA has already made detailed proposals on the structure of a proposed Directorate of Rural Water Supply, and a decision on this is awaited from the Public Service Commission. One concern of the PSC will doubtless be control over growth in the civil service. This may be why the alternative of allocating various parts of the rural water function to the different existing Directorates of DWA is also under consideration. This option would be much inferior in terms of delivering a coordinated and effective service to rural water users.

5.1.4 An important element of the rationalisation of government capacity must relate to **sanitation.** At present this is a grey area, falling between DWA, DRD, the Ministry of Local Government and Housing, and the Ministry of Health and Social Services. While DWA is prepared to absorb the rural water supply sector, and tackle the restructuring and reorientation this implies, it is reluctant to take on sanitation as well. The Ministry of Health and Social Services and the DRD are likely to be the leading actors, but this is the weakest area of GON institutional capacity at present. Strengthening and clarifying capacity in the sector should be an urgent priority for the proposed national Water Supply and Sanitation Committee.

Table 6. Establishment of DWA at 30 September, 1992

Classification of post	Owambo*	Namibia	total
	Posts filled	Posts approved	Posts filled
Deputy Permanent Secretary	-	2	2
Director	-	5	5
Divisional Head	-	15	15
Professional	3	84	46
Technical	2	222	138
Clerical	20	312	207
Artisan Staff	142	573	408
Security Personnel	19	136	95
Waterworks Officer	45	320	227
Labourer	280	725	543
Other	-	48	40
Total	511	2 442	1 726

* Figures include Planning Office, Operations (North) and Construction personnel.

5.2 Policy

5.2.1 A second necessary foundation for institutional sustainability will be adoption by government of an official water and sanitation policy. DWA is already operating to most intents and purposes as if the current draft had been approved. Subject to that approval, it has committed itself to applying the policies set out in the WASP statement (DWA, 1992b).

5.3 Training

5.3.1 Many of the training initiatives relating to community participation (section 4.4.7) will also support the development of institutional capacity in DWA and other government agencies. However, more structured programmes need to be developed specifically for DWA, in both the technical and the community water supply fields.

5.3.2 DWA has made arrangements via GTZ for the pretesting of a training course package currently being developed by IRC and WHO, entitled *Management of Operation and Maintenance in Rural Drinking Water Supply and Sanitation*. This package targets working level managers, engineers, extension officers and health workers involved in the water and sanitation sector. Pretesting of the package is planned for April, 1993.

5.3.3 The UNDP/World Bank Water and Sanitation Programme is currently developing plans for a **Training Network Centre** in Namibia. The centre will be linked to the International Training Network and will provide training on key topics to decision makers, managers, engineers, technicians, field workers and trainers working in the water and sanitation sector, or build up the capacity of other local institutions to undertake such training. The centre is also to act as a catalyst for the promotion of dialogue among sector policy makers, and will support the development of training materials for the sector. It is envisaged that the centre will initially be financed by the UNDP/World Bank Programme, but should move to be self financing in the longer term. It is expected that the centre will be established during 1993.

5.3.4 With regard to **artisanal and middle level technical training**, substantial capacity already exists within Namibia at the DWA Von Bach Training Centre (para. 4.7.5 and Annex 5), at the Technicon and at the College for Out of School Training. Because of the similarity between Dutch and Afrikaans, which is widely spoken in Namibia, it may be appropriate to consider provision of scholarships in technical subjects for studies at technical middle and high schools in the Netherlands.

5.3.5 It would be uneconomical to build **professional and degree level training** capacity in all the engineering and related fields in which DWA needs to develop its staff complement. As in the past, most of this training must continue to be provided at foreign universities and specialist institutions. **As DWA expands into the rural water sector, it is particularly important that Namibians with backgrounds in the communal areas be given the opportunity to train at senior professional level and serve the sector through DWA.**

5.3.6 **With its well established expertise and training capacity in the water sector, the Netherlands would be well placed to provide high level professional training to current and future DWA personnel.** Institutions such as the IRC and Delft Technical University (which offers an international course in English) would be well placed for this purpose. **The mission recommends that a special programme of Netherlands training support at the technical and professional levels be developed** (para. 9.3 and Annex 1, para. 21.3). **If a long term Netherlands commitment to the Namibian water and sanitation sector is developed, training should be a major component.** This input should of course be coordinated with other support to water sector training, including the activities outlined in paras. 5.3.2 and 5.3.3.

6 Cost recovery

6.1 Introduction

6.1.1 *A ...basic requirement for the sustained development of the D/S* [drinking water and sanitation] *sector is that capital costs (= interest and depreciation), operating costs (= costs of usage) and maintenance costs (= repair costs) must be covered. The capital costs of D/S activities are generally funded in whole or in part in the form of investment capital provided by external development banks or donors. Operating and maintenance costs are normally charged to the users and the national D/S agencies... The Netherlands will... operate on the principle that utilisation and maintenance costs should be borne by the users or the national authorities.*

(Government of the Netherlands, 1989, 9, 17)

The Dutch policy memorandum quoted above goes on to suggest that 3 - 5% of the average household budget is a reasonable amount to expect users to pay for water utilisation costs.

6.1.2 **Charging rural people for water drawn at community water points is a politically sensitive issue in Namibia.** After generations of colonial oppression and a bitter independence struggle, it is understandable that the rural people of Owambo and other communal areas might now feel their government should provide them with at least this type of basic service, and not charge them for it. There has been a generally encouraging response to government's policy that rural people should nevertheless contribute their labour to the introduction of such services. Not surprisingly, there is an ambivalent reaction to the proposal that, after making this contribution, communal water consumers should then pay water charges. Nevertheless, H.E. the President stated publicly at the launching of the Onaanda and Okahao South schemes that users of the new water supplies would be expected to pay for them (A. Nehemia, pers. comm.). Allegations that politicians of the ruling party have promised free water supplies during recent election campaigns in Owambo could not be substantiated by the mission. The vice chair of the CWCO told the mission that users are generally aware that they will be required to pay for water in the future.

6.1.3 **At present, perceptions of available and appropriate water sources in rural Owambo are unduly distorted towards one particular type of supply, i.e. DWA's reticulation system** (para. 2.3.28). **The curious situation has arisen in which some 60% of the total treated water supply reticulated by DWA in Owambo is consumed by livestock. Water wastage is substantial at tap points and** stock troughs, not to mention deliberate pipe and canal breakages. **It is clear that a more economically rational use of all available water sources will be stimulated by the levy of charges for all the water supplied by DWA.** Rural people are likely to reassess the option of using wells and *gat damme*, particularly for livestock watering. A number of project initiatives in Owambo are already supporting improved technology for traditional water points. DWA should also review its programme for rehabilitating existing *gat damme*, which collect surface water for use in the dry season.

6.2 Namibian policy

6.2.1 **Emerging GON policy and DWA practice on cost recovery are broadly consonant with the principles quoted in para. 6.1.1 and the recommendations made in para. 6.1.3.**

The different cases of and points where the payment of water tariffs will be required are as follows:

(a) *Bulk water supplied to urban areas, in which case the local authority will pay the bulk water tariff and recover the tariff plus the distribution costs from the consumer.*

(b) ***Bulk water supplied into a rural water distribution pipeline network, in which case a Local Water Committee might be required to take the responsibility for paying the bulk water tariff and recovering the money from the communities served.***

(c) ***Water supplied from a bulk water supply pipeline to an individual consumer connected to a bulk water supply pipeline, in which case the consumer will pay for the water supplied to him.***

(d) ***Water supplied from a bulk water supply pipeline to a number of consumers located in a small village, in which case the Directorate of Rural Development in the Department of Agriculture and Rural Development will be responsible to pay the bulk water tariff and to recover the cost from the consumers in the community.***

(e) *Water supplied from a local water source like a borehole or a well not connected to any bulk water supply infrastructure, in which case the Directorate of Rural Development will have the responsibility to recover the costs.*

(DWA, 1992b, 17)

6.2.2 The mission understands that the above statement conforms with the WASP statement currently under review by the GON. In a letter of February 1992, the Permanent Secretary of the NPC stated to the MAWRD that

> *...it is formally confirmed that the principles governing the tariff policy of your Ministry as spelled out in the above-mentioned document* [DWA, 1992b] *are consistent with the overall development objectives of the Government of Namibia. Allow me, however, to point out that the policy is subject to Cabinet approval.*
>
> (DWA, 1992b, Annexure 7)

6.2.3 **A key principle in emerging GON policy, as apparently stated in the WASP document and already applied by DWA, is that rural water installations should be considered to be the property of the communities that use them.** Routine operation and maintenance costs are thus to be met by the community. DWA is developing the concept that water users' representative committees will take these responsibilities. As far as DWA is concerned, WPCs or in some cases LWCs will be the end users and will be charged for all water consumed in the systems for which they are responsible. These bodies will be helped to develop internal mechanisms for recovering these costs from consumers. (The Okahao South LWC already operates a bank account.) All new water points in Owambo, including those on the Ogongo - Okalongo and Oshakati - Omakango schemes, are equipped with water meters for this purpose (paras. 2.6.9 and 2.6.18).

6.2.4 A measure already being taken by DWA to promote the concept of piped water as a chargeable commodity is its campaign against illegal connections in Owambo. It is estimated that there are 1 200 of these on 700 km of pipelines. During an amnesty period which will last to the end of 1993, those who have made illegal connections are being encouraged to submit formal applications for offtakes. Meters are then installed and charges are levied (DWA, 1992b, 5, 15).

6.2.5 DWA stresses that it itself already recovers all its costs. The costs of rural water supplies are currently paid to DWA by DRD. The July 1991 increase in the water tariff charged by DWA to DRD in Owambo (to R 0,90/m³) could be kept relatively low because operating costs had been substantially reduced by the Netherlands funded rehabilitation of the Calueque pump station (para. 2.4.2). Cross subsidies are applied from the urban to the rural water sector, and will be increased if the current move towards a uniform tariff is completed. DWA states current policy with respect to bulk water tariffs as follows:

1. *The long term objective is to have all domestic consumers pay for water at the actual supply cost, but when the affordability of the water does not allow full payment, some form of payment should be obtained even if it is less than the full supply cost.*

2. *In the case of commercial undertakings such as mines, the full economic tariff will be levied because the water is a productive resource input to generate profits.*

3. *Differentiated water tariffs whereby the water supplied from individual water schemes is charged for at a tariff related to the actual cost of water supply, will be levied at each scheme.*

4. *In cases where the full cost to supply water cannot be recovered from the consumer, at least the operating cost component should be recovered while an attempt should be made to recover some of the capital cost components, depending on the circumstances relevant to the water project which may be in the long term national interest or multidisciplinary, or multipurpose in nature.*

5. *Although the recovery of the full, actual cost for the supply of water is the main objective, and should eventually be attained, a realistic assessment of a variety of economic, social and political considerations will always be necessary within the framework of a community orientated drive towards equity, efficiency and affordability of water supplies.*

6. *The implementation of the water tariff policy should be directed at bringing home to the consumer the value of water as a scarce commodity in an arid country.*

(DWA, 1992b, 4)

6.2.6 If the anticipated transfer of DRD rural water supply responsibilities to DWA takes place, the current mechanism of internal payments from DRD to DWA should presumably fall away. Situation (d) quoted in para. 6.2.1 above will be treated in the same way as situation (b). **It is urgent that final Cabinet approval of the WASP statement be forthcoming, so that DWA can proceed with the next steps of its rural cost recovery programme.**

6.3 Costs and affordability in the scheme areas

6.3.1 The recent NISER socio economic survey in preparation for the Ogongo - Oshakati project (para. 2.1.8) covered the zone within 10 km of the proposed canal/pipeline route; the Oshakati - Ondangwa area; and communities to the north, east and south east of Ondangwa. Income data have been tabulated in draft for a total of 242 sample households. The survey found that

> *...most households have sufficient multiple income and savings to pay for potable water on a monthly basis. There is a high disparity in the level of income received*

within households, with a median annual household income of R 1 506 and a mean of R 3 274. Monthly savings vary from between R 10 and R 2 000, with a median value for the survey area of R 100 per month. Inevitably there will be situations where consumers are unable to pay for water. Poorer members of the community may find it difficult to pay for water on a regular basis (monthly). During drought years, when crops fail and stock are threatened, an increasing number of households may find it difficult to pay for water. Non-payment may be minimised through increased community participation and a public relations campaign by the Department of Water Affairs aimed at emphasising the importance of water, the necessity of households to pay for water in order to maintain and extend the system, etc.

NISER, 1992, Vol. 1, 5.

6.3.2 Data for the Ogongo - Oshakati part of the sample survey (53 households), quoted in para. 2.1.8, do not differ greatly from the overall figures shown above. Income levels in the Ogongo - Okalongo and Oshakati - Omakango scheme areas would be very similar.

6.3.3 In the NISER survey area overall, 64 % of respondents said they would be prepared to pay for water piped to their household site. The mean amount households were prepared to pay per month was R 17; the most commonly quoted amount was R 10 per month; the median was R 13. Willingness to pay was higher in the more urban Oshakati - Ondangwa area (67 % of respondent households) and in eastern Owambo where there is less surface water (66 %) than in the Ogongo - Oshakati area (57 %). This might be because those in the Ogongo - Oshakati area have been able to use free (untreated) water from the existing DWA canal for many years. However, those who did state willingness to pay in this area quoted a mean payment of R 21 per month, with a mode of R 10 and a median of R 12. In Oshakati - Ondangwa the mean was R 14, the mode and median both R 10. Figures for eastern Owambo were similar (NISER, 1992, Vol. 2, 44). R 10 is less than 1 % of a monthly income of R 1 500.

6.3.4 Taking the Ogongo - Okalongo scheme as an example, the mission calculated total capital costs to be R 2,77/m^3 and total operation and maintenance costs to be R 1,36/m^3. R 10 per month would cover the O&M costs of supplying 7 350 l of water at this rate. Over a 30 day month this would yield 29,5 l per person per day for a household with the mean size identified for the Ogongo - Oshakati area (8.3 persons; see para. 2.1.6). The design report for Ogongo - Okalongo assumed a domestic consumption rate for rural households of 25 l/person/day (DWA, 1992a, 7). The design report for the Oshakati - Omakango scheme assumes 30 l/person/day (DWA, n.d., 5). By comparison, the draft results of the 1992 NISER survey for the Ogongo - Oshakati scheme suggest total household domestic consumption of 135 - 160 l/day at present (NISER, 1992, 24 - 27).

6.3.5 **These data suggest that a water tariff covering operation and maintenance costs would be broadly affordable for households served by these schemes.** They assume, of course, no stock watering.

Realistic assumption ?

7 Environmental and regional planning

7.1 Water sector planning: links to other sectors

7.1.1 At the national level and in any specific region like Owambo, water sector planning needs to be guided by clear water and sanitation policy. It should also relate to:

- **environmental policy and plans**, founded upon adequate and dynamic environmental *information systems* and including natural resource management policy and programmes for key sub sectors like livestock and range management or nature conservation;

- **regional development and physical planning**, incorporating such elements as economic development policy, settlement policy, spatial planning and infrastructure planning (of which water is one component).

7.1.2 A **regional water master plan** can be a useful way of articulating water policy for the region and linking it to these other policies, plans and programmes. Given the rapid pace of policy development since the production of the last water master plan for Owambo in 1990, it might already be useful to update this plan, despite the fact that related elements of the planning framework may not yet be in place. Ultimately, it may also be necessary to produce such plans for other regions. Any regional water plan should cover the activities and responsibilities of all Government agencies involved in the sector. At present, DWA prefers not to update the Owambo water master plan until a regional development plan is in place. Nevertheless, preparations for the revised water master plan should begin (para. 8.4.1.4).

7.2 Environmental planning: current status

7.2.1 Namibia presented a **Green Plan** to UNCED in Rio de Janeiro. This document, still under review by Government, will in due course be developed into a national environmental action plan. Initial implementation may be supported by the World Bank. The **Directorate of Environmental Affairs** (DEA) of the Ministry of Wildlife, Conservation and Tourism (MWCT) will be the responsible agency.

7.2.2 The **National Planning Commission (NPC)** has responsibility for coordinating the planning procedures of line Ministries and ensuring that key planning principles are consistently applied. At present, the NPC has no capacity, experience or procedures for these tasks in the environmental field. MWCT proposes that legislation be enacted to create the post of **Environmental Commissioner**, housed within the NPC but employed by the DEA. The Commissioner would be supported by an **Environmental Board** which, *inter alia*, would ensure the execution of environmental impact assessments for all capital development projects. MWCT would provide policy and technical support to the Commissioner.

7.2.3 As the foundation for environmental planning at the regional level, the DEA is developing methodology for **environmental profiles**. These profiles would inventory natural resources and analyse relevant environmental and socio economic issues. Environmental data bases would be established, using a geographical information system (GIS) in the DEA which could subsequently be updated through monitoring systems. An interministerial working group would ensure that the profiles are a useful planning tool for all sectors. It would be guided and coordinated by a steering committee. A project proposal has been prepared for a pilot profile of East Caprivi, which might take six to eight months to complete. Plans will then be drawn up for coverage of the remaining 12 regions, which might take

up to five years. Through the office of the Environmental Commissioner, the NPC could ultimately take responsibility for the maintenance of regional environmental profiles and coordinate their effective application in line Ministries' planning procedures.

7.2.4 The DEA has also developed and is implementing a programme for **conservation planning in the communal areas**, intended to ensure local participation in the development of sustainable natural resource management and rural production systems. A series of survey, consultation, institution building, planning and implementation procedures is being developed and implemented. Pilot activities have begun, with some work already completed in West and East Caprivi, Bushmanland and elsewhere. Coverage of Owambo is expected fairly soon. Some support for the DEA programme has been provided by USAID and WWF. An additional major USAID input will be made through the Living in a Finite Environment (LIFE) project, due to commence in 1993.

7.2.5 The **Namibia Institute for Social and Economic Research (NISER)** has been invited by the DEA to provide monitoring services and methodology for the socio economic components of the community natural resource management programme, and to undertake periodic external appraisals of the progress made. NISER's initial project proposal for this monitoring and evaluation task covers work in Bushmanland and East Caprivi from 1993 to 1995.

7.2.6 A major component of environmental planning in the communal areas must address the complex issues arising in the **livestock production and range management sector**. A GTZ funded Sustainable Animal and Rangeland Development Project in the Department of Agriculture is making an initial effort to tackle these issues in six pilot areas in Hereroland and Namaland. The tasks of local institution building, training and developing consensus among range users are intricate and time consuming. Progress will be slow. It has now been decided that this project should be extended to Owambo. The sector demands urgent attention in Owambo, but additional staff resources will be required. One more team member has already been identified by GTZ. Intensive study of current management systems and range ecology will have to precede any practical initiatives.

7.3 Regional and physical planning: current status

7.3.1 The Ministry of Lands, Resettlement and Rehabilitation is implementing a Danish supported **Land Use Planning and Land Administration project** in close collaboration with the DEA. This project is intended to develop local planning structures and methods, and has been piloted in Bushmanland in conjunction with the DEA's conservation planning activities.

7.3.2 At the national level, the NPC has central responsibility for development planning. The identification of structures and procedures for giving regional and physical dimensions to the development planning process is still at a preliminary stage. Ultimately, the 13 Regional Councils, supported by the Ministry of Local Government and Housing might take local responsibility for economic and physical development planning, but it will take many years for the necessary institutions and capacity to be built up.

7.3.3 A UNDP project proposal for a **National Physical Development Plan Study** is currently under review. This study would comprise a series of analyses of economic and service sectors, Government facilities, natural resources and resource use; establish data bases and information systems; review the institutional and legislative structure for physical planning; and make recommendations for the future implementation of physical planning at the national level. One task mentioned would be to compile information on existing water resources, distribution, supply and demand by region for rural and urban areas. The study would be undertaken with the NPC and MLGH, for which in service

training would be provided. The proposal also includes a pilot Regional Physical Development Plan Study.

7.3.4 Some time earlier, the NPC invited NISER to produce a pilot outline of a regional plan. This is being produced for the four new northern regions containing Owambo. The work is supervised by an interministerial steering committee on which DWA and the DEA are represented. A draft document is to be submitted in January 1993 and reviewed at a workshop in February. It is intended to review key development issues in these regions and present strategic guidelines for use by line Ministries in their sectoral and project planning for the area. It is not intended to be a regional physical development plan. A possible sequence of events following completion of the NISER exercise would be the development of similar strategic guidelines for the other regions of Namibia. These and the national physical planning resources built up under the UNDP programme might then lead to the preparation of regional physical plans by Regional Councils.

7.4 Potential Netherlands support for Namibian water and environmental planning

7.4.1 As noted above, the Namibian water sector is integrally related to a broad range of environmental issues and environmental and physical planning requirements. Netherlands support to the water sector must therefore recognise this broader context. It cannot be effective, and its environmental soundness cannot be guaranteed, if related policies and initiatives are not in place at the national and regional levels and guaranteed by the commitment of the Government of Namibia. The commitment should be apparent now. Development of policies, procedures and programmes will take time. It may be appropriate for the Netherlands to support some components of this broader task.

7.4.2 Namibia's administrative history provided the independent nation and the new Ministries of Government with very little appropriate background in environmental and social policy, institutions or procedures. Nevertheless, a genuine and growing commitment to environmentally sensitive planning can now be identified at many levels in Government. A major task remains in familiarising Ministries with environmental issues and procedures and in developing the capacity for this growing awareness to be effectively applied.

7.4.3 In consultation with the responsible GON agencies, the mission identified some ways in which Netherlands support might usefully be provided to environmental planning in Owambo and Namibia, thereby rendering water sector development more sustainable. These are proposed as 'complementary measures' for further investigation (para. 23, 1.6 and section 9).

8 Remedial measures

8.1 Introduction

8.1.1 Having investigated the Ogongo - Okalongo and Oshakati - Omakango schemes, the mission proposes a number of measures which should be taken as part of the implementation of the schemes. These are termed remedial measures, as they would directly enhance the sustainability of the schemes. Adoption of the remedial measures would constitute the reformulation of the schemes on which the mission was asked to advise. Some of them refer directly to design modifications. Others are parallel actions which should be executed in a package with the two schemes.

8.1.2 The salient features of the two schemes are so similar that it is not necessary to propose a separate set of remedial measures for each. Both are rural water supply schemes whose original design as bulk transfer facilities has been updated in a somewhat *ad hoc* manner during a period of rapid policy transition in DWA. It could be argued that Oshakati - Omakango differs significantly from Ogongo - Okalongo, since 65 % of its capacity is still for bulk transfer to the northern part of the Herringbone system. However, the latter system is in turn largely dedicated to rural water supplies in other parts of Owambo. It is therefore artificial to suggest that the issues arising from rural water supply by the two schemes in their own service areas are less applicable to Oshakati - Omakango because it is partly a bulk transfer scheme. On the other hand, it may be some time before the remedial measures proposed in the first instance for these two schemes can be extended in full to other areas of the Owambo rural water sector.

8.2 Water point design

8.2.1 The design of water points has an influence on the sustainability of any rural water supply project. Water point design should strive to arrive at infrastructure that is socially acceptable, compatible with livestock requirements, minimizes water wastage and standing pools of water, has minimal maintenance requirements and maximal durability, all at an acceptable cost.

8.2.2 In recognition of the complexities involved, DWA has adopted a flexible and experimental approach to rural water point design. Currently, several designs are in place throughout Owambo and each new scheme incorporates certain unique design features. All existing designs, however, appear to suffer from one or several shortcomings.

8.2.3 Existing problems include:

- Inadequate drainage, often leading to standing water surrounding the water points and erosion below the concrete foundations of the water point infrastructure;
- Inadequate protection from livestock, leading to erosion below the concrete foundations;
- Inefficient use of water associated with broken pipes or unattended opened taps contributing to the above mentioned pools of water that often surround water points;
- Inadequate hygiene and increased mosquito breeding sites associated with this standing water;
- Drinking troughs that are inappropriate to small stock;

- **Clothes washing facilities that appear to be underutilized** by the supposed beneficiaries.

8.2.4 Some of these problems are exacerbated by the irregular supply of water in the pipelines. This results in people deliberately creating 'storage' pools at water points, leaving a tap open when there is no water with the hope that some will flow later on into the drinking trough and/or breaking into the pipeline with the hope of finding some water. These problems should improve when water supply in the pipelines becomes more reliable and during the wet season when cattle have access to water in the *oshanas*, reducing demand on piped water. Furthermore, problems of wastage will probably be dramatically reduced once the principle of cost recovery is instituted for these rural water supply schemes and once caretakers are appointed for each water point.

8.2.5 DWA is well aware of the problems associated with existing water point designs as well as the more general problem of unreliable supply. One recent attempt to solve the supply problem concerns the placement of storage tanks at water points. It is hoped that these tanks will fill during off-peak periods and thereby increase water security. Storage tanks are part of the water point design for the Oshakati - Omakango and Ogongo - Okalongo schemes and are also in use along the new Omapale pipeline and the Onaanda - Okahao pipeline. Currently there is not sufficient purified water available for this system to operate and frequent water shortages remain an issue in distal parts of the schemes.

8.2.6 Features in an improved water point would probably include the following:

- **storage facilities** to breach gaps in water supply in the pipeline;
- **separate facilities for livestock watering, drinking water for people and clothes washing;**
- **drinking troughs that are low enough for small stock** but acceptable to large stock;
- **drying facilities for clothes;**
- **comfortable conditions for clothes washers** (shade);
- **good drainage** at water points (difficult in view of the scarcity of large aggregate in Owambo), or facilities to channel 'waste water' into productive use;
- **fencing around human water points** to protect the surroundings of foundations from excessive trampling and erosion;

Some but not all of these features are found in existing water points. It is possible that previous attempts to solve some of the problems have not involved the supposed beneficiaries sufficiently in the decision making process.

8.2.7 One simple design would include:

- **storage tanks:** if elevated, these could provide shade to clothes washers and the location of the washing point should be sited accordingly;
- **an elongate livestock drinking trough** approximately 300 mm high situated on a concrete slab (the trough could be filled by herdsmen and would not necessarily require float valves);

- a fenced-in area containing:
  * a tapstand on a concrete foundation;
  * a concrete ring surrounding a shade tree.

  The fence could be used as a clothes line. People would be expected to supply their own washing basin. (Finding an acceptable and robust design for a public washing basin seems to be difficult.) The fence should be offset from the concrete foundation to provide a skirt of stable sand. Grass will probably grow on this skirt, thereby further stabilizing it;

- a drainage system for all concrete foundations with an inwards fall, to collect spilt water, and a pipe to feed the water to a shade tree. A utility tree (eg fuelwood, fodder, timber, fruit etc.) or vegetable patch that uses the spilled water is probably not desirable in that it may encourage people to use more water to promote growth.

8.2.8 The mission reviewed these options in some detail with DWA. It was agreed that DWA would hold further consultations with the consulting engineers, which would lead to preparation of variation orders on the contracts for water point construction on the two schemes. **The preliminary estimate of the extra cost of the improved design is R 625 000.**

8.2.9 It is recommended that DWA continues to maintain its flexible, experimental approach to water point design and that water committee members are afforded the opportunity of visiting several different designs *in situ* to facilitate rational choice and maximize the probability of social acceptability.

8.3 Location of water points

8.3.1 Although the location of most of the water points for the Oshakati - Omakango scheme has already been decided, this has not yet been done for Ogongo - Okalongo. The maximum number of water points is related to the design capacity of the system, but within those limits **user representatives should be given maximum flexibility in determining the location of taps and troughs.** Good progress has been made in the last 18 months with this consultative planning, but the mission was told by the Okahao South LWC that they were allowed to vary water point design within a set distance each way of a regular spacing prescribed by DWA. DWA should review whether, subject to overall design constraints, full flexibility cannot be given to LWCs in siting water points.

8.3.2 A related concern is the **representativeness of these committees as they locate branch lines and water points.** As noted in paras. 4.4.14 - 4.4.18, experience to date has not been entirely satisfactory in this regard, partly because LWCs have been introduced so fast. Some people in the Oshakati - Omakango service area may feel that their views on the location of water points have not been taken into account. In the case of Ogongo - Okalongo, there may still be time to check whether the LWC has fully represented all local needs.

8.3.3 This remedial measure has no additional cost implications.

8.4 Additional capacity for DWA Oshakati

8.4.1 There is already an agreement for the Netherlands to provide five supplementation experts to work for DWA in the rural water sector. Two arrived recently. **The mission recommends that the remaining experts be skilled in the social, economic and community mobilisation aspects of rural water supply planning rather than being primarily engineers.** Provision of these skills would help DWA

tackle the priority of integrating the technical and the non technical aspects of service to the rural water sector. In the first instance, as part of the implementation package for the Ogongo - Okalongo and Oshakati - Omakango schemes, it is recommended that one post be assigned to DWA in Oshakati. The expert assigned to the post would:

8.4.1.1 **Monitor the use of rural water supplies under the two schemes and in the region**, with particular reference to:

- water point design (para. 8.2.9);
- the maintenance and enhancement of alternative rural water sources, particularly for use by livestock;
- the representativeness and performance of user institutions (paras. 4.4.14 - 4.4.18).

8.4.1.2 **Undertake environmental and community impact assessments of the two schemes one year after commissioning.** These studies should recommend any necessary adjustments to operational and liaison procedures and user participation arrangements.

8.4.1.3 **Assist DWA in the continuing development of technical strategies, environmental procedures, user institutions, cost recovery policy and water charging systems for Owambo.** Experience from the two schemes should be adapted for this purpose as appropriate. Approaches developed in Owambo should in turn be reviewed and adapted for use in other communal areas.

8.4.1.4 **Produce updated information for future revision of the Water Master Plan for Owambo**, taking into account developments in policy since the last edition of the plan and the results of the monitoring recommended above. Although not all the elements of the related environmental and regional planning framework will yet be in place this updated information will be a valuable means of coordinating and reviewing water supply policy for the region. This exercise should be linked to the regional planning guidelines being adapted by the NPC for the area.

8.4.2 This remedial measure has no additional cost implications, as funding is already in place for the five supplementation posts.

8.5 Monitoring

8.5.1 The mission's review of the rural water sector in Namibia has made clear how fast policy and practice have been changing. Evaluation of the schemes under review against set standards is difficult because of this rapidly changing environment. Design changes are continuing to be made as the projects are built. It is therefore impossible to be certain now that the optimum design and user participation arrangements have been identified or achieved. **Even more than usual, monitoring of the schemes during their early years of operation should be a priority.** It should cover water point use and potential design faults, as well as the functioning of WPCs, LWCs and the CWCO. It should be supported by an ongoing commitment to introduce modifications to technical and institutional aspects of the schemes as required.

8.5.2 It is not normal for monitoring activities to be written into the design of water supply schemes, as it is assumed that this function is covered by the normal operations of the responsible authorities. In the case of the Ogongo - Okalongo and Oshakati - Omakango schemes, however, **there should be an explicit commitment to ongoing review of operating experience.** In effect, DWA would then have four schemes in Owambo from which to continue learning: these two, and Onaanda and Okahao South. As proposed in section 8.4, 9.2, the Netherlands funded supplementation expert would make a major contribution to this monitoring.

8.5.3 This proposal has no immediate cost implications, although potential adjustments identified later by the monitoring process might require additional expenditure.

8.6 Community Health Workers

8.6.1 A small but useful step in integrating the health, water and sanitation sectors would be to **promote the participation of Community Health Workers in Water Point Committees,** as the cadre and the committees come into being around Owambo. DWA and the Ministry of Health should make the necessary arrangements together.

8.6.2 This measure would have no cost implications.

9 Complementary measures

9.1 Introduction

9.1.1 The mission has identified a number of actions which would enhance the sustainability of rural water development in Owambo, by tackling broader issues of capacity, information and policy in the general context of the water and environmental sectors in Owambo and nationwide (para. 23, 1.6). These are proposed as **'complementary measures'** which, after the necessary preparation, would be funded and implemented independently of the two schemes. The mission believes that implementation of these complementary measures would strengthen the rural water sector in Owambo and enhance the policy framework in which the two schemes are to operate.

9.2 Additional capacity for DWA

9.2.1 If, as expected, responsibility for rural water supplies is formally transferred to DWA, **consideration should be given to the provision of a Netherlands funded supplementation expert to work at DWA headquarters on rural water supply policy and institutions.** The expert should have similar qualifications to the one proposed for posting to Oshakati (section 8.4, 9.2). S/he would assist in the integration of technical and non technical aspects of DWA's work, focusing on user participation, cost recovery for rural water supplies, and related issues at the national level. S/he would probably be posted in DWA's proposed Directorate of Rural Water Supply.

9.3 Training

9.3.1 **If a long term Netherlands commitment to the Namibian water and sanitation sector is developed, training should be a major component.** For the present, existing arrangements through UNICEF should cater for the training of water committees. **Dutch support should focus on technical training at all levels: from water point caretakers to graduate professionals in DWA.** The mission recommends that a special programme of Netherlands training support at the technical and professional levels be developed (para. 18, 5.3.6). The programme should include support to curriculum development at the Von Bach Training Centre, as well as scholarships for professional studies at institutions elsewhere in Africa or the Netherlands. A joint Namibia/Netherlands mission should be fielded to design this programme.

9.4 Computer modelling

9.4.1 The mission discussed with DWA the possibility of developing **a computer model of the increasingly complex water reticulation system in Owambo.** This model would be used to enhance operation of the system. Dutch support could include short term technical assistance, computer software and training.

9.5 Owambo natural resource management study

9.5.1 The relationship between water availability, livestock numbers, range condition, crop production and land degradation in Owambo is very complex. It varies over space and time. Ecological conditions and land use systems are not uniform across the region, but are functionally interrelated. For

Owambo as a whole, rational water sector and regional development planning require a more comprehensive understanding of these relationships than currently exists (para. 3.3.56).

9.5.2 The mission therefore recommends that Netherlands support be considered for a study of agricultural land use and traditional management of natural resources in Owambo. The study should survey current patterns and practices and investigate their relationships with land degradation, to the extent that such degradation is objectively identified. It would include agroforestry and range management issues. It would provide a data base on land use patterns, systems and trends, together with clear guidelines on infrastructural development, land use zoning, settlement planning and agricultural and economic development policy.

9.5.3 Netherlands support has already been requested for a proposed Directorate of Forestry study of agroforestry potential in Owambo. The mission recommends that the broader land use study be designed to include the requirements of the proposed agroforestry investigation. The next step would therefore be to produce terms of reference for the study and to identify personnel and funds to enable it to be carried out in 1993. A minimum duration of six months is anticipated. The proposed study would not be an academic exercise. The pace of change and of apparent land degradation in Owambo makes it an urgent priority. Its results could be incorporated in an environmental profile for the Owambo regions (section 9.6).

9.6 Environmental profiles

9.6.1 As indicated in para. 7.2.3, the Directorate of Environmental Affairs is developing a programme for environmental profiles of each region in Namibia. The mission believes that, as a central framework for environmental and land use planning, a profile of the Owambo regions, following the methodology being developed by the DEA, is urgently needed. While agreeing with the need for an Owambo environmental profile, however, the DEA recognises the complexity of the task in those regions of Namibia. It has therefore piloted the profiling approach elsewhere.

9.6.2 This phased approach to documenting environmental issues and priorities for Owambo is appropriate. It would mean that the study of natural resource management recommended in section 9.5 could feed into an environmental profiling exercise for Owambo later in 1993 or in 1994.

9.6.3 The mission recommends that Dutch support should not be restricted to an environmental profile of Owambo. Rather, the Netherlands should make further enquiries about how a broader contribution to the GON's environmental profiles programme might most usefully be made. A package of environmental support might be considered, to include the Owambo natural resource management study in 1993 and assistance to the DEA's programme over a longer period.

9.6.4 A longer term input of Netherlands support to this programme around the country would directly enhance the sustainability of rural water development in the communal areas. As the mission's report has repeatedly stressed, the rural water sector is just part of a complex of factors, forces and trends which shape livelihoods and environment in these areas. A broader programme of support for Namibian efforts to enhance natural resource management would therefore be appropriate.

Annex 1 Aide Memoire

REPUBLIC OF NAMIBIA **KINGDOM OF THE NETHERLANDS**

Reformulation mission: Ogongo - Okalongo and Oshakati - Omakango water schemes

Aide memoire

1 December, 1992.

Introduction

1 The Ogongo - Okalongo and Oshakati - Omakango water schemes have been proposed for funding by the Netherlands. Following initial queries in The Hague about the environmental impact and sustainability of the schemes, it was agreed that a joint reformulation mission would be fielded to investigate them in more detail; assemble all the information required for final appraisal by the Netherlands Government; and recommend any remedial or complementary measures that would enhance the environmental impact and sustainability of these schemes and of rural water supply generally in Owamboland and Namibia.

2 A mission[5] worked on these tasks in Namibia from 18 November to 2 December, 1992, visiting Owamboland from 22 - 27 November, 1992. The mission members wish to express their gratitude for the hospitality and cooperation they received from the Department of Water Affairs, the National Planning Commission, the Netherlands Development Cooperation Office, other Government of Namibia personnel and members of various Water Committees in Owamboland.

3 The mission's report will be compiled after the return of the mission leader to the Netherlands. This aide memoire summarises the findings and recommendations of the mission, agreed on completion of its investigations in Namibia.

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[5]W. Bayer (livestock/range management consultant); H. Drews (Department of Water Affairs, Windhoek); H. Goetze (Department of Water Affairs, Oshakati); A. Marsh (environmental consultant); S.D. Turner (mission leader). The mission was accompanied by J. Blom (water sector specialist, DGIS, The Hague).

Status

4 **Ogongo - Okalongo:** the contract for the construction of the main pipeline and community water points was awarded in November, 1992. The contractor is now mobilising. The contract period is 12 months (excluding branch lines). The contract price, including supply of materials for the branch lines, is R13.5m. A Local Water Committee for the scheme has been formed. Community excavation of branch lines has begun.

5 **Oshakati - Omakango:** the main pipeline and community water points for this scheme are being constructed directly by DWA. The main pipeline was completed in October 1992. Its commissioning for bulk supply to the northern 'herringbone' system is imminent (awaiting commissioning of recently completed interim purification works at Oshakati). Branch lines are about 65% complete. They are being excavated by local people. A Local Water Committee is in place. Water point construction will be completed by March, 1993. The revised cost estimate for this scheme is R16.0m.

Environmental impact

6 Construction of the schemes causes no significant environmental damage along the pipeline routes.

7 Potential interruption of oshana flow and consequent downstream environmental damage will be avoided by higher pipeline standards below oshanas; siting of valves and manholes outside oshanas; and restoration of natural oshana surface after pipe laying.

8 The treated water supplied by the schemes will be used for livestock watering as well as human consumption. This is unavoidable in current socio economic and environmental circumstances. Water for stock drinking purposes may be available from local sources for certain periods during the year, for example in natural ponds and in shallow wells soon after they have been recharged by the ephemeral rains falling during summer. In order to discourage and ultimately exclude livestock use of these treated water supplies:

8.1 Community water use charges should be introduced as soon as possible (see para. 15). This will encourage a reappraisal by communities and livestock owners of the economics of livestock water supply and the supply options locally available for this purpose.

8.2 In consultation with the Department of Agriculture and Rural Development (DARD), DWA should actively support the investigation and development by livestock owners of alternative sources for livestock water supply in the vicinity of the schemes, whenever available.

9 Construction of the schemes will not lead to an increase in the number of livestock in the vicinity of the schemes. Land degradation in these areas is not yet inevitable. If irreversible land degradation takes place, it will not be directly attributable to these schemes. Livestock production in these areas of central Owamboland depends upon a remarkably resilient ecosystem and a sophisticated system of transhumant range management. In the vicinity of the schemes, livestock numbers at any time are more dependent upon the availability of grazing than the availability of water. Because livestock production in these areas (and Owamboland generally) depends upon transhumance, restrictions on livestock movements (such as prevention of grazing in Angola or private enclosure of seasonal pastures in the south and east) would lead to land degradation; herd mortality; and lower incomes for stock owners.

10 The overall impact of the two schemes on human health will be positive. However, leaking pipes and valves and standing water around standpipes and stock watering troughs may increase the occurrence of malaria in the dry season. Water borne diseases will be reduced overall by these piped schemes, but this standing water could partially offset the benefit by providing a new habitat for disease vectors. Inadequate water point design or broken taps or cattle troughs may lead to human use of livestock supply points or animal use or pollution of human supply points. DWA and DARD should therefore:

10.1 Take all possible steps to minimise leakage and standing water along pipelines.

10.2 Refine and monitor water point design to minimise standing water there. The mission has made detailed recommendations to this effect, but monitoring of water point use and possible refinement of water point technology and design should be a continuing priority for DWA.

10.3 Work with user representatives to ensure that faults and breakages at water points are promptly reported and repaired.

10.4 Conduct awareness campaigns among water users and stock owners on the importance of segregating livestock water consumption and supply for human use at water points.

User participation

11 Initial steps have been taken to develop user participation in the planning, construction and operation of the two schemes. A Local Water Committee (LWC) has been formed for each scheme and is represented on the Central Water Committee for Owambo. DWA has promoted these developments and collaborates with the LWCs in determining branch line routes and water point locations. The Directorate of Rural Development (DRD) is developing policy and guidelines for Water Point Committees, but these have not yet been formed for the two schemes. Institutions and detailed procedures for user participation in operation and maintenance are thus under development, but not yet in place. At present they are the responsibility of DRD. The integration and rationalisation of Government capacity in support of institutional development for rural water user participation should be vigorously pursued.

12 The LWCs have successfully mobilised rural people to excavate branch lines for the two schemes. Representation and participation are uneven, however, and will need to be enhanced during long term support to these and other water user institutions. At present women are under represented on water committees, and over represented on community construction teams.

13 Although drought needs may justify it, the use of food aid payments to members of community construction teams contradicts the principle of self help and distorts community motivation to participate in water scheme construction. It is therefore inappropriate and should be discouraged as soon as conditions permit.

14 User participation in the development and operation of rural water supplies has traditionally been total. Rural people developed and operated wells and other water sources without external assistance. The history of administration and the water sector in Owamboland means that bulk transfer systems of water from external sources are now being converted and developed for supply to rural people. New modes of participation must then be developed for these systems. While not inappropriate in current circumstances, this approach may increase rural people's dependence on external supplies and technology, and diminish their willingness or ability to develop local water resources and

technology. Through the hierarchy of user institutions for these and other water schemes, Government should work with rural people to maintain awareness of the full range of water supply options available, and to develop local as well as external sources and technologies as appropriate.

Cost recovery

15 All consumers of water supplied by the two schemes should make a financial contribution to the cost thereof. At minimum, this user payment should cover the operation and maintenance costs of the supply system. DWA promotes this policy. All private connections are already metered, and water charges are levied. A programme of legalising unauthorised connections and enforcing payment for supplies received therefrom is being implemented. Community supplies, including livestock watering points, will be metered and charges levied as soon as conditions permit at tariffs sufficient to cover at least the operation and maintenance costs of these local supplies. As noted in para. 8, this will encourage community initiatives to ensure an adequate contribution by livestock owners to the cost of stock watering from the schemes. This should in turn encourage local initiatives to develop alternative water sources for livestock. While enforcing community water charges, DWA and DARD should give practical support to such initiatives.

16 User participation in water scheme construction may lead users to feel that they have made their contribution and that subsequent water charges are unjustified. In its liaison with user representatives, Government should stress that such an approach is economically unsustainable and that water charges for all users are unavoidable. User participation in construction is of lower priority. If need be, DWA should be prepared to consider paying for this task and reassessing water tariffs accordingly.

17 Quantities of water supplied by the two schemes have been calculated to increase annually over the design period to match estimated growth in the consumer populations. DWA will operate the schemes on this incremental basis, rather than allowing users to consume the maximum amounts the system is able to deliver. In its liaison with user representatives and through its water tariff system, DWA should stress that piped water is a finite commodity and that expansion of supply should be matched to increases in consumer numbers before increases in consumer demand are considered.

18 The above measures will stimulate water conservation and reduce water wastage by consumers, which will have health benefits (see para. 10).

Recommendations: implementation of the Ogongo - Okalongo and Oshakati - Omakango schemes

19 The mission recommends that the two water schemes now be appraised by the Netherlands Government. The following remedial measures should be implemented and funded (where appropriate). The Government of Namibia agrees to the reformulation of the projects in this manner.

19.1 Revision of details of water point design and construction for the two schemes should be considered. Recommendations have been developed by the mission in consultation with DWA.

Additional cost (preliminary estimate): R625,000.

19.2 User communities should be given maximum flexibility in determining the location of water points, subject to technical considerations. The number of points should of course be related to the design capacity of the system.

Additional cost: none.

19.3 In theory, DWA is responsible for bulk water supply. DARD is responsible for rural water supply. In practice, DWA is undertaking rural water supply and user liaison for the two schemes and in Owamboland generally. It is possible that DARD's rural water supply capacity will be merged with DWA. Even after such a merger, Government capacity for the necessary planning, monitoring and user liaison for these two schemes and the region would be inadequate. It is therefore recommended that one of the already planned Netherlands supplementation posts be assigned to DWA in Oshakati. The expert assigned to the post would:

19.3.1 Monitor the use of rural water supplies under the two schemes and in the region, with particular reference to:

- water point design (para. 10.2);
- the maintenance and enhancement of alternative rural water sources,

particularly for use by livestock (paras. 8.2 and 14);

- the representativeness and performance of user institutions (para. 12).

19.3.2 Undertake formal environmental and community impact assessments of the two schemes one year after commissioning. These studies should recommend any necessary adjustments to operational and liaison procedures and user participation arrangements.

19.3.3 Assist DWA in the continuing development of technical strategies, environmental procedures, user institutions, cost recovery policy and water charging systems for Owamboland. Experience from the two schemes should be adapted for this purpose as appropriate. Approaches developed in Owamboland should in turn be reviewed and adapted for use in other communal areas.

19.3.4 Produce updated information for future revision of the Water Master Plan for Owamboland, taking into account developments in policy since the last edition of the plan and the results of the monitoring recommended above. Although not all the elements of the related environmental and regional planning framework will yet be in place (para. 21), this updated information will be a valuable means of coordinating and reviewing water supply policy for the region. This exercise should be linked to the regional planning guidelines being adapted by the NPC for the area.

Additional cost: none (covered by existing Netherlands commitment to provision of supplemented expert posts for DWA).

19.4 As recommended in para. 10.2, water point use and potential design faults should be continuously monitored during implementation of the schemes, and improvements introduced as necessary.

Additional cost: covered by remedial measure 19.3.

19.5 DWA should promote the participation of Community Health Workers in Water Point Committees, as these come into being.

Additional cost: none.

Recommendations: complementary measures

20 In order to guarantee the sustainability of rural water supply programmes in Namibia, functional planning links need to be developed at national and regional levels between this sector and its broader environmental and regional development context. The effectiveness of Netherlands support to the water sector in Namibia cannot be assured unless complementary planning measures are being taken in these related sectors, supported by the effective commitment of the Government of Namibia to the environmental and economic sustainability of rural water supply programmes.

21 The mission has ascertained that a number of elements of the required environmental and regional planning process are now being put in place, although these are long term tasks. The mission has ascertained that the Government of Namibia confirms its commitment to environmentally and economically sustainable development of the rural water and related sectors. It is recommended that the following complementary measures be reviewed in detail by the Namibian and Netherlands Governments for potential Dutch support, in order to reinforce this commitment and strengthen the structure of environmental and regional planning now being developed. Cost estimates for these measures would be developed in the course of subsequent detailed planning.

21.1 If responsibility for rural water supplies is formally transferred to DWA, consideration should be given to the provision of a DGIS supplementation expert to work at DWA headquarters on rural water supply policy and institutions. This contribution would focus on user participation, cost recovery for rural water supplies, and related issues at the national level.

21.2 Assistance in the development of a computer model of the piped water system in Owamboland. This model would be used to enhance operation of the system. Inputs might include short term technical assistance, computer software and training.

21.3 Design of a programme of training support for the development of professional capacity in DWA, covering the technical, institutional, economic and consumer liaison aspects. This support could include the development of training institutions in Namibia and the provision of training scholarships at various levels in Namibia and other countries.

21.4 Support to the environmental profiles programme of the Ministry of Wildlife, Conservation and Tourism (MWCT). A first component of this support might be preparation of environmental profiles for the Owamboland regions. The Environmental Planning Unit (EPU) of the MWCT has expressed interest in reviewing the potential for Netherlands support to this programme.

21.5 Interim support to the environmental coordination capacity of the National Planning Commission. This concept will be reviewed in more detail in 1993. Presentation of the current planning study of Owamboland (being undertaken by NISER for the NPC) in February 1993 will provide additional background for this review.

21.6 Support for a study of agricultural land use and traditional management of natural resources in Owamboland. This study would include agroforestry and range management issues and provide an in depth review of the complex land use problems of the area for incorporation into an environmental profile. It would permit better informed development planning for land use and water supply in future regional development plans for Owamboland. It would also provide the data needed for a proposed Directorate of Forestry study of agroforestry potential in the area.

P. Maritz
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[Paragraphs 1 - 19]

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National Planning Commission.

S.D. Turner
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1 December, 1992.

Annex 2 Terms of reference

TERMS OF REFERENCE

FORMULATION MISSION

OGONGO - OKALONGO AND OSHAKATI - OMAKONGO WATER SUPPLY SCHEMES

NAMIBIA

1 Introduction

The first steps to develop water sources in Namibia, other than easily accessible water from springs and shallow wells, were made by the German Government about 100 years ago. The first boreholes were drilled in the late 1890s, the first dams were constructed in the same period, and hydrological knowledge gradually became available so as to enable advice to farmers for dam construction.

After Namibia came under the control of the Union (later Republic) of South Africa, formal structures were gradually established. A separate Division of Water Affairs was created under the Administration for South West Africa in 1957 and later became a directorate under the Department of Water Affairs in the Republic of South Africa in 1969.

It was from 1969 onwards that greatly increased resources were made available for water development in the present Namibia. Investments peaked in 1978 when more than R30 million were expended on capital works. The Department of Water Affairs was established on 1 July 1980 as a fully fledged department in the government service of Namibia. The actual expenditures of the DWA in Financial Year '88/89 amounted to over 83 million rand (incl. administration cost, training investments, operation) with an increase of approx. 10% in FY '89/90, slightly decreased to 88 million rand in '90/91. FY 91/92 and 92/93 show overall budgets of more than 95 million rand and over 128 million rand respectively.

It is intended that the Department of Water Affairs takes over the rural water supply component from the Directorate for Rural Development with a view to integrate the activities in the field of bulk and rural water supply. As a drought relief measure the groundwater related supply to communal areas, which was until recently under the Directorate for Rural Development, has been transferred to the DWA.

The main tasks of the Department of Water Affairs are: exercising control over the natural water resources, including water resource investigations and management, pollution control and planning for meeting of the water demand by various consumer groups. The department has a particular responsibility for developing and operating ground water and bulk water supplies; some of the latter are large regional schemes. The water is delivered in accordance with the Water Act (1956 Act No. 54) and with specific agreements to consumers ranging from Windhoek City Council and large mining enterprises to individual farms and communal water points. The Water Act dates back to the South African regime; it is currently revised and updated to Namibian standards. All water is sold through water meters at approved tariffs.

2. Background

The Department of Water Affairs (DWA) has approached the Netherlands authorities for financing of the Ogongo-Okalongo State Water Plan and the Oshakati-Omakongo Regional State Water Scheme, both in Owambo region.

The region of Owambo has a population of 615.057 according to the preliminary results of the 1991 census, and covers an area of 51.800 Km^2. Namibia's land area is some 824.000 Km^2 and its population is 1.401.711. The corresponding population density for the whole country is less than 2 persons/Km^2. Owambo with a population density of approximately 12 persons/Km^2 is therefore much more densely populated than the average. Indications are that the development of Owambo will increase significantly over the coming years, necessitating that urgent attention be given to upgrading the existing bulk water supply network in order to be able to meet the water demands of the region. The majority of the population is engaged in mixed subsistence farming, crops and livestock, supplemented by cash income derived from working elsewhere. Average annual income is below R300 per capita (Nfl 180).

The Central Water Supply System in Owambo is in the process of being upgraded with funding from the DWA and the donors Germany, France, Finland, European Communities and the Netherlands. The rehabilitation of Calueque Olushandja Water Supply Scheme (phase I) and the upgrading of Ogongo Purification Plant are being done with financial support of the Netherlands, whereas phase II of Calueque (to increase the intake of water at Cunene River) is presently in the identification phase.

The Ogongo/Okalongo State Water Plan (NA/91/004) was subject to a feasibility study in 1988. Four alternatives were identified and one was chosen. The planning report was issued in 1989, the tender document was tabled in August 1991 and tendering started. The tenders are currently being evaluated.

The Oshakati-Omakongo Scheme, connecting the German (KfW) sponsored Ogongo-Oshakati Scheme and the France constructed Omakongo-Omafo Scheme, is already under implementation. The planning report dates back to October 1990, the implementation started in 1990 by the Department's own construction unit.

Both schemes have a high priority; during the long independence struggle, Owamboland suffered considerably. People did not have access to public facilities as the area was seriously neglected and affected by the war. For further development of the area, the availability of water is a prerequisite. The scarcity of this economic good necessitates a thorough approach. Particularly the Oshakati-Omakongo Scheme plays a vital role for the whole North-Eastern Area of Owambo, as it is the main feeder.

Early in 1991 an inter-ministerial Water Supply and Sanitation Policy (WASP) Committee was established for the formulation of a sector policy addressing in particular community involvement, responsibility allocation for water supply and sanitation functions, and coordination of the actors involved. The WASP-report (General Water Supply and Sanitation Sector Policy for Namibia) is presently tabled for approval by Cabinet. Through this and other studies the DWA is becoming aware of the need to attend technical and non-technical problems simultaneously in a integrated manner, to establish community (user) involvement, to elaborate cost recovery policies and to address environmental issues.

Two pilot areas for introduction of community based water supply management structures were selected: Okahao and Onaanda. A Central Water Committee was established to that effect one year ago. This committee is responsible for need and priority assessment for Owamboland. This central committee initiated the local committees and will initiate the new ones. The local committees are involved from the early planning stage onwards. The experience gained from these areas may be of great importance for the two projects under appraisal.

At request of the "Kreditanstalt für Wiederaufbau" (KfW), an environmental assessment was done for the Ogongo-Oshakati region in 2 phases. Under phase A, a baseline study of the existing situation was executed; under phase B, the possible effects of proposed alterations of the Ogongo-Oshakati canal were studied. The findings of phase A are of particular interest, as the characteristics of the region studied are comparable to the area where the 2 projects are situated. Even the phase B report (not yet formalised) might give valuable information.

3. Scope of the mission

The mission is expected to focus primarily on the two water supply schemes, in particular to look

- at the way in which technical and non technical inputs are implemented with regard to community based approaches in water supply;
- at the environmental impact of the schemes;
- at the institutional capacity of the Department to manage and monitor these water schemes through all phases as sustainable undertakings.

4. Objectives of the mission

- To assess the two projects in terms of sustainability and to collect all data needed for the final appraisal by DGIS.
- To identify additional supporting measures contributing to sustainable functioning and use and management of the schemes by users, authorities and supporting agencies jointly.

5. Tasks

General

1. To assess the general situation of water supply in the two project areas.

Sustainability/user participation

2. To assess the technical and non-technical sustainability of the Oshakati-Omakango and Ogongo-Okalongo projects with special emphasis on the participation of the prospective users of the water (mainly women), in the planning and implementation phase and possible/future participation in the operation and maintenance of the schemes.

3. To study the proposed community based water supply management structure at Okahao and Onaanda, and other experience to date with Village Water Committees and the Central Owambo Water Committee, with a view to applying the lessons learned from these pilot activities to the two water schemes and to propose - if needed - improvements of the structure

4. To identify other supporting activities to make the water supply sustainable and to improve functioning and use (e.g. health, drainage, sanitation).

Institutional

5. To appraise the institutional capacity of the DWA at the various levels in relation to the planning, implementation and operation and maintenance of the two projects. Particular emphasis is to be given to the Department's capacity to apply integrated (technical and non-technical) approaches: to strengthen/improve the participation of the communities, in particular of the prospective users of the scheme, to assist the newly created Water Committees in the region in their organization and strengthen their functioning as representatives of the communities, to attend to hygiene and sanitation aspects at the tap points and in the vicinity of the schemes.

6. To identify training needs within the DWA, the Water Committees and the communities related to the two projects so as to improve the sustainability of the projects. The performance of the other actors involved in the water supply schemes is to be taken into consideration as well, and recommendations may be made to strengthen their inputs and contributions to the schemes.

7. To identify and assess Namibian institutions that could be involved in the training, management and support of the water supply activities.

8. To review the need for longer term support to the development of DWA policy and institutional capacity in the fields of user participation and cost recovery.

Environmental

9. To look into the social and environmental impact of the schemes and to assess the benefits and disadvantages of piped water systems. Particular reference should be made to:

(a) construction and rehabilitation methods (notably impact on *oshanas*);

(b) details of planning for stock watering;

(c) impact of the schemes on livestock numbers and distribution, stock ownership, range management practices, livestock condition and value; range land condition and potential land degradation.

10. To identify "remedial" and supporting measures to counteract environmental degradation which may be caused by the schemes.

11. To identify potential for longer term cooperation to develop planning institutions and methods which would integrate water development with the rest of the rural sector in an environmentally, economically and socially sustainable manner. This might involve support to development of environmental profiling methods and capacity in the Owambo region and elsewhere, perhaps as a first step towards regional planning systems.

Annex 3 Persons met

S. Adkisson	Programme Officer, UNICEF
S. Aldrich	Chief, Planning, DWA
R.A. Alexander	Chief, Civil Design, DWA
I.A.T. Ashipala	Directorate of Planning, DWA, Oshakati
E. Ashipara	Vice chair, Central Water Committee for Owambo
B. Belding	USAID, Windhoek
F.V. Bester	Chief Research Officer, Pastures, Department of Agriculture and Rural Development
D.L. Biggs	Director of Works, DWA
C. Brown	Director, EPU, MWCT
J. Botha	Chief, Construction, DWA
A.C. Cashman	Chief, Media Unit, DWA
J.C. Fitter	Adviser to Directorate of Planning, Pricing, Marketing and Cooperatives, Department of Agriculture and Rural Development
B. Frayne	NISER
N. Goabab	Permanent Secretary, NPC
F. Greiner	Chief Technical Adviser, DWA
P.F. Hamman	Director, Rural Water Supply, DWA
M. Harris	Chief Engineer, DWA
P.S.v H. Heyns	Director, Investigation and Research, DWA
B. Haussler	Chief, Mechanical/Electrical Design, DWA
A. Hango	Secretary, Okahao South Water Committee
L-C. Haukongo	Diocesan Water Project, Odibo
J. Huesken	Land Use Planning and Land Administration Project, Department of Lands, Resettlement and Rehabilitation
R. Jileka	Member, Okahao South Water Committee
E. Kashele	Member, Okahao South Water Committee
H.W.R. Koch	Directorate of Planning, DWA, Windhoek
C. Koegelenberg	Resident Engineer, DWA, Oshakati
E. Kreike	Researcher, Odibo
E. Leopoldt	Meatco, Oshakati
P.J. Maritz	Deputy Permanent Secretary, DWA
Y. Mhone	Field Officer, UNICEF, Tsandi
B. Muifi	Bicon Namibia
S.H. Negumbo	Deputy Director, Rural Supportive Services, DRD
A. Nehemia	Directorate of Planning, DWA, Oshakati
P. Nghipandulwa	Deputy Director, Rural Industries Development, DRD
L. Niipare	Regional Head, Operations and Maintenance, DWA, Oshakati
M. Niipare	Member, Okatana Water Committee
G. Odiawo	Directorate of Veterinary Services, Ondangwa
R. Paskin	Directorate of Veterinary Services, Windhoek
H. Pelkonen	Water Supply and Sanitation Adviser, FINNIDA, Ongwediva
B. Potschka	Medical Officer, Oshikuku Hospital
C. Schumann	NPC
A. Shikongo	Headman, Okahao
A. Shomagwe	Vice chair, Okahao South Water Committee
C. Tapscott	Director, NISER
P. Tarr	EPU, MWCT

T. Tueumuna	Ministry of Health, Oshakati
R. Uushona	Treasurer, Okahao South Water Committee
C.M. van Waegeningh	Netherlands Development Cooperation Office, Windhoek
W. Werner	Director of Lands, Ministry of Lands, Resettlement and Rehabilitation
J.S. de Wet	Chief, Research, DWA

Annex 4 Namibia/UNICEF Country Programme of Cooperation: summary notes

Government of Namibia/UNICEF Country Programme of Cooperation
Programme Plans of Operations, 1992 - 1996
November 1991

7 programmes:

Primary Health Care
Household Food Security
Family Life Empowerment Programme
Non-Formal and Basic Education
Integrated Area Based Programme
Rural Water Supplies
Capacity Building for CSPD Building

Primary Health Care

Addresses some of the major health problems of children and women in Namibia. Aims at achievement of universal immunisation by 1993; increasing coverage for all antigens to 90% by 1996; improved control of diarrhoeal diseases and acute respiratory infections; virtual elimination of neonatal tetanus; significant reduction of polio and measles; reduction of malnutrition; increase of access to maternal health services and information on women's health; empowerment of communities for participation in health promotion activities. Main agency is MOH.

Household Food Security

Intended to help reduce malnutrition, especially of children. Will operate through a range of strategic interventions, with a strong focus on the increased social, economic and technical empowerment of women, the reduction of their workload, the improvement of their ability to manage domestic, food and community resources, and encouragement of their participation in community, group and income-earning activities. Includes strengthening national HFS monitoring capacity. Main agencies: Depts. of Rural Development and Community Development, together with a range of NGOs.

Family Life Empowerment Programme

FLEP is a direct out growth of the concept of Child Survival, Protection and Development (CPSD). A central premise of FLEP is that the majority of children and women to whom CSPD interventions are targeted are at their most vulnerable and their most accessible within the sphere of the family unit and the community. FLEP will respond directly to the problems of weakening and fragmentation of family structures which have emerged from Namibia's colonial and apartheid experience and which undermine CSPD severely. It will particularly aim to tackle the negative psycho-social effects of Namibian colonial experience, manifested in loss of confidence, social isolation, marginalisation, alcohol abuse and domestic violence affecting women and children. FLEP will be implemented on a multi-sectoral and interdisciplinary basis with strong participation by national NGOs, community based and religious organisations.

Non Formal and Basic Education

Will support government efforts in Literacy Promotion, the Improved Efficiency and Quality of the Primary Education Cycle and an Education Management Information System. 40% of adult population of Namibia is literate. Majority of illiterates are women.

Integrated Area Based Programme

Comprises Community Based Rural Development Project and Community Based Urban Development Project. Aims to reduce disparities among communities in Namibia through the achievement of the national goals for Child Survival, Protection and Development in the most disadvantaged areas. Major strategies of the programme include the Area Based Programme Approach, the Basic Services Strategy and the promotion of participatory development processes at all levels. Aims to cover 10% of total population of Namibia by 1996 through 6 district-level projects, of which 4 will be in rural and 2 in low income urban areas. These will assist communities to address their priority problems by supporting local initiatives or intensifying national sectoral interventions including health, nutrition, household food security, water, sanitation, income generation and early childhood development. CSPD objectives in selected disadvantaged communities, 1992 - 6:

reduction of infant and under-5 mortality rate by at least 15%;

reduction of maternal mortality rate by at least 25%;

reduction of severe and moderate malnutrition among under-5 children by at least 25%;

improved access to safe drinking water and to sanitary means of excreta disposal;

improved access to basic education and completion of primary education by at least 60% of primary school age children;

reduction of adult illiteracy rate by at least 25%, with emphasis on women;

improved protection of children in especially difficult circumstances.

Foundation for rural programme is Uukwaluudhi project at Tsandi (started in 1990).

Rural programme includes an environment and appropriate technology sub component. It will also prepare a Situation Analysis of each district covered by the programme and use it for planning projects and for social mobilisation.

Rural Water Supplies

Comprises 2 projects:

National Capacity Building for Rural Water Supplies

Improved Water and Sanitation Services in Owambo, Caprivi and Namaland.

Support will be provided to DRD to increase its capacity at national and regional levels for the planning, testing and delivery to communities of low cost technologies for water catchment and harvesting, and improvement of

surface water and shallow wells. Support will also be given to borehole construction and repair activities by DWA to meet high priority needs in certain regions. The programme will concentrate its activities for increased service provision in three regions of Namibia with major population concentration and urgent need. Technical and programme linkages will be built with the Integrated Area Based Programme operating in 1 or 1 of these regions.

Long term policies of GON in water sector include:

> 'Communities should be given the right, within resources available, to determine which solutions and service levels are acceptable to them.'
>
> 'Beneficiaries shall contribute towards the cost of these services, within their available means.'

Operational strategy of the Government for the provision of safe water to the rural populace is to ensure access to at least 20 l. of safe water per person per day within a distance of 1 km.

In first 2-3 years, programme strategy will focus on establishment of Rural Water Supplies Unit in DRD.

National Capacity Building project will include:

> Training for staff of DRD who will act as national and regional coordinators and planners for low cost rural water supply.
>
> Provision of equipment and training for staff of DWA in improved physical siting of boreholes and in community consultation on planning of borehole schemes.
>
> Additional training on planning, implementing, monitoring and evaluating water and sanitation activities. This will include short courses for rural extension workers, pump operators and local water committees.
>
> Provision of essential equipment and supplies for planning, implementation and monitoring of rural water supply.
>
> Collaboration with Health Education Unit of MOH on sanitation and hygiene.
>
> KAP studies on water hygiene and sanitation practices (linked to PHC Programme).

UNICEF will provide a Project Officer for Rural Water Supply and Environmental Sanitation.

Project for Owambo, Caprivi and Namaland will use following strategies in Owambo:

> Identification of unserved population in priority areas of the region and assess their needs for water supplies and sanitation and hygiene information.
>
> Develop capacity of existing institutions presently involved in promoting safe water through low cost technologies and sanitation activities, by providing additional equipment, supplies and logistics for effective implementation of field activities.
>
> In service training and study tours for staff.

Mobilise resources to meet needs of beneficiaries, including through liaison with churches, NGOs, IABP.

Develop sanitation and hygiene education materials related to safe water management of water facilities and the specific environment, translate them into Oshivambo and arrange for their wide dissemination.

Develop capacity of participating communities to identify and address their water problems and needs on sustainable basis with low external support.

Facilitate strong links between DRD, DWA, Agriculture at regional level.

Project will provide logistics, supplies and equipment to existing institutions and Departments for constructing new water sources, particularly shallow wells, and rehabilitating and improving old ones. Participating agencies will include Rural Development Centre and Depts. of Agricultural and Rural Development. Limited support will also be given to DWA for borehole repair and construction activities to meet high priority community needs.

Will support 200 rain water catchment/harvesting systems.

Improve 80 existing shallow wells.

Provide technical and material support to protect 80 existing oshana sources.

Support construction of 30 and repair of 70 boreholes.

Study tours.

In service training for DRD technicians on hand pumps and water storage tanks.

Support mobilisation and training activities for establishing community water point management committees.

Support sanitation and hygiene education training programmes.

Provide portable water testing kits to DWA.

Total budget for Owambo 1992 - 1996 is $ 1.813m.

Capacity Building for CPSD Planning

Support to NPC and its Directorate of Development Planning, with increasing emphasis on regional planning with a participatory dimension, through multi-sectoral regional development bodies which will be established in 1992-93.

UNICEF will provide short course training in and outside country; short term TA; study visits.

Establishment in NPC of data base for monitoring child survival and development.

Programme will give selective support to essential research on problems and needs of children and women, and updating of Situation Analysis of Children and Women.

Programme will coordinate all other component programmes of the UNICEF country package.

Annex 5 Courses offered at DWA Von Bach Training Centre

1. Clerical Training

Orientation of new employees
Literacy course phase I, II and III
Foreman and his responsibilities
First aid, skilled and unskilled
Meeting procedures
Worker's motivation
Disciplinary measures applied to subordinates
Interviewing
Personnel administration phase I and II

2. Security Training

Elementary security
Advanced security
Fire extinguisher course

3. Operational Training

Equipment assistant grade I, II and III
Pump removal
Chlorination
Waterworks officer: Water Treatment
Waterworks officer: Mechanical/Electrical

4. Operator Training

Driver code 08 and code 11
Operator driver
Senior operator driver
Advanced earthmoving equipment
Equipment operator
Equipment operator compressed air
Boreman driller

5. Civil training

Elementary concrete technology
Advanced concrete technology
Pipelayer: Introduction
Factotum pipelayer
Bricklayer: Introduction
Factotum bricklayer

Senior factotum bricklayer
Carpenter: Introduction
Factotum carpenter
Senior factotum carpenter
Painter

6. Mechanical Training

Hydraulic courses
Diesel engines courses: Detroit, Hatz, Lister
Monopumps
Mechanical trade assistant: Introduction
Factotum mechanical
Senior factotum mechanical

7. Welders Training

Welding trade assistant: Introduction
Factotum welding
Senior factotum welding
Plumber: Introduction
Factotum plumber
Senior factotum plumber

8. Electrical Training

Electrical trade assistant: Introduction
Factotum electrician
Power station attendant

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