

Rural Village Water Supply Programme – Botswana

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EXECUTIVE SUMMARY

This report represents the findings of the Final Evaluation Mission of the Botswana Rural Water Supply Programme supported by the Swedish International Development Authority (SIDA) from late 1971 until 1993. The programme has been a major component in the overall development co-operation between Sweden and Botswana.

The evaluation was carried out between March and May 1995. This revised version has been reduced in size by about half of the original volume of the September 1995 final report. The evaluation team members were: Dr. Jan Valdelin, Mr. David Browne, Ms. Elsie Alexander, Ms. Kristina Boman, Ms. Marie Grönvall, Ms. Imelda Molokomme and Mr. Gunnar Settergren.

Cost: SIDA provided a total sum, excluding emergency aid, of MSEK (million Swedish Kronor) 884 in 1995 values, (> P300 million), for rural water supply development in Botswana between 1971 and 1993.

Achievements: Overall the RVWSP can be considered to have been a success. Water has been provided to 348 out of the 354 villages included in the programme. Approximately 550,000 people are being supplied with water from the schemes funded by SIDA. The overall average per capita cost, around P500 in 1995 values, was high, but this was largely a function of the difficult water supply conditions. Most of the facilities were provided within a period which was only slightly longer than originally intended, and at a real cost which was not much higher than the estimates.

Current Water Supply Situation: Today the completed supplies are functioning reasonably well, with most schemes, except during occasional breakdowns, delivering a regular supply of water to consumers. Furthermore breakdowns are normally fixed within an acceptable time. The supplies are highly utilised, (by 96% of villagers in 12 sample villages). The water supply situation in the villages is dramatically better than that prevailing before the programme commenced.

Relevance: The specific water programmes objectives were relevant to the needs of the village residents, and the programme itself has been consistent with, and supportive of, the socio-economic objectives of SIDA and the Government. The village supplies have resulted in major time and drudgery saving benefits, although the extent to which the potential health benefits have been realised is uncertain. Although the RVWSP was originally poorly conceived, with an over-emphasis on physical construction, it has been appropriately modified over time with an increasing emphasis on training and O&M. However the amendments have regularly been introduced later than desirable.

Cost Effectiveness: In most villages the standardised motorised pumping technology was appropriate and cost effective. However a weakness of the programme is that where unit costs were very high, mainly in the smaller villages, inadequate consideration was given to alternative technologies, notably hand pumps. Even though the overall effect on programme cost was limited, some of the smaller village schemes were not cost effective.

Gender: Women have been the main beneficiaries of the resulting drudgery/time savings, and are being given increasing, albeit still limited, opportunities as council water supply employees. This is largely due to national attitudinal changes relating to the role of women, since the RVWSP has not had any gender specific policies. This has meant that the programme has failed to enhance the participation of women at the village level in terms of planning, operation and management of the system.

Environmental Impact: The lack of data makes it difficult to assess the environmental impact of the programme. It has had some adverse affects but these have usually been very limited due to the limited volumes of water involved. Over-pumping has occurred on a very local level, but without any known wider implications. The limited volumes of water have also meant that the programme has not created a waste water problem, although the post SIDA investments will increasingly create a problem in the major villages. The programme contributed to increased groundwater pollution in the 1970s, but this was successfully addressed. A significant effect of the new supplies has been the increased pressure on grazing close to villages resulting from the increased population keeping more animals and illegal watering of livestock.

Financial Sustainability: The programme is financially sustainable, although not at community level. Since the O&M costs represent only 0.7% of the Government's recurrent budget, and water supply has high political and social priority, the existing schemes are financially sustainable.

Technical/Institutional Sustainability: Since the councils now have the infrastructure and the manpower for managing and operating the technology of the existing supplies, technical sustainability is tied to institutional sustainability.

Environmental Sustainability: Given the paucity of relevant data, the environmental sustainability of the programme is uncertain. However with the volumes of water involved, the risks are limited. The programme did undermine sustainability inasmuch as it failed to match its promotion of demand with a corresponding promotion of conservation, resulting in higher levels of use/waste than was necessary. In order to promote sustainability a resource oriented approach should be adopted involving conservation and demand management, and site specific solutions in small villages.

Evaluation: Overall the programme can be considered to have been a success;

1. The majority of the target population are today enjoying a reasonably reliable water supply service.
2. As a result of the capacity building component the institutions responsible for O&M are capable of fulfilling their functions.
3. The supplies are financially and, (subject to councils retaining trained staff) technically sustainable.

The main weaknesses have been;

1. Until the late 1980s, a holistic approach to the key training element was not adopted. The result was that although the manpower situation improved, the trained manpower availability remained far below needs and localisation plans were regularly delayed.
2. The health education component failed to achieve a significant impact due to a lack of resources, co-ordination and support.
3. There has been a conspicuous lack of concern with water conservation. This has exacerbated the programme's, albeit minor, adverse environmental impact, and has contributed significantly to supply capacity constraints and the need for the current expensive rehabilitation programme.

ACRONYMS

A,O&M	Administration Operation and Maintenance
BIAC	The Botswana Institute of Administration and Commerce
BPMS	Borehole Preventative Maintenance Scheme
BRS	Borehole Repair Service
BTC	Botswana Technology Centre
CS	Council Secretary
CTO	Chief Technical Officer
DDC	District Development Committee
DDF	Domestic Development Funds
DDSS	District Development Sector Support Programme
DLGSM	Department of Local Government Service Management
DPSM	The Directorate of Public Service Management
DTRP	Department of Town & Regional Planning
DWA	Department of Water Affairs
FY	Fiscal Year
GDP	Gross Domestic Product
GOB	Government of Botswana
GOS	Government of Sweden
HND	Higher National Diploma
HRD	Human Resources Development
IDM	The Institute of Development Management
MFDP	Ministry of Finance and Development Planning
MLGLH	Ministry of Local Government, Land & Housing(previous MLGL)
MMRWA	Ministry of Mineral Resources & Water Affairs
MOH	Ministry of Health
MSEK	Million Swedish Kronor
MTTC	Madirelo Trade and Testing Centre
NCC	National Craft Certificate
NDP	National Development Plan
O&M	Operation and Maintenance
OTD	Ordinary Technician Diploma
P	Pula
RIIC	Rural Industries Innovation Centre
RVWSP	Rural Village Water Supply Programme
SEK	Swedish Crowns
SIDA	Swedish International Development Authority
SIPU	Swedish Institute for Personnel Development
STO	Senior Technical Officer
ULGS	Unified Local Government Service
UNDP	United Nations Development Programme
VDC	Village Development Committee
VTC	Vocational Training Centre
WET Course	Water Engineering Technicians Course
WHEP	Water Hygiene Education Programme
WMU	Water Maintenance Unit
WSO/VWSO	Water Supply Operators or Village Water Supply Operators

1. PROGRAMME CONTEXT

This report represents the findings of the Final Evaluation Mission of the Botswana Rural Water Supply Programme supported by the Swedish International Development Authority (SIDA) from late 1971 until 1993. The programme has been a major component in the overall development co-operation between Sweden and Botswana.

The study is a final evaluation in its true sense. Its main purpose is to determine any lessons which might be applied to other programmes supported by SIDA, or which could be used by Botswana in its future water development activities. The evaluation has to consider the unique features of Botswana when assessing the programme performance against SIDA's evaluation criteria. Given the length of the programme, the assessment is made in terms of a long term macro perspective. During the programme period, in excess of 20 years, the water sector in Botswana has been marked by high continuous development which has included such large additional investments in the programme villages and elsewhere that the assessment of the impact of Swedish support cannot be isolated from the overall development of the sector. This in turn has been significantly influenced by the economic development of the country.

It is not simple to estimate the total cost of the 20 year programme since apart from embracing several different components and funding sources, it has involved the provision of SEK by SIDA to Botswana which has undertaken its expenditures in Pula. During the programme there have been significant differences in the exchange rate and in the SEK/Pula levels of inflation. Hence the programme cost is summarised separately in two different ways.

Year	Total expenditure incurred	Total in 1991/2 prices	SIDA %	DDF %	OTHERS %
1971/72	16 411	147 847	100,0%	0,0%	0,0%
1972/73	110 681	930 092	100,0%	0,0%	0,0%
1973/74	251 054	1 731 407	91,1%	5,3%	3,5%
1974/75	986 778	5 944 446	88,5%	11,5%	0,0%
1975/76	1 030 686	5 424 663	88,7%	11,3%	0,0%
1976/77	1 513 945	6 912 991	100,0%	0,0%	0,0%
1977/78	1 425 798	5 795 928	93,3%	0,0%	6,7%
1978/79	1 402 463	5 332 559	89,7%	0,0%	10,3%
1979/80	2 423 480	8 024 769	91,7%	0,0%	8,3%
1980/81	3 029 667	8 731 028	74,5%	12,7%	12,8%
1981/82	4 206 663	10 543 015	71,6%	22,3%	6,1%
1982/83	5 136 820	11 440 579	64,1%	31,4%	4,5%
1983/84	4 652 491	9 573 026	83,5%	4,4%	12,1%
1984/85	7 080 613	13 616 564	73,7%	18,7%	7,6%
1985/86	5 824 117	10 456 224	84,0%	16,0%	0,0%
1986/87	8 775 361	14 362 293	77,9%	19,7%	2,3%
1987/88	12 111 425	18 212 669	61,9%	17,0%	21,1%
1988/89	15 230 749	20 722 108	44,7%	46,9%	8,5%
1989/90	15 020 090	18 566 243	53,7%	46,0%	0,2%
1990/91	16 758 186	18 829 422	65,0%	34,7%	0,3%
1991/92	29 194 640	29 194 640	28,0%	68,9%	3,1%
1992/93(*)	18 992 650	21 271 768	45,4%	54,1%	54,0%
Total	155 174 768	245 764 281	63,9%	30,7%	5,4%

(*) includes minor expenditure in Botswana FY 1993/94

Firstly the above table¹ presents the total pula expenditure of the programme as estimated by the Fact Finding Review from all funding sources. The first column shows the expenditures in current prices. It can be seen that the total expenditure was just over P 155 million. The second column shows the same expenditures expressed in constant 1991-2 prices. This shows that expenditure even in real terms was highest during the latter years of the programme. This was partially the result of higher contributions by the Government of Botswana, but the SIDA contribution was also higher than it had been in earlier years.

The total expenditure in 1991-2 constant prices was just over P 245 million. SIDA contributed approximately 64% of this sum, while the Government contributed just over 30%. However from 1988/9 Government² was contributing approximately half of the cost. Other donors only contributed around 5%.

¹ Source: *Fact Finding Review*; Exhibits 3.2, 3.5, 3.7.

² Whenever the term Government appears in this report, it refers to the Government of the Republic of Botswana.

AGREEMENT	PERIOD	AMOUNT MSEK	1995 VALUE MSEK
Kanye	711126-740630	1	6
VRWS I	730517-780630	13	60
VRWS II	750815-780630	15	54
VRWS III	780426-840630	30	81
VRWS IV	810429-850630	86	165
RVWSP I	850701-890630	95	146
RVWSP II	890929-930630	102	115
DDSS I	1979/80-82/83	10	23
DDSS II	1983/84-86/87	11	17
DDSS III	1987/88-89/90	12	17
DDSS IV	1990/91-92/93	21	24
	Total	397	708

Swedish support to the programme, expressed in MSEK (million Swedish Kronor), is shown in the table above³, based on the different agreement periods. The third column shows the amount in current MSEK, while the last column shows the same figures translated into 1995 values. It should be noted that the definition of SIDA assistance to the programme is not clear cut. The main ambiguities relate to VRWS IV. During this period MSEK 15 was reallocated from other programmes within the country frame to RVWSP⁴. This sum is included in the table. Also during the VRWS IV period, SIDA contributed MSEK 25.5 as drought emergency support. This sum has not been included in the table. Based on the above assumptions, the SIDA contribution to the village programme was MSEK 342 million in current prices, and MSEK 627 in 1995 values. If the emergency funding was included the corresponding figures would be MSEK 368 and MSEK 676. The SIDA contribution to the DDSS programme which is attributable to the rural water programme is MSEK 54, or MSEK 81 in 1995 values.

In addition the cost of a number of associated components should be included. Firstly the value of SIDA direct sponsored technical assistance personnel. This was estimated by the Fact Finding Review to total MSEK 146 million in 1991 prices. The actual cost in current prices was of the order of MSEK 90 million and using the SEK cost index, the 1995 cost is MSEK 164 million. In addition various related consultancies are estimated to have cost MSEK 12 in updated 1995 values.

Hence the total SIDA contribution in 1995 values is:

	MSEK
Village Programme	627 (676)*
DDSS Water Component	81
Technical Assistance	164
Consultancies	12
Total	884 (933)*

* If the emergency funding provided during VRWS IV is included.

³ Source: Ibid. and the Team's estimates under given assumptions and indices.

⁴ In this report we use the Rural Village Water Supply Programme (RVWSP) to designate the whole programme.

It is not possible to directly translate this figure into Pula accurately given the different exchange rates and SEK/Pula inflation levels over time. Based on the current exchange rate, (2.7 :1), the current value of the SIDA water programme assistance, (MSEK 884), would be just under P 330 million in 1995 values.

The consultants have also estimated the breakdown of the expenditure between the main programme components using SIDA decision memos and annual review. The results are as follows⁵:

Institution	Component	Share of funds
DWA	Core Project	75.7%
MLGL	Rehabilitation	11.8%
MLGL	Capacity Building	10.0%
MLGL	Sanitation	0.5%
MOH	Hygiene	1.5%
MOH	Schistosomiasis	0.3%
DWA	Hygiene	0.1%

Hence it can be seen that the core programme absorbed 75% of total funding, while the main components financed through MLGL, rehabilitation and capacity building, received just over 20% of the total allocation. All other components combined received under 2.5% of the total funding. The very minor contributions to sanitation, hygiene etc are a key feature of the programme.

1.1. Rural Water Sector 1971 to 1995

Most of Botswana has always had a very limited availability of water from surface or shallow groundwater sources. Consequently drilling for deeper groundwater began in the early days of the Protectorate, and was undertaken by both the Colonial Government and by chiefs.

Although in the 1960s, a few dams, such as Gaborone dam, were built for towns where borehole water was inadequate, the emphasis has, since the 1920s, been on developing groundwater resources. At Independence over 4000 boreholes had been drilled throughout the country. While a large number were privately owned, the new Government inherited approximately 700 boreholes from the Colonial administration. These supplies had been drilled and sited by the Geological Survey and equipped by contractors or by the Public Works Department.

Hence in 1971 rural water supplies, including those in the major villages, were based mainly on boreholes. Some of the smaller key regional centres such as Maun and Ghanzi had adequate water, but required improved distribution and storage facilities, and stand-by equipment. While some of the larger major traditional villages, such as Kanye, Mochudi, and Molepolole were suffering from acute shortages of water. Although there were suitable sites close to some villages where dams could be built, the cost of surface supplies appeared to be far higher than that of additional groundwater provision.

⁵ Sources: *SIDA decision memos and Annual Reviews.*

By 1971 Government was already planning to embark on a rural water programme to meet current and future needs to match projected growth and development requirements. It was appreciated that the unit costs of provision would be high and NDP 2 had noted that the development of new supplies would depend upon the extent of Government provision and the level of payment by consumers, since the latter would affect the level of recurrent subsidies needed.

No comprehensive baseline study on the rural water supply situation was undertaken prior to the commencement, or in the early stages of the rural water programme and figures relating to the numbers of village residents who were obtaining their water from simple borehole supplies and from unimproved traditional sources are not available. The lack of such a study and limited data on the situation prior to the programme means that quantification of beneficiaries is only possible in terms of the number of people who have been served, but not in terms of the extent to which their service has been improved. It is recommended that future long term programmes should be preceded by baseline studies which document the key characteristics. Such studies need not significantly delay the implementation of the programme since they can be undertaken simultaneously with other planning. Furthermore where such studies do delay the start of implementation, they should be borne as a price of potentially improved planning, monitoring and outcomes. The omission in the recent RVWSP was understandable, inasmuch as the future scope and length of the programme was not envisaged in 1971.

1.2 SIDA/Botswana Rural Water Programme 1971-95

Based on a request by the Botswana Government, a co-operation agreement between Sweden and Botswana was signed in November 1971. SIDA undertook to finance 100% of the costs of the provision of an improved water supply for one major village, Kanye, on a grant basis. The estimated cost was MSEK 1.1 million. Work started in February 1972 and was completed, after a slight delay, in 1974. Additional capacity, and distribution and storage facilities were constructed to meet a peak daily demand of 45 l/c/d based on the 1971 population and the provision of a standpipe within 400 metres of every dwelling. The pre-construction hydro-geological investigation indicated that the groundwater resources were sufficient to meet demand up to the year 1980.

In 1973 an agreement was signed for the first phase of the Village Rural Water Supply Programme, (VRWS I). This specified that SIDA would provide funding for another 15 major villages and for 28 rural villages during the agreement period 1973-4 to 1977-78. The planned coverage was 100,000 people in major villages and 35,000 in rural villages. The programme was based on the Kanye design criteria, and the total cost was estimated to be MSEK 17.5 million of which SIDA would fund 75%. MSEK 10 was allocated to major villages, MSEK 3 to rural villages while the remaining MSEK 4.5 was for related costs and contingencies.

By 1975 it had become clear that the 1973 agreement was too optimistic regarding the Department of Water Affairs' implementation capacity and construction costs. Higher costs were largely due to inflation, but more advanced designs was also a factor. Government requested an additional MSEK 10.56 from SIDA to fulfil the original plans and MSEK 3.2 to investigate the potential of extracting water from the beds of some seasonal rivers in Eastern Botswana. An agreement was signed with SIDA in August 1975 covering the period 1975-6 to 1977-8 (VRWS II), in which SIDA provided a slightly higher figure of MSEK 15. However there was no mention of any additional Botswana contribution.

NDP IV (1976-80) planned the provision of water to all major villages by 1978-9, to all villages with a population in excess of 500 by 1980-1, and to all designated villages by 1985-6. It stated that 191,000 rural people should be supplied by 1980. The plan also documented within village supply objectives: in the major villages, the supplies should cover the entire waterworks area and provide a standpipe within 400 metres of all households. Private connections were to be provided within the waterworks area upon application and payment of costs. Systems were to provide a minimum of 40 l/c/d for the entire population. In rural villages (population > 500), the proposals were similar except that there were no defined waterworks areas and the design criterion was 20 l/c/d. In small villages, specific numbers were not mentioned, the strategy was to bring water into the village from an outside borehole to a standpipe and to key institutions. The British Overseas Development Agency subsequently agreed to support the initial phase for small villages.

The plan also recognised the need to co-ordinate water supply and sanitation planning in the larger villages due to increasing amounts of waste water, and to an increasing risk of contamination of water sources from an increased human/cattle population.

The third agreement (VRWS III) initially covered the period 1978-82 and aimed to bring the total number of villages supplied up to 201 by mid 1982. However the agreement period was later extended up to June 1984, running parallel with VRWS IV (1982-5). Total support for the third agreement was MSEK 30. As a result of the 1977 evaluation, VRWS III emphasised the importance of; (i) the training/education of Botswana personnel, and (ii) operation and maintenance, (iii) the link between training and O&M.

NDP V (1979-85) gave top priority to keeping existing schemes operating efficiently. It stated that a project to supply the necessary equipment to councils and to recruit and train staff would commence in 1979. However it also stated that the implementation of new supplies should be increased as much as possible. It noted that fees for standpipe water were being abolished.

During the two year period 1978-80 approximately 50 village supplies were constructed, leaving more than double that number (108) to be constructed during 1980-82. This failure to meet maintain the planned schedule resulted in a further request to SIDA in September 1980 for additional funding which outlined the reasons for cost over-runs and construction delays. The main reason given for the delays was the shortage of construction staff. It was projected that funding for both rural villages (SIDA) and small villages (ODA) would be exhausted by the end of 1981 leaving 68 villages without funding. The reasons for the cost over-runs included; (i) major village projects were sometimes extended beyond the original designs, (ii) small village design criteria were revised to those of rural villages, (iii) delays meant that construction costs included additional inflation, (iv) inflation was greater than had been anticipated.

The project memorandum covered 37 rural villages and 84 small villages including the above mentioned 68 unfunded villages. this resulted in the overall village target, from the beginning of the programme being modified from 201 by 1980 to 254 by 1985.

However SIDA no longer accepted to pay for transport costs, and it was planned to use the savings, inter alia, for a health and hygiene campaign. The budget for the new agreement period 1981-2 to 1984-5 (VRSW IV) specified Swedish support of MSEK 71. However British support ceased and SIDA remained as the only significant donor.

New construction proceeded during the early 1980s but operations were increasingly hampered by a series of drought years. By 1983 DWA operations were dominated by emergency drilling. Many sources of water supplies designed and developed during the 1970s when rainfall was relatively high, started to dry up. During 1982-4 drought SIDA contributed MSEK 25.5 as emergency support, mainly for equipment to increase DWA's construction capability to alleviate the effects of the drought.

The deteriorating supply situation facing DWA and the councils in which many systems could not match the demands was exacerbated by high population increase and by a permissive private connection policy in major and some large rural villages. However the design period had been 10 years and that the earliest supplies had been constructed before 1975. Insufficient attention was paid to the planning of augmentations until the problems actually arose. For example the original hydro-geological surveys for Kanye indicated that capacity was only adequate until 1980.

At around the same time the rural village programme was extended, to cover 354 villages, although it was questionable whether it was appropriate to extend a similar technology service to progressively smaller villages and settlements. In fact NDP VI (1985-91) noted that some of the 354 villages included in the rural water programme did not appear in the list of 417 recognised villages, indicating that some of the programme villages were too small to qualify as a village. It further stated that taking resource availability and councils' operational capacities into account, the new construction target should be 20 schemes per year, and that it had to be expected that the programme would not be complete at the end of NDP VI. In particular it appropriately recognised the need to redirect resources to rehabilitation/upgrading of existing supplies, given the decreasing marginal benefits of new small schemes and the importance of conserving past investments.

Within the VRWS IV programme, the MSEK 71 allocated to mid 1985 was fully utilised by the end of 1984, and an additional sum of MSEK 15 was re-allocated from other programmes within the country frame. At around this time SIDA felt that the policy on private connections which was leading to the need for large augmentations in major villages was not in line with their own policy of funding the provision of basic needs, and decided that from 1985, they would not support the upgrading of major village supplies.

The agreement for the period 1985/6-1987/8 (RVWSP I) provided a total allocation of MSEK 74 million, of which MSEK 51 was for the construction of 20 new small village supplies per year. However a key feature of the agreement was that support under the water programme was for the first time given to MLGL. MSEK 12 was provided for rehabilitation of village supplies and MSEK 6 was provided to strengthen councils' O&M capacity, which until then had relied entirely on the DDSS programme. In addition MSEK 4 was allocated to Ministry of Health covering the final phase of the water hygiene campaign and its development into a programme for water and health education, a bilharzia reduction programme, follow up studies on water quality, and a few overseas scholarships. By the end of 1986 over 250 supplies had been constructed. This figure increased to 290 villages by the end of 1988. These supplies provided water to 52% of the rural population. The majority of the target population had been supplied since the remaining 64 villages only covered 3% of the rural population. A Rural Water Costs and Tariff Study and a Rural Water Design Manual were finalised in 1988. The former led to an improved, albeit still inadequate, rural water tariff, while the latter has been extremely useful.

The RVWSP I was extended by a year to 1988/9. It was followed by a second phase RVWSP II covering the period 1989/90-1991/2. Subsequently this phase was extended by one year to June 1993, when the programme was terminated. The funds allocated during 1988-93 were:

- (i) MSEK 27 million — for the extension of RVWSP I.
- (ii) MSEK 68 million — for RVWSP II
- (iii) MSEK 5.6 million — carry-over to RVWSP II of tied aid from 1988/9.
- (iv) MSEK 8.6 million — subsequent reallocation to RVWSP II from other programmes
- (v) MSEK 20 million — extension of RVWSP II to 1992/3.

Hence, allowing for the carry-over, a total of MSEK 95.4 was provided for RVWSP I and MSEK 102.2 for RVWSP II.

The need for rehabilitation, upgrading and extension of existing village supplies continued to increase. This was, as earlier, due to continually increasing demands and the reduced supply at some sources resulting from the long period of low rainfall. The most acute problems were addressed by the Consolidated Emergency Village Water Programme (CEVWP) which commenced in 1988 and which covered 82 villages some of which were on the SIDA programme list but which had not yet been constructed, although SIDA did not contribute to the funding the CEVWP. While the regular rural water supply development programme continued parallel to the emergency programme, the heavy work load imposed on DWA by CEVWP meant that during the last three years of the decade, the number of new schemes constructed annually fell to single figures.

The new village supply construction during 1989/93, was largely in small villages, and although it is difficult to separate the different programmes, by late 1993 all but 17 of the 354 SIDA programme defined villages had been provided with a water supply, and a number of the remaining schemes have since been completed. Furthermore many other villages, for example 82 under the government funded emergency programme and 11 under the Remote Area Dwellers programme had been supplied. In addition over 100 supplies had had activities completed under the rehabilitation programme by late 1993. In fact during the last period of the programme, the whole thrust of water supply investment was moving towards rehabilitation which is absorbing an increasing share of all new investment since most designated villages are now served. By 1991, the rehabilitation programme had been expanded to cover 196 villages, with a total estimated cost, at that time, now increased, of some P90 million, (MSEK 270)⁶. This represented a huge expansion of a programme initiated in 1985 to cover 60 villages at a total cost of P6 million.

1.3 District Development Sector Support Programme

Although the District Development Sector Support Programme was initiated as a totally separate programme from the RVWSP, it has such a significant effect on the sustainability of the latter that it cannot be ignored in any comprehensive evaluation of the latter. This section is restricted to outlining the DDSS programme as it relates to water supply.

⁶ Sources: *Appendix 4, Review of the Village Water Supply Programme, Botswana, 1991*, GoB/SIDA, and *Project Memorandum, 1991*.

From 1979 SIDA started providing financial assistance through the District Development Sector Support Programme. The general objective was to enhance the capacity of district councils to deliver services to the rural population through the strengthening of the local government structure and training to promote further decentralisation of responsibilities to local government.

The emphasis on O&M in the 1977 evaluation and an assessment undertaken in late 1978 of councils needs for strengthening their capacity to operate village water supplies, highlighted the need to support councils by strengthening their O&M capacities. Part of the funding of DDSS I was used for this purpose. The proportion of the Phase I total of MSEK 50 which was allocated to water supply has not been documented, but estimates based on known project components suggests that the figure was around MSEK 10 million. This was used to provide every district council with adequately equipped water maintenance unit (WMU). In Central District the facilities were provided to every sub-district, giving a total of 13 WMUs. Office, workshop, and stores facilities were provided together with vehicles, tools and equipment.

In 1981 MLGL carried out a study "The Establishment of District Council Water Departments" which proposed plans for the next round of council water supply capacity building. It proposed the rapid transformation of the WMUs into fully fledged water departments, and a rapid hand-over to the councils of the Major Village supplies. However it under-estimated some of the problems and difficulties involved and was rejected by government. In contrast the possibility that DWA would have to take over the O&M of some of the larger rural villages which councils did not appear to be capable of operating efficiently, was being discussed at around the same time. Nevertheless the report lead subsequently to the creation in 1983 of a post in MLGL of a professional advisor to the councils on all water related matters. The advisor was also given a liaison role between the councils and DWA.

The second phase of the DDSS programme continued to provide assistance to the water sector for capacity building. MSEK 10.5 of the total funding of MSEK 60 million was allocated for water supply. Since district recurrent budgets were too low to allow adequate maintenance and replacement of worn out equipment, such as vehicles, engines and pumps, the SIDA funds were used largely for these items. While adequate stocks were provided for every unit, it was imagined that henceforth, it would be the councils responsibility to fund future requirements. Efforts were made to make the councils aware of the need to allocate sufficient recurrent funding to the water budget. During this period two councils upgraded their water units to departments.

Under DDSS III (1987/8 - 1989/90) and IV (1990/1 - 1992/3), funding of MSEK 12 million and MSEK 12.3 was provided. The latter included a late reallocation of MSEK 10 in early 1993 for rehabilitation of existing villages supplies. In addition the councils' water departments benefited from the SIDA funded DLGSM/SIPU implemented human resource development and management programme. The cost of the water related element of this programme is uncertain but is probably around MSEK 9 million. By 1990/91 all council water units had been transformed into water departments. Towards the end of the period construction started on a new generation of workshops, offices and stores, although the greater part of the funding was provided by government.

2. THE EVALUATION

2.1 Objectives and Scope of the Evaluation

In this Chapter the objectives and methodologies of the evaluation are presented.

The main purpose of the evaluation is to summarise the results and experience from more than 20 years' of development co-operation in the water sector of Botswana, and subsequently to judge its performance. The evaluation covers all support given to the rural water supply programmes and technical assistance within the water sector during the period 1971 to 1993, when the support was terminated. The Terms of Reference for the evaluation study are found in Annex 1.

In order to further assist in a common understanding of the scope of the study an Inception Report was prepared by the consultant prior to the field visit. The report mentioned a number of difficulties that faced the study. These included the fact that although there is an impressive amount of information on the programme available, no baseline study was prepared in the initial stage of the programme.

Another difficulty was that Botswana's own water supply programme, without the support of Sweden, often has provided new investments in villages where there was already a water supply system from the SIDA co-operation. In some instances there have been several "layers" of investments, and separating the effect of the SIDA funded "layers" alone is not always possible.

The emphasis of the team was not to establish quantifiable facts such as how many water supplies were built, how much money was spent etc, since their work had been preceded by a Fact Finding Review, (c.f. below), and the time which would have been required for the fine tuning of data, (which in some instances would not have been possible however much time was invested), would not have been justified. Instead the emphasis was on establishing an accurate impression of the merits and limitations of the programme, in particular on an assessment of the programme's performance when judged against targets and objectives. As a result of this emphasis, the study addresses questions relating to the relevance, impact, sustainability and lessons of the programme. Some other aspects or special themes such as methods for community participation which are included in the terms of reference are also covered.

Direct proposals for amendments to the existing programme are inappropriate in an ex post evaluation. Nevertheless in addition to presenting lessons for SIDA to take into account in formulating rural water supply programmes in other countries, the consultants have considered what lessons the Government of Botswana might draw from the experience of the RVWS programme.

2.2 Study Approach

The evaluation was carried out between March and May 1995. Initially a desk study of programme documents was undertaken in Stockholm and the above mentioned Inception Report was prepared. After this had been discussed with SIDA, the team visited Botswana for the fieldwork phase from 10th to 29th April.

At the beginning of their visit to Botswana the team had a meeting with the Reference Group⁷ in order to discuss the study focusing on the Inception Report. As a result of that meeting the team modified some aspects of the study coverage and finalised their district visit itinerary.

The fact that the programme had been terminated in 1993 and spanned 22 years meant that; (i) there was a wealth of data available, although some of it was incomplete and quantitative data was sometimes conflicting, (ii) many physical interventions have been covered by new layers of investments, (iii) there are very few people have an overview of the whole programme.

This situation dictated the need for a wide review of literature and for discussions with a range of persons who had a good knowledge of limited parts of programme. Consequently while in Botswana the team's programme included:

- reviews of available documentation covering the 20 year period, including previous Evaluations, Annual Reports, Project Memoranda etc (c.f. Annex 3),
- interviews with relevant staff in institutions and ministries at central government level,
- interviews with District Council staff in Central, Kweneng and Kgatleng Districts and in Malahapye Sub-district, and with DWA local staff in Serowe, Mochudi, and Molepolole,
- interviews with other relevant persons,
- three village visits and interviews with chiefs, community members, Village Development Committees, Village Health committees, Family Welfare Educators etc.

The list of the wide range of persons interviewed at both district and central levels and in Sweden is presented in Annex 2. The available literature and interviews with persons who had experience of different components of the programme at different times provided the consultant with a good basis for obtaining an overview of the whole programme.

The Mission spent three weeks in Botswana and before departure the main conclusions were presented to the Reference Group. The Group members' comments were used in the preparation of the draft report, which was subsequently submitted to SIDA and Reference Group members. In late June a final meeting was held with the Reference Group in which Group members provided their comments on the Draft Report. These comments and others received from SIDA have been used in the preparation of this Final Report.

2.3 Study Team

The evaluation team members were:

Mr. Jan Valdelin, economics, organisation and management aspects, team leader in Sweden.

Mr. David Browne, economics, organisation and management aspects, team leader in Botswana.

⁷ The Reference Group consisted of Mr B Khupe (chairman) and S. K. Mmopi from the Department of Water Affairs the Ministry of Mineral Resources and Water Affairs, J. M. Thema from the Ministry of Mineral Resources and Water Affairs, M. Hagos and C. Brown from the Ministry of Local Government Lands and Housing, K. B. Mpowe from Kgatleng District Council, M. A. Tselayakgosi and O.D. Matlhabe from the Ministry of Health, M. Nyathi, L. N. Cephas and S. Kebakile from the MFDP and Å. Edström and L. O. Janson from SIDA. At the final meeting Mr O.A. Masedi from Department of Water Affairs acted as Chairman in Mr Khupe's absence.

Ms. Elsie Alexander, human resources development, community participation and gender aspects.

Ms. Kristina Boman, health and hygiene education, community participation and socio-economic aspects.

Ms. Marie Grönvall, environment and sanitation aspects.

Ms. Imelda Molokomme, human resources development, and gender aspects.

Mr. Gunnar Settergren, engineering, administration, operation and maintenance aspects.

Ms. Molokomme and Ms. Alexander from PEER Ltd, Gaborone, were contracted directly by SIDA in Botswana, and worked together with the other team members from ICS Interconsult Sweden AB. The "Fact Finding Review of the SIDA-Support to the Water Sector in Botswana 1971-1993" was undertaken by Mr. Chris Sharp of Economic Consultancies (Pty) Ltd, Gaborone prior to the evaluation. Ms. B. U. Bhebhe, Principal Regional Planner at MLGLH was commissioned as a resource person during the evaluation.

2.4 Evaluation Criteria

The main evaluation criteria used in this study are achievement of objectives, relevance of the support, sustainability, and cost effectiveness. In addition based on the terms of reference other criteria have been considered including the appropriateness of strategies and methods used in the health and hygiene education component, and the role and level of participation of women.

3. FINDINGS

This section presents the findings of the evaluation of the programme.

3.1 Objectives

Initially Swedish development assistance to Botswana was one element of a programme for Southern Africa, aimed at the three independent states of Botswana, Lesotho and Swaziland. This programme was based on one of the four overall objectives of Swedish development co-operation prevailing at that time, namely economic and political independence. It is clear that the origin of the assistance to Botswana was political, in that the main objective was to reduce the country's dependence on South Africa. SIDA aimed to, "support Botswana's government in its efforts to create economic development which is as independent and balanced as possible" In 1973 the independence objective was made more specific. "The primary objective for Swedish assistance is to create an opportunity for the country to reach the economic and political independence she aims for, firstly from South Africa and Rhodesia."

In 1978, SIDA for the first time added 'social and economic equity' in the phrasing of the objectives of the development assistance programme for Botswana. Since then political and economic independence, reduced dependence on South Africa, and social equity remained the main overall objectives of assistance to Botswana up to the time of political transformation in South Africa. In 1984 SIDA requested that procurement in South Africa should be reduced and eventually cease completely.

Although the objectives for the water programme set out in the bilateral agreements between Sweden and Botswana have been modified over time, they have been based on socio-economic criteria and have not mentioned the political objective of SIDA's overall country assistance.

Initially it was specified that the objectives were:

- supplying sufficient amounts of water to improve the general health and hygiene conditions and to satisfy demands required by the general improvement of living standards and social conditions
- supplying sufficiently clean water to eradicate waterborne diseases
- saving time spent on water collection.

The specific aims of the support were:

- an increased per capita water consumption from 9 l/c/d to 20 l/c/d, as considered desirable for improved health.
- improved security against supply breakdowns & shortage of water - improved water distribution and hence reduced walking distance from household to tap.

By the mid 1980s the emphasis had changed to:

- reduce drudgery for rural women
- assist the growth of productive employment in Botswana
- improve public health in rural areas and reduce waterborne diseases.

The needs were expressed as:

- catering for the poorest sections of community
- maintaining existing facilities
- improving benefits from existing facilities
- promoting growth and development in the rural sector as well as health, hygiene and sanitation.

For the last phase of the programme the objectives were:

- to reduce drudgery for rural women
- to provide reliable and affordable water supply in the villages - to improve the maintenance and operation of rural water schemes
- to improve the education with regards to environmental health and sanitation

These objectives being agreed in the bilateral agreements between Botswana and Sweden represented the objectives of both parties. Hence as expected there is a close similarity of these objectives with those expressed by the Government in its National Development Plans. For example NDP 5 emphasised the reduction of drudgery, the improvement of health and assisting the growth of productive employment, all of which were included in the programme objectives. In addition NDP documents increasingly stressed the objective of sustainability of services.

Substantial support to the water sector has formed part of the District Development Sector Support programme. The general objective during from the start of the DDSS programme was

to enhance the capacity of District Councils to deliver services to the rural population. The third phase included the following specific objectives:

- to enhance the capacity of the District Councils to provide a wide range of services to rural people through the development of the local government structure and through training;
- to promote further decentralisation of responsibilities from central to local government;
- to contribute to an even distribution of economic and social resources among the people.

3.2 Relevance of the Support

In judging whether the objectives were relevant, a distinction should be made between relevance *ex ante* and relevance *ex post*. Sometimes objectives which were relevant at the planning stage may, due to changing circumstances, be less relevant in the *ex post* situation.

The overall objective of economic and political independence was highly relevant for all independent countries in the region at a time of apartheid and colonialism. It must therefore be concluded that the overall objective for support to Botswana was relevant. However two questions arise. Firstly how did SIDA expect its co-operation to assist in promoting this objective given that Botswana had decided to join a customs union with South Africa. Budget support should not realistically have been expected to have reduced Botswana's purchases in South Africa. Since the barring of purchases in South Africa only applied to the funds provided by SIDA, it was no more than a political gesture.

Secondly it would have been unrealistic to have linked the objective of economic and political independence to rural water supply development. Hence the independence objective of the overall programme was not relevant as regards the water programme. Hence the emphasis, in considering relevance, should be on the socio-economic objectives.

As regards SIDA's other overall country programme objective of social and economic equity, this was, and is, clearly highly relevant. It is best examined by considering the relevance of the water sector objectives since these were largely equity based.

Given the water supply situation in the rural areas the key objectives related to improving the quantity and quality of water and reducing the distance to consumers, i.e. improving health and reducing drudgery were clearly relevant. The key questions relate to whether SIDA went about implementation in order to achieve these objectives in the most appropriate way. Was the support relevant given that the objectives were relevant to the situation? Secondly were the end objectives of reduced drudgery and improved health achieved by the provision of potable water within the villages?

The Swedish decision to provide development assistance to Botswana in the rural water sector, was based on a problem analysis from the early support preparation reports. With the benefit of hindsight it can be argued that the analysis was too shallow, although in principle correct. The depth of the analysis should be seen as a reflection of the time. Theories and general ideas about development aid were still in the early phases of development. The problem of supplying water to rural Botswana was seen primarily as an engineering problem. Given adequate resources, the engineers would solve the villages' water supply problems and in the process they would transfer the necessary skills to Botswana to take over, adequately maintain the systems and further develop the sector. Even if the analysis was shallow, it is not possible to argue that the support

was irrelevant to the problems given the way they were identified. There was a serious water problem in rural Botswana and the programme has over the medium term made a major contribution to the solution of the problem. Initially it was simply assumed that health improvements would result directly from the provision of adequate potable water. This is despite the fact that the development literature of the time was starting to put the case that complementary inputs such as health education were necessary for the potential benefits of improved water supplies to be actually realised, i.e. that improved supplies were necessary but, by themselves, insufficient to ensure improved health.

However the programme has been modified over time, as a result of experience gained and of a wider understanding of other important factors necessary for realising the potential benefits of rural water supplies and for sustaining the systems. There was an increasing understanding of the fact that the provision of support for just building physical infrastructure was insufficient. New components such as operation and maintenance and hygiene education were added over time together with the necessary capacity building involving HRD and institutional development. However it is suggested that the emphasis remained too strongly on the hard programme elements for far too long. Furthermore insufficient resources were put into the soft elements such as health education and community participation right up until programme termination. The most important change of direction related to the capacity building for operation and maintenance. The objective of DDSS to enhance the capacity of councils to deliver services to the population was important in providing the water programme with vital support.

Nevertheless the programme can be said to have developed in the direction originally anticipated, albeit with a number of new elements. However the programme expanded far beyond the scope envisaged by the original planners. It is important to point out that in 1971 no one envisaged that SIDA would support a programme which brought water to most villages in Botswana. One factor in the rapid expansion was the over-optimistic judgements in the early years on the benefits and success of the programme. The result was that constant adjustments were needed. In general the adjustments were made too slowly, and sometimes not at all, because at no stage was there anyone whose job it was to consider programme direction and strategy. Despite this, throughout the programme period, the support never been too far out of line with the initial and later slightly amended needs and objectives.

At times programme interests have been subjugated to politically motivated interests. For example (i) when some of the assistance was tied to procurement in Sweden and (ii) when funds were not allowed to be used for procurement of South African goods.

It is concluded that;

- (i) the programme was not relevant to SIDA's overall "independence" assistance objectives. But this was inevitable given the nature of the programme.
- (ii) the specific programme objectives were relevant to the needs of the rural villages.
- (iii) the programme was initially not well conceived, but this was in part a reflection of the prevailing limited knowledge of the development process.
- (iv) over time the relevance of the programme has been increased by amendments and by the addition of new components.

(v) in general these amendments have been introduced later than was desirable. This was a result of no one being responsible for overall programme direction and strategy.

(vi) despite the fact that the programme expanded in scope far beyond that which was originally envisaged, it has remained reasonably relevant to; (a) the needs of the rural consumers and (b) the socio-economic objectives of SIDA and the Government.

3.3 Achievement of Output Targets

The table below presents figures showing the number of villages supplied under the programme, and the population of those villages. The table has been compiled from Annual Reports, Evaluation Reports, Project Memoranda and DWA Reports. However inconsistencies exist in those reports and the figures presented are only reasonable approximations involving judgement and interpolation.

Table: Villages and Population Served

		Villages		Population		Served
		Major	Rural	Small	Total	
End	1975	6	10	-	16	60 000
Mid	1977	11	22	-	33	110 000
Mid	1978	14	31	3	48	150 000
Mid	1980	15	53	25	93	230 000
Early	1984	17	90	95	202	375 000
End	1986	17		233	250	450 000
End	1988	17		273	290	525 000
Mid	1993	17		320	337	650 000
Mid	1995	17		331	348	700 000

It should be noted that the marginal increase in the population supplied between the different dates included not only the population of the additional villages being supplied but also the increase in the population of the villages already supplied. During the latter part of the programme period, this was the major factor in the increase in the population served figure.

While some of the population figures shown in the above table have been extracted from various reports, the final figure been estimated by the consultants, using the 1990 census figures. That exercise estimated that the total population of all villages, major and rural to have been 647,000. The 1995 population, using a growth rate of 3.5%, would be 768,000. Only a few thousand people are living in unserved villages, while a minority are living in villages where there has been no SIDA assisted intervention. However all major villages and 331 out of the 451 council operated supplies have at some stage benefited from the SIDA assisted programme. Exact estimates are hampered by the number of parallel programmes and a lack of precise population served figures for those villages. However the population of the 120 villages not in the SIDA programme are limited, and an average of 500 would probably be an over-estimate. Hence it is estimated that at least 700,000 people are today living in villages which have benefited from a VRWSP scheme.

Furthermore it is difficult to determine what proportion of the population living today in villages served by the programme should actually be attributed to the programme, rather than to later programmes such as the Rehabilitation Programme, and major village augmentations. In 1990 various programmes were planned for villages with a total population of 250,000 persons, the vast majority living in villages initially supplied by the VRWS programme.

There is no sound method of estimating the population which has been served directly SIDA programme and those whose consumption has effectively been supplied by later interventions. However in order to establish a "ballpark figure", it will be assumed that the major part of the population of the rural and small villages have been supplied by the SIDA programme, and that the major part of the additional capacity provided is for current and future increases in demands. However when SIDA withdrew from funding major village supplies in the middle 1980s, there was very little if any spare capacity in most major villages. Hence only the 1984 population should be attributed to the programme. This population was 120,000 less than it is today. The subtraction of these people together with a limited number in the other villages would suggest that a "ballpark" figure of people served by the SIDA programme would be 550,000.

Targets from the beginning were ambitious and centred on the number of supplies to be constructed by particular dates. They increased over time; from improving the Kanye supply to supplying 354 villages. Targets for different phases of the programme included:

Phase	Villages			Total
	Major	Rural	Small	
VRWS I 1973-78	15	28	-	43
VRWS III 1978-82	17	98	86	201
VRWS IV 1980-85	17	108	129	254

NDP 4 proposed the following specific goals; the provision of safe water to all major villages by the year 1978/79; to all villages with population of more than 500 people by 1980/81, and to all villages of Botswana by 1985/86. This final target was not explicitly included in the programme although by the early/middle 1980s, a programme target of 354 villages appeared for the first time. No date for its achievement was proposed at that time which differed from the NDP 4 target.

Although progress during VRWS I was initially behind the above target, and additional funds were provided due to cost over-runs the targets were essentially met, 14 major villages were completed and rural village construction met its target.

Progress during VRWS III fell behind schedule and the 1982 quantitative targets were met approximately two years later. Similarly during VRWS IV the mid 1985 targets were met in early 1987.

The timing of meeting the final target of 354 supplies was obscured by the drought and parallel programmes. However the overall programme target has almost been achieved, with only six of the 354 villages on the mid 1980s programme list not having been supplied by 1995, although SIDA did not contribute to the funding the most recently constructed schemes.

In fact it is argued that while a failure to meet quantitative targets was not a major weakness of the programme, it did for a period, around 1980 lead to a problem. This was because an over-

emphasis was placed on meeting these quantitative targets to the exclusion of other considerations. For example, although fifteen years later it is difficult to find documentation to support the assertion, the consultant is aware that in order to catch up with backlogs, mistakes were made. For example one team member remembers seeing schemes constructed before a source was secured. Occasionally expectations were raised far too long before water was available to consumers.

Another example of the over-emphasis on quantitative targets was that once plans were established they tended to be adhered to even when circumstances changed. For example plans which were established based on the rainfall conditions of the 1970s were not altered when prolonged drought occurred which should have changed elements of the plans.

A feature of the programme was that cost over-runs were a common occurrence. During VRWS I the additional MSEK 10 required to meet targets represented an over-run of MSEK of over 60%. Later over-runs were considerably lower in percentage terms during a particular phase, but could have been effectively similar since targets were not met. For example during VRWS IV the over-run was MSEK 15 compared to the initial allocation of MSEK 71 million, i.e. 20%, but the inclusion of another 18 months implementation under RVWSP I to complete the VRWS IV targets could have increased the effective over-run. However the problem is more complicated since the VRWS IV funds were also used to complete some VRWS III villages.

It is concluded that:

1. For the most part the programme met its quantitative targets. Furthermore while completion of the targets for the different phases was usually late, the delays were not lengthy and satisfactory for such an ambitious programme.
2. The emphasis on quantitative targets should have been modified by other considerations.
3. Even though part of the cost over-runs was due to more expensive designs, inflation was the main factor, and although the data is not available for a sound analysis, the over-runs in real terms were not unreasonable given the nature of the programme.
4. Process planning would have promoted the changing of plans after conditions changed. Hence future programmes should encompass process planning principles.

3.4 Programme Effectiveness

For the analysis of the programme effectiveness, four different criteria, technical cost-effectiveness, average unit costs, effectiveness of the system for revenue collection and effectiveness of programme implementation, are used. All the criteria are analysed in this chapter.

3.4.1 Technical Cost-Effectiveness of the Systems

The technology adopted in the Botswana rural water supply programme based on motorised pumping means that schemes are expensive both to construct and to operate. This has been a source of criticism. The usual response, has always been that there are no alternatives. This assertion contained a considerable element of truth, there were few obvious alternatives. The technology used within the programme is, in principle, the same as that which has been used

since borehole drilling commenced in the 1920s. Most boreholes were traditionally equipped with diesel engines, pumps and tanks. The programme did not introduce new technologies but rather improved on technologies in use already. Modern pumps were used, tanks were roofed, water was reticulated to standpipes located closer to the users and away from the boreholes, etc. All components were available in the regional market. In other words, the approach was to improve a technology developed over fifty years, rather than to be innovative.

However it was not completely true to claim that no alternatives existed. Even during the colonial period, dug wells with hand pumps or bucket and rope, and boreholes with hand pumps were not uncommon. The "Thebe" hand pump was locally manufactured and well suited for high lifts. Rainwater tanks at old houses were common although they are unlikely to provide a complete solution in rural Botswana, given the amount and pattern of local rainfall.

The perceived early successes of the programme and the available financial resources contributed to the limited interest in the development of alternative less expensive technologies. Numerous studies have been carried out by organisations such as BTC and RIIC, but these and suggestions by SIDA missions have had very little impact on the choice of technology.

One factor was that programme implementation was guided by ambitious engineering targets. Consideration of different technologies would have been a diversion of effort from the main thrust of the programme. During the first phases of the programme when major and larger rural villages were being supplied, the potential for simpler technologies was minimal. Furthermore even after the programme expanded to cover most (354) villages in the country, some of which then had populations of less than 200, physical constraints would have limited the scope for cheaper systems. However serious consideration of alternatives should have been made at that time. Although practical and theoretical research work was reaching a peak level, the mainstream programme implementation largely ignored such technology considerations. Without such considerations would it be difficult to justify a statement that all systems are optimally cost effective.

In particular the use of hand pumps should have been pursued. The CWPP was very clear in its recommendation; i.e. within the capacity and lift limitations of hand pumps they provide water at a lower unit cost than any other technology. Large areas in Eastern and Northern Botswana have water tables of less than 40 metres, a commonly used lift limit for hand pumps. Technology is available for higher lifts if lower capacity and harder work is accepted. Large savings would have been possible for villages where hydro-geological conditions were favourable. A neglected factor was that there are many boreholes in the country abandoned for low yield but which nevertheless have a sufficient yield ($\sim 0.5 \text{ m}^3/\text{h}$) to supply a small community through a hand pump. Utilisation of old boreholes would have added to the saving. Hand pump supplies would also have reduced the very high unit recurrent costs which arise at very small supplies due the high fixed cost element. The magnitude of the saving would have depended on the repair and maintenance system. The greater the responsibility delegated to the village level, the larger the saving.

The fact that the development cost of a village scheme, (when using the standard technology of the programme), for 200 consumers was almost as expensive as that for 500 consumers, due to the large fixed cost element should have been a key consideration when the programme was expanded to include most villages. The unit cost per capita for small schemes was extremely high. Hence alternatives should have been considered for the smallest villages in the programme list, and for larger villages where there were problems in identifying an adequate source. In the latter

case, it may even have avoided today's inadequate water availability since if consumers were still using improved, but non piped supplies, further from home, today's demand would be far lower.

It is concluded that a key weakness of the programme, is that where there was a supply problem or where unit costs were very high, the provision of a lower level of service was not analysed. The concept of "trade off" was given scant consideration. The programme was a victim of its own success. Politicians had seen that it was providing most villagers with water from a tap close to the home, and desired this same service for all their constituents. They either did not appreciate, or did not care, that in a limited number of cases, water from a tap would be inordinately expensive. There is little evidence that professionals involved in the programme were concerned with cost effectiveness since they do not seem to have made any serious efforts to have explained the cost equation. Given that the number of villages which might have been considered for such an approach was limited, and that a simple technology solution may only have been possible in a limited percentage of these, the overall development cost saving would have been relatively small in the context of total programme cost. Nevertheless large savings could have been made in individual villages and simple technologies should have been considered in highest unit cost locations. However any attempt now to quantify the possible savings would depend upon a number of uncertain assumptions.

Furthermore the exclusion altogether of a few of the smallest villages from the programme should have been analysed. Since the provision of water leads to the proliferation of small villages and pressure on other Ministries to provide other infrastructure, water should only have been provided if all agencies involved had accepted that a particular location should be provided with a social infrastructure package. Furthermore the dynamics of rural settlement does not mean that all of today's inhabitants in the high cost villages would be without piped water today, since a proportion of them would now be living in another village.

It is concluded that by taking advantage of past experience and easily available components, the programme was reasonably cost effective for the service provided, i.e. the delivery of water to all the residents of a village from taps. The fact that it was expensive was largely a function of unfavourable water supply conditions. While in a limited number of locations a technology which would have provided a lower level of service, but which involved lower capital and recurrent costs, should have been adopted, in the average village the technology was cost effective and appropriate.

Some observers today criticise the RVWSP on the basis that it aimed to identify sources close to villages with the intention of minimising initial development costs, but gave insufficient attention to the ability of the sources used to meet longer term demands. The result has been that the rehabilitation programme has been far more expensive than it would have been if a longer term view had been taken. While the arguments presented appeared to have substance, the consultants are unable to endorse the criticism, since there is inadequate quantified data to support it. The initial design did allow for demands increasing over a 10 year design period, and where demand increases have been high these have usually resulted from a demand for private connections which was not envisaged at the outset, and/or from a failure to manage demand. It may also be a case of the programme being a victim of its own success. Furthermore even if the total costs of the initial investment and the subsequent rehabilitation, have sometimes been considerably higher than a greater initial cost and a lower rehabilitation cost would have been, this does not necessarily mean that the total present value cost of the actual investments has been higher than the total present value cost of the higher initial capacity strategy.

It is recommended that MLGLH prepares estimates of what the cost of the alternative strategy would have been for a number of cases where expensive rehabilitations have been completed. Quantified analysis of the cost effectiveness of designing for far more capacity initially than was provided would be a useful outcome of the programme, especially for other countries developing similar programmes.

One legacy of the programme is a high operational bill. Currently the total cost of O&M is around P30 million/annum, with a unit cost of around P70/capita. This is only just above the current cost in Sweden where consumers are receiving a higher level of service. Although the consultants believe that this cost can be sustained by the government, efforts to reduce this cost should be made by delegating greater responsibility to the community in order to reduce transport and supervision costs.

There are two lessons relevant for the rehabilitation programme. Firstly, the most expensive augmentations in terms of per capita costs should only be approved if absolutely all the alternative options have been fully investigated. Secondly, the concept of "trade offs" should be introduced into the current expensive programme. For example, design guidelines in respect of per capita provision should only be guidelines. Actual design should not be undertaken independent of cost considerations.

The first generation of reticulated water supplies were constructed during the mid-70s, under the SIDA programme. However SIDA declined to fund the expansion/rehabilitation needs which arose in the 1980s as demands outstripped supply capacities, largely due to the high up-take of private connections. The following table shows the population, number of connections and water production over the period 1977-93 in six villages⁸:

Village/ Year	Approx. Population		Number of Priv. Conn.				Water Production (m3/d)		
	1977	1987	1993	1977	1987	1993	1977/78	1986/87	1992/93
Kanye	15700	26300	33600	230	1122	3218	333	1258	2538
Mahalapye	16400	24900	29700	300	963	2776	280	1138	2216
Maun	14400	21100	28900	281	725	1770	300	1660	3254
Ramotswa	10700	16100	19800	274	1088	3067	163	676	1795
Tlokweng	5400	9700	13100	No info	836	2587	103	679	1776
Tonota/Shashe	7100	9600	11600	96	372	1385	94	658	1476

Based on the above figures, it has been estimated that over 1977-93, the overall average increases in six villages have been:

Population	4.6% p.a.
No. of Private Connections	16.9% p.a.

⁸ Sources:

- DWA Annual Report.
- Population Census 1971 and 1981, GoB.
- SWECO, *Botswana Rural Water Supply, Evaluation of existing Rural Supply Schemes and Preparation of Guidelines for Nitrate Reduction of Contaminated Boreholes*, 1978, SIDA.
- ICS, *Botswana Rural Water Supply, Costs and Tariff Study*, 1978, MMRWA.

Capita Consumption	11.6% p.a.
Total Consumption	16.7% p.a.

Over the period, the population doubled, the per capita consumption increased by a factor five, while private connections and total production have both increased by a factor ten.

The result has been that although most systems have been rehabilitated/expanded, water availabilities have been failing to keep up with the continual high rate of increasing demand. In some cases, the problem has been exacerbated by reduced borehole yields arising from the prolonged period of low rainfall. Sometimes when augmentations have been completed, new works have been needed almost immediately to satisfy an even higher demand. In some cases it has not been possible to integrate existing, relatively new (<10 year), facilities fully into the upgraded system, whereas those installations should have been utilised for 15-40 years.

It is clear that this has not been an efficient approach. Consequently many of the original SIDA funded investments have not been cost effective. However during the original planning stage, the huge uptake of private connections was not envisaged. While part of the blame for any waste involved could be attributed to the original vision, a major part should go to the failure to manage water demands.

The current total O&M cost in all major villages is around P25 million/annum, with a per capita cost of P80/annum. While this cost is high, there is no evidence that it could be dramatically reduced, given the high pumping and other costs involved. However as argued above Government should ensure that this cost is fully recovered from consumers.

3.4.2 Overall Average Unit Cost of the Programme

The criterion of development cost per head is often a useful measure of cost effectiveness, especially if there are similar projects, facing similar conditions with which the programme being evaluated can be compared. However in the current project there are a number of constraints to estimating the overall unit cost. Firstly the long time period over which the project was implemented meant that costs would need to be brought to a single point in time, but the cost increases have not always been in line with general inflation. Secondly the programme involved a large range of supplies from major villages to small settlements. Here there are two conflicting cost characteristics; (i) at the major village end of the scale costs may be higher due to higher design standards, (ii) and even more important, is the very significantly reducing economies of scale as village size decreases. Finally there is the problem that the SIDA assisted programme investment represented just one layer of an on-going programme.

Based on the figures presented above, the total cost of the RVWSP, in 1995 values is P 246 million. In addition, the "layers" of the programme assisted by SIDA supplied around 550,000 people. Including part of the technical assistance costs, the overall average unit (1995) cost was just under P500. Given the caveats listed above, this figure is of rather limited value. Nevertheless it is clear that it was a high cost rural water supply programme, compared to many rural water supply programmes in Africa. However the difficult natural conditions and the resulting high cost technology adopted, (notwithstanding the fact that limited opportunities for cheaper solutions were not taken), made this inevitable.

3.4.3 Effectiveness of the Revenue Collection Systems

The billing and revenue collection system operated by DWA in the major villages is reasonably cost effective. Typically two staff sitting in the local DWA office receive the meter readings from the readers, undertake the billing, receive the money from consumers who visit their office, and keep all billing and revenue records. The total cost is a small percentage of the money collected and the major part of the amount billed is collected on time.

By contrast the efficiency of the collection from Council run supplies is very low. The cost of collection is high with collectors having to visit the villages, payment is usually very slow, and the total collection is very limited, less than 5% of the costs which the councils incur operating and maintaining the supplies. However the problems which Councils face in collection; a limited number of consumers in distant villages, consumers who are absent when collectors visit on schedule, time consuming tasks, etc. would be extremely difficult for even the most efficient organisations to overcome. The whole billing/revenue collection exercise is costly in terms of transport and staff time, and not very productive financially.

However the costs involved to ensure rapid payment to council employees are unlikely to be justified. The emphasis should be on not allowing consumers to escape payment in the medium term and on increasing the rates. Disconnection should be increasingly used as a tool to ensure payment by consumers, even if the period before disconnection is implemented is extended to say six months. All meter reading should be undertaken by the scheme operators. A sound system of sending meter readings to the district must be established. The currently poor information flows between the water and revenue departments must be improved. For example, some revenue staff claim that they do not receive complete meter readings on time, and some water supply staff claim that they do not receive payment data, and never know who should be disconnected. Subsequently disconnection by operators for non payment within the period laid down period must be strictly followed. Given the high costs of transport, revenue collectors should never visit specifically for water rate collection. Hence the date when they will visit a village should be determined in advance and adhered to, and be written on the bills, which should be distributed by operators well in advance. Initially there is likely to be a high level of confusion and complaint, but if Councils get a reputation for being consistent, the payment situation should improve. Billing and collection, including staff attitudes to these tasks, is an area where those currently responsible for training should put an increased effort. The major effort should go into increasing revenues in the larger rural villages since this will have the greatest effect on finances and would be the cost effective strategy. However while these proposals may lead to improvements they do not tackle a key problem.

The basic flaw in the system is that there is no onus on consumers to go to pay their bills. The collectors must visit the consumers. This means that the system will be far more expensive than where, as in the major villages, the consumers must go to pay. However in all but the very largest villages it would not be viable for the council to employ a full time collector whom consumers could visit easily.

Hence it is concluded that in most villages it may not be possible to achieve cost effective financial systems for direct collection by Council revenue staff. It is therefore proposed that the possibility of contracting out collection at village level should be investigated. An individual in every village, or a group of villages, might be awarded an annual contract to collect water rates, and it would be his responsibility to submit the revenue and accurate payment records to the council. He would be paid on a pre-determined basis, possibly as a percentage of the revenue

which he has collected. The introduction of a realistic cost recovery tariff, which is desirable for overall financial reasons, would also allow the commission percentage to be set at a lower level than would be required today to make the contracts sufficiently attractive.

3.4.4 Effectiveness of Programme Implementation

The division of responsibilities between the different Ministries involved in the SIDA programme has closely followed a clear national policy in which DWA is responsible for new construction and major village O&M, in which MLGLH through Councils is responsible for the operation and maintenance of rural supplies, and in which Ministry of Health is responsible for health aspects of water supply. With a few minor exceptions, the allocation of responsibilities has been clear and appropriate over the entire period. Furthermore the roles have not changed significantly over the period, the main change is the extent to which the different institutions involved have fulfilled their roles.

At the start of the period Councils had an extremely low capability to fulfil their assigned task of rural water supply operation and maintenance and their responsibility for major village supplies was passed over to DWA. Hence SIDA's entry point, DWA, was appropriate since there was no realistic alternative for the necessary engineering and planning expertise. Councils works departments had few resources to devote to rural water supplies in their areas. SIDA's subsequent support points have been appropriate and in line with the responsibilities of the institutions involved. Their support for O&M was directed to District Councils, the appropriate institution for O&M, an activity which has to be undertaken well below national level. The strengthening of Councils' capacity, has seen them not only being responsible for an increasing number of supplies but also improving their performance.

Support for the water hygiene campaign although originally directed through MMRWA, was transferred to the Health Education Unit of Family Welfare Department of the Ministry of Health, when the campaign became a programme. This was appropriate since it was where the limited expertise and experience was available. It made the funds directly available to health personnel and created the potential to integrate water hygiene with other health education and for sustainability. While its location in Ministry of Health did not give the programme much political clout, this would probably have been true wherever it had been located, since preventive and intangible activities are not politically glamorous.

The planning role of MLGLH has broadened in recent years with the onset of the large rehabilitation programme. They have been responsible for the entire programme except for design and supervision of the larger schemes which have been allocated to DWA as specific individual tasks. DWA's role in rural water supply has changed to some extent inasmuch as the completion of supplies in most designated villages and the shift to rehabilitation, has meant that instead of being fully responsible, they are now a "consultant" for MLGLH for a large part of the rural programme.

The main institutional problem affecting programme effectiveness was a lack of co-ordination between the different activities resulting from very limited co-ordination between the different ministries and departments involved. To a large extent the different programme components have been implemented independently of each other and there has been little meaningful integration of the complementary activities. This was especially true of the health education activities which have had few direct links with water supply. The lack of co-ordination between

Ministry of Health and water supply agencies continued to be a problem into the operational phase. For example when health staff have taken water samples of unacceptable quality, they failed to co-ordinate with the Council responsible and thereby delayed corrective actions.

A further problem is that where co-ordination existed, it was largely due to individual relationships rather than to institutional links. The limited success that the water hygiene programme had for a limited period in improving co-ordination was due to the links established between MOH and DWA. But since these were based on personal contact of key individuals in the two institutions rather than on a strong permanent inter-institutional link, it only provided temporary improved co-ordination. A lack of effective formal co-ordination mechanisms was therefore exacerbated in the programme context where there was a high turnover of personnel.

Co-ordination was even lacking within some District Councils, and again tended to depend upon personal relationships rather than on procedures and routines. Although the establishment of district water departments reduced bureaucratic problems in the districts, these have remained a problem hindering O&M, especially for sub-district officers in Central district.

Overlapping responsibilities have not been significant and have not directly affected programme effectiveness, but were not completely absent, for example in water sampling. This could have been overcome if SIDA had provided assistance to the Ministry of Health to increase its water testing and follow up capacity. The programme failed to contribute effectively to the provision of institutional arrangements for effective co-ordination until towards the end of the programme when attempts were made to link rehabilitation with O&M. The formal co-ordination mechanisms at the national level have been very weak. The Inter-Ministerial Water and Sanitation only met occasionally and tended to focus on major villages, sanitation and pollution while the Programme Reference Group was not formed until the programme had been on-going for 14 years. Little evidence has been found that it was an effective forum, although it did assist in sorting out minor specific problems at times. The lack of co-ordination is best seen in the middle 1970s when DWA was steadily implementing new schemes without any serious consideration of the implications for District Councils operations and finances.

The effectiveness of implementation of the programme has to a limited extent been affected by the lack of a link between expenditure and responsibility. When only small villages remained to be supplied, individuals without any financial responsibility lobbied for local interests, regardless of effectiveness. Furthermore although the reduced responsibility of DWA should be clear, it is not always understood by local politicians who report problems to DWA instead of to Councils/MLGLH, thereby creating confusion and delays.

The initial funding of rehabilitation through MLGLH added new co-ordination problems. After MLGLH prioritised work nationally, and requested DWA to carry out the top priority work, it did not always provide a complete feedback to councils. However overall co-ordination between MLGLH, District Councils and DWA was improved towards the end of the programme. This was partly due to the fact that MLGLH is responsible for overall planning of the large rehabilitation element, and the same Ministry is responsible for O&M. However an important development has been the introduction of routine quarterly co-ordination meetings, which have provided immediate feedback between the three parties and which have therefore added a co-ordination element to planning. Nevertheless it is reported that council water supply matters are still sometimes discussed above the District Council Water Department heads. At the district level it is reported that the local co-ordination has been improved in some districts by the Councils' Management Committees.

Co-ordination between the programme and ministries not involved in the programme was frequently lacking, and this has been a contributory factor in reducing the effectiveness of the programme and in contributing to the need for the very expensive upgrading/rehabilitation programme currently being implemented. The appropriateness of SIDA's entry, and other, points of assistance, the lack of ambiguity of responsibilities, and little overlapping have been factors which contributed to programme success. The limited co-ordination between the institutions involved and lack of integration of the activities may have reduced the effectiveness of the programme in that O&M needs were not co-ordinated sooner with development. Furthermore the fact that the health component was undertaken as a largely separate activity was an important contributory factor in its subsequent demise.

3.5. Capacity Building

Capacity building consists of three different elements: organisations and systems development, provision of infrastructure and equipment, and personnel and human resources development. These elements are interdependent and the needs of all three components must be addressed if capacity building is to be effective.

The duration and extent of SIDA funding and technical assistance in the rural water sector has been such that the present situation has been largely moulded by such co-operation. Support to the institutions has closely paralleled the development of the programme. Hence when initially the emphasis was on implementation, institutional support was directed to DWA. When it was realised that insufficient attention was being given to how the supplies which were being constructed were going to be operated, some support was redirected to Councils for O&M. In the early years there was no real attempt to develop long term institutional capacity, the main effort was aimed at increasing short term implementation capacity so that the programme could be undertaken in line with the targets. This consisted of providing equipment, vehicles and personnel exclusively to DWA.

Capacity building became more explicit when the focus switched to O&M. SIDA's most important institutional contribution has been to build up the District Councils' capacity to operate and maintain the supplies built under the programme. This has consisted of encouraging the establishment of the water units/departments, the provision of hardware to strengthen their operational base and above all training. Nevertheless although capacity building received increasing weight over time, it has lagged behind implementation and has been an on-going effort to catch up. In fact until SIPU entered the programme in 1988/9, the lack of a systematic approach to capacity building seriously affected the programme's ability to meet manpower requirements. The shift in technical assistance from "gap fillers" to co-ordinated training has been in line with the shift from a general infrastructure/ hardware focused approach to a systems/software approach.

3.5.1 Development of Organisations and Systems

SIDA support was directed towards assisting the existing institutions that implemented the different programme elements, rather to developing new organisations. However, two key institutional developments within the councils have provided the basis for improved operation and maintenance. The first development was the creation of water maintenance units in 1979-80. The second was the transformation of these units into water departments in the late 1980s.

While water supply was an integral part of the works department, not only were the resources available very limited, but the priority given to water was also limited. The support of the programme for the creation of the water units was a key factor in their establishment. Even senior Council staff who did not support the move at the time subsequently felt that the foresight of the programme in pushing for separate water units has been an important reason for subsequent O&M success. Furthermore the allocation of DDSS I funds for providing the units with infrastructure was vital to get them operational.

The fact that the WMUs were not departments was a disadvantage for the rural water sector since inter alia, the head of the unit; (i) was under the CTO who often did not understand the requirements of water O&M, (ii) did not have direct access to the Council secretary, and (iii) did not participate in the internal negotiations on the allocation of the Councils recurrent budget.

The programme, largely through the MLGLH water engineers, pushed for the upgrading of the units to departments, since they were aware of the problems of the units and the needs for departments. They had to persuade both Councils and ULGS, and were supported by programme evaluation teams. The transformation into departments was a key institutional development for strengthening water supply O&M and hence indirectly for programme sustainability, since water was now able to compete for an appropriate share of the Councils' recurrent budgets. Although some districts were proposing the creation of departments, the programme itself was an important factor influencing the transformation.

Another important institutional development was the creation of the water engineer's post in MLGL in 1983. This has provided an important point of support for water unit/department heads both with regard to the provision of finance and technical support and for planning. SIDA continued to provide an expatriate engineer, (at times two), until the end of the programme, and beyond.

Another element of increasing institutional capacity was various studies related to design and policy. For example, the Rural Water Design Manual finalised in 1988, has created a sound base for the planning and design of new schemes and augmentations. It has been used so extensively that it can be said to have increased design capacity. On a less positive note it was supposed to have been updated regularly, but no revision has yet been undertaken. In addition it has tended to have been used as rules, rather than as guidelines.

An omission during the programme was that greater use was not made of the private sector, despite the fact that extensive use of private contractors has proved efficient. This may have reduced costs, since when all hidden overheads are included, private companies are often cheaper. The privatisation of BRS and DWA drilling might have been encouraged earlier, and recommendations by missions regarding the use of private garages could have been pursued further, even if they had eventually been rejected.

3.5.2 Infrastructure and Equipment

An important element of institutional capacity building has been the provision of hardware for both DWA and District Councils. Assistance in the form of vehicles, drilling rigs, workshops including some in major villages, offices etc. has been provided to DWA from early in the programme. However the main intent appears to have been to support development activities and

any long term capacity building effects were a secondary consideration. The main exceptions were the major village workshops which strengthened O&M capacity and the training school building for the DWA.

By contrast the provision of workshops, office facilities, vehicles at the beginning of the 1980s were intended to create a longer term capacity in the District Councils, specifically for O&M to fill the identified capacity gap. Every district was provided with a standard workshop/store/office plus two trucks and a light vehicle. This initial provision was followed by provisions of; equipment and tools, vehicles to bring the fleets at least up to their earlier capacity, and a large volume of spares to ensure adequate stocks. Although some of these investments were relatively short term, they strengthened the Councils water units and in time created the recognition that such investments were required on a regular basis. These and later vehicle and other infrastructure provision have been important in providing Councils with the necessary facilities for adequate O&M. While the impact was only medium term, it has created the awareness of the need for maintaining both fixed infrastructure and vehicles at a minimum level.

Since the water units have been transformed into water departments, plans have been developed to replace the 1980 generation of workshops, offices and stores. Implementation commenced around 1991, although SIDA assistance was restricted to a few districts, and the most of the funding for the still on-going programme has been provided by Government. While the current transport situation varies between districts, it is generally below requirements and although not seriously hindering operation, it has been a constraint on supervision and preventive maintenance. However the position should be adequate after the allocation of vehicles currently in the pipeline. Similarly the current workshop/stores position is acceptable in most districts and the current plans should result in all districts having adequate facilities.

One disappointing feature of the assistance for institutional development, at the tail end of the programme, was that while the training element continued to flourish, the allocation for institutional infrastructure at a time when the emphasis should have been on institution building and sustainability was very limited. During 1991-94 well under SEK 2 million was provided for non training institutional strengthening, while around SEK 10 million was allocated to a single village rehabilitation.

3.5.3 Personnel and Human Resources Development

Technical Assistance Personnel

At the start of the programme, there was an almost total lack of qualified water engineers and technicians in the country. Most of the Department's professional and senior technical staff were expatriates, and this situation did not greatly improve until the mid 1980s. Furthermore even with the existing expatriates, there were insufficient qualified staff to implement the RVWSP. Hence in order to assist implementation SIDA started to provide technical assistance personnel to DWA. By mid 1975, there were 10 SIDA personnel in DWA with a further four at the Geological Survey. During the following 10 years there were an average of 20 Swedes working in the rural water sector under Swedish technical assistance, the majority of whom worked in DWA. This provision of professional staff for DWA which represented SIDA's main initial personnel strategy, remained important throughout the programme. For the most part these "gap fillers" occupied line positions in order to increase short term implementation capacity. They played a very limited role in institution building since their training roles were

limited by their other responsibilities, by the lack of counterparts, and occasionally by their own limited views of their roles. Hence the potential for capacity building created by the presence of a large number of professionals was not fully utilised. Over time they were sometimes seen as blocking the progress of local staff, but for the most part local trained staff were simply not available.

Furthermore the staff who were provided to increase the institutional capacity in the short/medium term, and training staff, were both employed on individual contracts by SIDA. The currently favoured approach of twinning with a specialist institution was not adopted until the late 1980s, when SIPU (Swedish Institute for Personnel Development) was contracted to assist DLGSM in training council water supply staff under the DDSS programme.

From 1986 SIDA personnel to the rural water sector were reduced from around 20 to 6 by 1993. Furthermore in line with SIDA policy there was a move away from line positions towards advisory roles. However despite the on-going localisation programmes, Government found it impossible to provide all SIDA personnel with counterparts whom they could advise. Hence in practice some continued to undertake line positions, although the trend was in the right direction.

Training

Even though the major part of SIDA provided staff were implementors, DWA and SIDA recognised that the serious lack of qualified staff had to be addressed and they emphasised the importance of training. As early as 1972, part of the Kanye funding was used to finance facilities for training drillers in Gaborone. SIDA provided technical and financial assistance for training during most of the programme period. One/two trainers were placed in DWA until near the end of programme and other SIDA personnel also provided limited on the job training. A key development was the establishment of the DWA training school, where by 1975, courses of up to three years were being organised for water technicians. In addition a whole range of refresher and upgrading courses were arranged for technicians, drillers and artisans. The training staff were sometimes assisted in lecturing by other SIDA staff. The key Water Engineering Technician (WET) course was planned to commence with a new intake every two years. In the early 1980s, the programme staff were responsible for developing the DWA WET course into a recognised diploma course and transferring it to the Polytechnic. Programme support was then provided to the Polytechnic and SIDA/DWA training and other staff initially undertook the major part of the teaching. The move was important since the provision of a recognised diploma enabled graduating technicians to proceed to further training overseas. The programme also provided funds for overseas training.

Long term capacity building in DWA was not a top priority in the RVWSP, and from the beginning there was no comprehensive or analytical HRD strategy for DWA. Localisation plans existed but were not sufficiently soundly based that they could be implemented. Nevertheless a range of personnel were trained in service. The training school and Polytechnic training increased technical capabilities and contributed to DWA's ability to send employees abroad for degree level training. Significant strides were made in increasing local competencies. SIDA also contributed to building local capacity for training by direct technical support to the training institutions.

The lack of a comprehensive plan, and the ensuring that there would be sufficiently trained local personnel available to provide sufficient appropriate candidates for particular training at a spe-

cific future date, meant that localisation plans were frequently delayed. Nevertheless the HRD component of the RVWSP has contributed to the localisation process in DWA, albeit at a relatively slow pace, and to the increase in DWA's local capacity. Overall 96% of the technical and professional post have been localised. It has also allowed DWA to localise top level positions from the late 1980's. Presently four of the five technical divisions heads are locals. Vacancy rates have also been decreasing as more qualified Batswana are available as a result of the local and overseas training.

MLGL and the Councils lacked the organisational capacity to develop a comprehensive HRD strategy in the 1970's and early 1980's. Furthermore they had poorer access than DWA to training facilities and resources. The institutional and resource base limited the capacity of the department to train existing staff or recruit new people. However a greater problem was that DLGSM lacked vision. Even in the early 1980s they had a very short term time horizon for sector needs, and only identified training needs in relation to vacant posts, and not to posts that would be required in the future. Hence when in 1979/80, the WMUs were created the lack of qualified Batswana lead to a group of expatriate volunteers being recruited to manage the units. When their contracts finished, adequately trained Batswana were still not available and further groups of volunteers were subsequently recruited, and the water units continued to be headed by expatriates for some years. However by 1986 a number of locals with limited technical training had been appointed to head the water units.

When SIDA started providing assistance to councils, the importance of training was recognised, and from the early 1980s seminars and other training was organised for council water personnel, including the training of water supply operators at district level. In order to provide councils with technically qualified water supply staff, MLGL sponsored four students on the Polytechnic's first water engineering course. Two years later, eight students half of the intake, were so sponsored.

All council personnel functions are highly centralised since the 1973 Unified Local Government Service Act does not allow for delegation of personnel matters to district level. Consequently the Department of Local Government Service Management (DLGSM) of MLGLH, the department responsible for the planning, recruitment, training, discipline, staff development, promotion and transfers of the staff of all councils has been responsible for co-ordinating all training activities on behalf of all councils, and hence for the HRD component of the DDSS programme.

SIDA support to DLGSM HRD activities under the DDSS programme since the early 1980s included the water sector. However until the late 1980s the main training efforts were not based on a comprehensive analysis. A more holistic HRD approach to training and staffing began in 1988 when DLGSM and the Water Unit in MLGLH, with the support of SIDA through the DDSS programme, carried out a training needs assessment for the water sector at the district council level. The aim was to integrate HRD with institutional development through performance planning, assessment and career planning, with the public service to be delivered as the starting point. The training needs assessment undertaken by DLGSM/SIPU subsequently developed into organisational and HRD planning, which proposed organisational structures and staffing/posts/training required in terms of numbers and capabilities. It resulted in individual council HRD plans. Training, based largely in country but also involving overseas courses, tried to cover all staff from potential heads of department to operators. As a result DLGSM was able to start using the sector as the basis for co-ordination.

At around this time in the late 1980s, the water units were being transformed into water departments with HRD implications. This together with increasing technical sophistication meant that more senior and better qualified personnel were required to staff the departments, and initially the departments were headed by expatriates, since the lack of adequate earlier HRD planning meant that there were few sufficiently qualified Batswana ready to take on the new responsibilities.

The training programme developed addressed all levels of personnel. The entry point for WSO's was upgraded to standard seven and junior certificate level to recruit trainable candidates for whom appropriate courses were designed and held. In 1991 a handbook for village WSO's was developed as a reference document and a guide for effective operation and maintenance. The majority of WSO's now have basic training which facilitates the movement of both male and female WSOs to the artisan level. However the duties of WSOs have remained relatively unchanged, despite attempts to widen the responsibilities to cover all aspects of village water supply operation.

Training opportunities have also been developed for the borehole mechanics and the pipe fitters. They are sent for training at the VTC's for C and B trade certificates which enables them to obtain the National Craft Certificate (NCC) as part of the MTTC apprenticeship programme. Technical level in-service training and further education opportunities have also been created. Bridging courses were developed for existing staff to enable them to enter the Water Engineering Technicians (WET) course at the Polytechnic. In addition new recruits were trained as technicians at different levels. As a result of these efforts some senior technical positions have been filled by locals. Presently there are approximately 27 senior and chief technical posts, 6 are occupied by Batswana, 8 by expatriates and 13 are vacant.

At the professional level efforts have also greatly improved in the recent years. Advantage has been taken of the introduction of the Higher National Diploma course at the Polytechnic. Sufficient candidates are currently training abroad for a M.Sc. in water engineering which will permit the localisation of the professional posts in the councils water departments by 1998/9 even though only one of the nine professional posts is currently held a Motswana, (five are held by expatriates and three are vacant).

Recently a comprehensive "Water Supply & Waste Water Management Handbook for District and Urban Councils" has been developed in a participatory process involving close co-operation with council water and waste water personnel, MLGLH staff and other experts. The existing version will be appropriately modified and should be published by September 1995.

Although the training programmes have lead to an increasing number of technically qualified Batswana being employed by the Councils water departments, it has taken longer than was originally expected to provide them with their technical staffing requirements. At the time of the final evaluation, there was only one Batswana head of water department in post. Furthermore there was still a significant proportion of vacant technician posts, and some posts were held by under-qualified personnel. The shortage meant that although Councils have enough technical staff to be operating supplies at a reasonable level of efficiency and providing a satisfactory service at most supplies, standards of supervision and preventive maintenance have been below desirable levels. This means mistakes have had to be rectified, that resources are used sub-optimally and that the useful economic lives of some scheme components have been at risk. Furthermore since priority has been given to O&M, the main effect of the staff shortage has

been to severely constrain Councils' ability to design and construct rehabilitation and new schemes.

The slower than intended pace of localisation has been due largely to; (i) the increasingly complex nature of council water supply operations leading to the need for more highly qualified water department heads. This meant that Batswana earmarked for the posts were sent for additional overseas training, (ii) the training programme having too little vision and being too limited before the 1988 needs assessment, (iii) a high failure rate among the earlier HND candidates, and (iv) staff conditions within government have not been adequate to attract sufficient Batswana of the appropriate calibre.

The training programme which developed from the 1988 assessment has had a major impact, although to date the benefits in terms of higher levels of qualified staffing have only partially been fed through to the water departments. The large numbers of trainees who have done/are doing the OTD course since 1989 will not only provide a firm base for filling all the water department technician posts but will also provide a solid core of professional trainees. It is reported that all STO posts will be filled in 1996, and that with the return of staff from overseas, all heads of water department posts should be localised by 1998/9. The programme has therefore provided the basis enabling Councils to fully localise in the not too distant future without significantly reducing efficiencies. At the other end of the scale the competence of operators is improving with the recruitment of junior certificate holders who benefit from the training courses. This situation is entirely due to the programme and it is not unreasonable to say that most technical training in the sector had been provided under the SIDA programme, and the remainder has been developed from what was started under that programme. However a recurrent theme throughout the period is that more training should have been carried out earlier.

3.5.4 Management Information

A key requirement for efficient sector development is the existence of a good data base and reporting systems. Unfortunately the strategy for institutional strengthening did not include any serious attempts to create a comprehensive information system within the sector. There was no analysis of the data needs, and of which software would best satisfy those needs. A data base of all council supplies was developed by MLGLH, and provides a potentially powerful planning tool, but it has its limitations. For example, current inspections of the data base shows that data which was available at the start of the decade has sometimes been overwritten rather than added to. In addition it could be more comprehensive. Other individuals keep their own data bases, but not all the information is fed to the Ministry's data base. This represents a key institutional weakness, and combined with an extremely poor institutional memory, acts as a constraint on both improved planning and effective capacity for all involved institutions. Reporting systems have improved over time, particularly between the Ministry and the districts, but considerable room for improvement remains, especially as regards monitoring of the village systems. It is recommended that a short term management information specialist should be employed by MLGLH to assist in designing a system which would be easy for existing staff to regularly update and which provides all data required for management decisions.

3.5.5 Conclusions

Until towards the end of the programme a comprehensive strategy for contributing to the development of the involved institutions was difficult to discern. The programme did not explicitly make a deliberate choice among alternative institutional arrangements. It simply tried to assist existing institutions having responsibilities covered by elements of the programme, although it did promote the creation of water units and subsequently departments. In the latter years it attempted to contribute to the improvement of practices and the introduction of administrative development programmes, through the HRD programme. Long term institutional capacity building in DWA was never a high priority, although a number of components such as the establishment of the training school at DWA in the middle 1970s, and some training elements have contributed to building this capacity.

Despite the lack of a comprehensive capacity building strategy, the RVWSP has had positive effects on the capacity building in the water sector.

Since 1975 the manpower position in DWA has changed from one where there were few Batswana in professional posts and a limited number in technical posts to the situation today where only a few expatriates are employed. The training provided by the programme in DWA has been the foundation of a significant part of DWA's current technical and professional capacity. Some of their current professional staff started their training under the programme before they went on to higher training/education. While DWA is still short of professional capacity, the position represents a clear improvement on the pre-programme situation. In addition an adequate position at technician level, taking account of the trainees in the pipeline, has been achieved.

The effectiveness of the strengthening of councils water departments is manifest in O&M performance which has improved over time despite the increasing work load. As recently as 1984 Melchert/White highlighted the O&M weaknesses of council supplies, a high level of breakdowns was due to the failure to achieve proper O&M standards, while today despite their increased operational tasks O&M is satisfactory, even if the level of preventive maintenance stills falls below the desirable level. Furthermore the gap between technical staff requirements and capacities will continue to close in the near future. Hence despite the fact that until recently the institutional capacity building component was only loosely related to any needs assessment, and which was one cause of the disappointing rate of localisation, the component has lead to the situation where all council water department staff requirements should be met within about three years. The key factor in reaching this promising situation was the amended approach to HRD adopted in 1988. Although training prior to that time did increase staff capacities, it fell well short of meeting needs. However, it is vital that council careers are made sufficiently attractive, or the staffing situation will suffer, with the risk that the operation of the council run water supplies may be jeopardised.

Hence the programme has had a major impact on rural water supply related institutional development in Botswana. It gave a boost to development in the water sector which is probably sustainable. Current financial allocations show that Government is giving even higher priority to water than earlier in the programme. Although Council Water Departments still face problems, water is the best supported sector at district level in terms of resources, training, and support from the centre. The major part of the credit for this must go to the programme, whose capacity building element has successfully enabled the Councils to provide a reasonable water supply service to the village populations.

A key weakness of the capacity building programme has been the very limited attention given to management training throughout. In recent years, even though technical staff have still not reached the necessary complement, management rather than technical skills has been the more serious constraint for Council water departments. Even since the planned training programme for Council water staff has been functioning, the emphasis has been more on technical than on management training, although the latter has been a greater need. Poor management has led to less than optimum resource use and higher than necessary costs. Better management could have reduced the need for technical skills through better utilisation, and by permitting increased use of contractors. Councils inability to handle contractors is a constraint on their implementation capacity. While management is still the key institutional weakness and adequate management training is still not yet in place, this need is starting to be addressed through the development of the Water Supply and Waste water Management Handbook and through the management training which will be provided to Councils during DDSS V.

It is argued that the softer institutional capacity building elements of the SIDA programme may have had a greater impact than that of the construction activities. This is because even in the absence of SIDA, the Government may well have funded the development programme, but it less likely to have been able to have replaced the manpower and training components.

3.6 Environmental Impact

The negative environmental impacts of potable water supply programmes are generally viewed as insignificant in comparison with the effects of water resources exploitation for economic activities, such as mining, industries and irrigation. This is mainly due to the relatively limited volumes of water involved. The development of the RVWSP in Botswana reflects this general view and environmental issues were not a major concern during the implementation of the programme. No environmental baseline survey, or monitoring of environmental impact during implementation, was undertaken. The resulting lack of programme related environmental data, means that the following conclusions are based on mainly qualitative information. They present a number of direct and indirect environmental consequences, related to the natural and human environment.

Quantification of the rate of ground water replenishment is a basic prerequisite for efficient ground water resources management but precise and detailed information is lacking in Botswana. Little research is available and figures used are only rough estimations. Monitoring of ground water levels within the RVWSP is not carried out on a regular basis and historical data is not easily accessible. Possible over-exploitation of ground water resources is, consequently, not known. It is, however, clear that of the total ground water extraction in Botswana, only a very limited percentage is extracted by the potable water supply programme. Furthermore only 20% of this water is consumed in rural villages and smaller settlements, although more than 60% of the population live in these communities.

The National Water Master Plan states that "...the demands associated with rural domestic water supply and livestock watering are generally small and widely dispersed. ...they are unlikely to overtax storage resources of even minor aquifers in the long-term⁹." Sustainable ground water extraction must, however, take a considerably longer planning horizon than the 30 years of the Master Plan. With an estimated mean annual recharge of about 3 mm, as an average over the whole of Botswana, it is unlikely that extraction of ground water resources beyond sustain-

⁹ *Botswana National Water Master Plan Study*, Volume 5 — Hydrogeology, 1991, p. 6-1.

able yields, for rural water supply alone, would occur at the national level. In contrast it is very likely to occur at the local level, i.e. at some individual locations. The yields of many boreholes have fallen due to recurrent drought or have become inadequate due to increased water demands. The need for extension and up-grading of existing supplies is increasing as the population grows. The situation is particularly severe in some of the well fields supplying major villages, and this is where over-exploitation is most likely to occur.

It is concluded that the lack of recharge data means that the extent to which the programme over-exploited groundwater resources cannot be determined. However it is clear that any effects of over-pumping would only have had an impact within very limited local areas, with no significant wider consequences. Nevertheless this may have long term implications for the development and sustainability of some settlements.

Waste water in the rural villages is not a major problem due to the limited quantities of water used and the high evaporation. However, with an increased number of private connections and the use of flush toilets, problems could arise in the future. Today it is mainly public institutions which produce the larger volumes of waste water. This is commonly treated in septic tanks. The waste water problems in the major villages are, however, increasing and need urgent attention. In some areas sewage stabilisation ponds were reported to be full. Sewage had overflowed into nearby waterways and had also contaminated ground water resources.

The NDP 4 (1976-81) addressed the issue of waste water and environmental sanitation, and pointed out that "Rapid urbanisation and the growth of larger villages make it increasingly important to co-ordinate water supply and sanitation planning..." It proposed that measures should be taken, not only to monitor the development, but to come up with firm proposals for protection of water sources and for proper disposal of solid wastes and waste water. The NDP 5 (1979-85) pointed out that a serious problem of bacteriological pollution had resulted in the water supplies in 15 major villages having to be chlorinated. In the NDP 6 (1985-91) it was stressed that "The need to take positive steps to protect the environment and safeguard water sources against pollution, particularly from sewage, is now urgent in some major villages." In the NDP 7 (1991-97), the issue of water pollution is included among the major strategies for the water sector, i.e. "to improve health standards by ensuring that the water quality at new and existing sources is of an appropriate standard, by encouraging hygienic water use patterns and by protecting water sources from pollution" and "to ensure that effluent waste water from sewage systems is properly collected and treated." It is clear that problems with waste water will increase as water consumption increases and the Government is currently developing a major sanitation programme. The re-use and re-cycling of water on a large scale is being considered with the objective of adding 40% to available water resources by the year 2000, through reuse of urban waste water.

It is concluded that the programme has not created a waste water problem. There is no real threat of a significant waste water problem in most villages in the foreseeable future. The main current problem is in the major villages, where the capacity provided by the programme has often been significantly increased by subsequent investments. Furthermore the main future threat in some of the larger rural villages comes from major post programme augmentations, and from their largest institutions. It is proposed that the future policy should be based on; (i) a clear needs assessment so that large waste water investments are only made in locations where there is a major potential waste water problem, (ii) the costs of waste water services being borne by the consumers (iii) waste water plans which take the consequences of an appropriate tariff pol-

icy into account, and (iv) priority being given to efficient O&M of existing waste water facilities since these pose the greatest threat of all, if they are not properly run.

Inappropriate location and insufficient protection of boreholes lead to severe bacteriological and chemical contamination of ground water resources in the 1970s. Boreholes drilled in the middle of villages or boreholes that were gradually encroached upon by settlements were particularly affected by nitrate pollution through deep leaching from pit latrines. Other sources of pollution were animal excreta, waste disposal and septic tanks. Several studies were undertaken and contaminated boreholes were closed. New boreholes were fenced off and located away from the villages. Research in the Mochudi area¹⁰ showed that the average nitrate content in water supplies increased during the 1970s and exceeded the health limits during the first half of the 1980s. However during the latter half of the 1980s nitrate concentrations had decreased as a result of measures taken.

Nitrate pollution of ground water requires constant monitoring and in 1984, a computer analyses of data from the Water Quality Register at the DWA showed that 15% of 2000 boreholes were yielding water with nitrate concentrations in excess of the recommended limit of 45 mg/l. In 1988, the Government pointed out in a project memorandum that "Environmental considerations as well as the protection of ground water and surface water will have to be taken into account to a much greater extent than before." In 1990, SIDA funded a consultancy study on "Magnitude and Sources of Water Pollution in Botswana", prepared for the MMRWA. The study concluded that "The most severe current threat identified to the water resources of Botswana arises from overload and badly managed sewage stabilisation ponds. ...The pollution hazard to boreholes posed by pit latrines requires closer control and the proliferation of septic tanks gives cause for concern, especially where these are concentrated in areas of poorly drained soil." It was stressed that the majority of the pollution problems identified in the study would be substantially ameliorated by close attention to the economy of water use, re-use and recycling. These measures have the dual benefits of conservation of water and protection of resources against pollution.

It is concluded that programme weaknesses contributed to increased groundwater pollution in the 1970s. However the measures taken prevented the situation from deteriorating further and even to some improvement in the late 1980s. Future threats will be minimised if; (i) appropriate standards are established, all waste water disposal facilities are properly monitored and penalties imposed on those, including senior council employees, who violate the standards. (ii) an appropriate water tariff policy is introduced, since this will encourage re-use of water.

The availability of water in the semi arid environment of Botswana is a key element for development. Hence it is likely that any major rural water supply programme would have a major impact on the development of settlements. It is also possible that it would impact on land use. Human activity often intensifies once a water source is developed. The provision of reliable water sources may increase the demand for fuel wood and farmland since the carriers, mostly women, may have more time for agricultural and other activities. A number of socio-economic studies have identified increased economic activities and an increased scarcity of firewood in villages supplied with water. An increased population also leads to changes in land use due to the need to bring more land under cultivation, which in turn affects the availability of grazing land. This may lead to overgrazing and land degradation. Change in land use influences the recharge of aquifers and insufficient source yield may be directly linked to low infiltration capacity, due to land degradation in the catchment area. An integrated approach to the develop-

¹⁰ E. Lagerstedt, G. Jacks, F. Sefe, *Environmental Geology*, 1994, p. 60-64.

ment and management of water sources is needed, involving land use planning and control. These issues have not been sufficiently addressed by the RVWSP.

According to the NWMP, about 82% of all the cattle in Botswana are owned by traditional farmers. Out of these 20% are owned by farmers with herds of less than 20 head. These farmers, with relatively small herds, either pay for water from boreholes owned by farmers with large herds or depend on public water supplies, which are frequently fully utilised. The use of the village water supplies for watering livestock is not allowed, except in a few districts where water is reticulated to special watering points. However, it is apparent that small herd owners do use water provided through the RVWSP to water their livestock and in particular their small stock. The extent to which this has affected the grazing land is not known but the importance of village water naturally increases during the dry season and in drought periods. When other water sources have dried-up, livestock move into the villages. In some villages increasing volumes of water are transported to cattle posts and lands areas. The number of small stock in the villages has increased during the last decade but this seems to be mainly a response to the prolonged drought, since these animals are less affected by drought. Water for small stock is commonly taken from the standpipes and given to the animals in the backyards. Competing demands for water at times of drought might contribute to the problem of insufficient yields.

It is concluded that due to the lack of data, it is not possible to determine the effect of the RVWSP on grazing land. It has clearly lead to an unquantified increase of cultivated land close to some villages and hence to some reduction in grazing land. The more significant effect of the supplies on grazing patterns, is caused by the illegal watering of livestock. The main impact is seasonal and is concentrated in the driest periods, when the rangeland is at its most vulnerable. However it is concluded that the long term effect cannot be determined because; (i) even the short term effects cannot be quantified, and (ii) the experts do not yet agree on the regenerative powers of the grazing areas.

A major impact of the RVWSP has been on the human environment, in the form of an accelerated development and even proliferation of settlements due to the provision of water. It was felt that this was an area that had not been sufficiently addressed in earlier evaluations and a local expert was commissioned to study the impact of the RVWSP on settlement patterns and the environment¹¹.

The availability of water has historically been a key determinant of the pattern and growth of settlements in Botswana and the seasonal migration between the village, the lands and the cattle post has developed in response to the environmental conditions. The 1971 Population Census registered a trend of increasing permanent settlement in the lands areas and in the 1981 Population Census several new settlements were registered that had been established during the inter-census period. In the Central District only, there were forty new settlements, generally cattle posts and lands areas which had become settlements. This trend continued during the 1981-91 inter-census period. The NDP 7 observed that the proliferation of settlements interfered with traditional land use and caused problems to the public service sector¹². There are

¹¹ B. U. Bhebhe, *Rural Village Water Supplies in Botswana: An Evaluation of the Impacts of the RVWSP on the Settlement Patterns and the environment*, a paper prepared for the RVWSP evaluation, 1995.

¹² "Unplanned settlement developed in areas designated for wild life, cattle grazing, forestry and arable agriculture. As the population of these settlements increased, government responded by providing services and infrastructure without full assessment for the long term consequences, and of the economic viability of the settlements. Many of the new settlements, after the initial rapid growth, began to decline as inhabitants moved to other more attractive settlements. Services and infrastructure provided by the government, such as

several causes for the proliferation of settlements but it is apparent that the Government's determination to provide potable water, to even the smaller villages, increased expectations that Government would provide a water supply where required. Hence new settlements were established in the expectation that Government would respond by providing water and other services.

One results of the RVWSP on settlement development can be as positive; the provision of water facilitated the development of schools and clinics and enhanced economic and commercial development in non-serviced and remote areas and thereby relieved pressure on major villages and urban centres. However, a number of negative impacts can also be identified, notably the accelerated proliferation of villages without adequate planning. One result was that other government agencies with responsibilities for other social services were under pressure to provide such services to small communities, with the result that facilities were provided for too few people.

Some settlements provided with water were established on land originally designated for arable agriculture, cattle grazing and wildlife. The number of land use conflicts increased and most districts experienced encroachment of arable land into grazing land and the latter into wildlife areas. In the process of villagisation of lands, prime agricultural land was lost.

The provision of water even encouraged development of settlements in fragile ecosystems, such as in the western and north-western parts of the country where the environment around developing settlements is especially vulnerable. Some settlements have suffered from shortage of water due to failing and drying boreholes and the long-term sustainability of these water supplies is questionable.

It is concluded that RVWSP responded to the existing water demand without evaluating the environmental characteristics, and without apparently recognising the impact which the programme would have on settlement development. Many of the above mentioned problems could had been avoided had regional, physical and land use planning played a more central role in the RVWSP. It is evident that the provision of water plays a key role in the development of settlements and is likely to have a direct or indirect impact on the land use of an area. A more holistic approach to the development of water supplies is needed, where integrated land use plans are linked to the development and management of water resources. This is also of great importance due to the fact that expansion of human activities and change in land use have direct implications for the hydrological and hydro-geological conditions of an area.

3.7 Sustainability

Since the cessation of the SIDA programme, the development of the rural water sector has continued on a number of fronts. Firstly a few new supplies in very small villages have been constructed. Expenditure under the village water supply programme was budgeted at P6 million in 1994-95 and at P10 million in 1995-96. Secondly the rehabilitation and upgrading of existing supplies and thirdly the improvement of the infrastructure for Council Water Departments have continued. The two latter components are both covered by the LG 148 programme. In 1994-95 the expenditure was budgeted at P32 million but less than P15 million was actually spent on the two components. However this was primarily due to administrative reasons, and does not reflect a lack of funding or intent. In order to make up for the expenditure shortfall a sum of P49

schools and clinics have been increasingly under-utilised in these settlements, while demand for the same facilities has arisen at other locations...", NDP 7.

million has been budgeted for 1995-95, of which over P11 million is to provide workshops, offices, stores and vehicles for Council water departments. In excess of P37 million is planned for rehabilitation of SIDA funded programme supplies.

Although actual expenditures are not yet known, budget estimates for recurrent funding have continued to increase slightly in excess the level required to match inflation and increased supply. Excluding transport the total sum budgeted by all Councils in 1994-95 was P21.68 million compared to an actual expenditure of just over P14 million in 1992-93, and P5.5 million in 1988-89.

There is no sign at present that the withdrawal of SIDA has lead, or will lead, to a reduction in the expenditures made on, or the priority given to, the rural water supply sector. SIDA continues to play a minor role in the rural water sector by its salary topping up support, which although very limited, still has symbolic value.

Sustainability is a key criterion in evaluating any development programme. Where donor assistance is involved, an important consideration is whether the programme is able to continue effectively after the donor withdraws support. In the RVWSP the question of the overall sustainability of the main water supply component of the programme has to some extent, already been answered. Two years after SIDA assistance ceased, the programme continues, and although some weaknesses are discernible, few are more serious than they were two years ago. During SIDA's long phase out period and since, the water supply programme has shown no signs of deteriorating. Government has fully absorbed the financial burden and some features of the programme such as availability of technical staff have continued to improve.

Sustainability has to be related to a specific time period. It is impossible to say whether the water programme is, or is not, sustainable over the very long term. Since the distant future involves wild speculation rather than informed forecasting, the comments in this section are based on a 10 year view. It is shown below that the mission believes that the rural water programme is sustainable over this period, and it is concluded that SIDA left behind a sustainable programme.

3.7.1 Financial Sustainability

Given the technology involved and the large O&M organisational structures which have been established, rural water supply O&M is a high cost activity. Its financial sustainability can be looked at from two main stances. Firstly whether the contribution of the beneficiaries is likely to provide the major part of subsequent costs either through their participatory role or through cost recovery charges. If the beneficiaries pay for the costs of the service and will continue doing so, long term financial sustainability is assured. However if this approach is used in the RVWSP, then the programme is not financially sustainable. The ability to pay is not high and even if water rates were significantly increased, revenues would only constitute a minor part of the O&M costs. The main exception is the major villages where cost recovery of all recurrent costs, at least, should be possible, although even this target would require a large increase in the recently increased tariff. But for the majority of rural villages, a significant contribution from users is unlikely.

Hence in Botswana, it is more appropriate to view financial sustainability of rural village water supplies as whether or not Government has the ability to fund almost all the costs involved. It

has been financing almost all these costs in recent years, during which time the recurrent provision has been reasonably adequate. During 1984-88, "the recurrent funding entirely provided by GoB matches well with the increased maintenance requirements". Since then, recurrent funding has continued to increase in line with requirements. Finance is reported to act as a constraint on preventive maintenance. This may well be the case, although it is not clear that other factors are not the relevant constraints. Improved technical capacity and management may result in current funding being adequate. What is clear is that recurrent funding meets the major part of O&M requirements. Government also been increasingly funding the development costs. While at the beginning of the programme it only funded a minor part of the costs, by 1984-88 it was paying for 45% of the costs and this figure increased to 90% by the end of the programme. Hence the question of financial sustainability is not whether government can afford to finance the cost, it can at the moment, but whether it can continue to do so. The answer to this is involves speculation.

In 1992-93 after having averaged an annual real rate of growth of 10% over 1981-91, the economy experienced a sharp downturn, and a slight fall in GDP but the full extent and duration of this setback have yet to be established. The preliminary indications for 1993-94 are that growth occurred but it remains too early to determine whether a positive trend has been resumed. In 1993-94 Government still had a large budget surplus, but the 1995 Budget speech anticipated that a limited deficit would result in 1994-95. Furthermore it has been noted that the longer term adjustments to ensure longer term budget sustainability will fall mainly on the expenditure side of the equation. Hence it is likely that government will face a tighter financial situation in the future. However assuming that the situation does not deteriorate dramatically the financial sustainability of the programme is unlikely to be seriously at risk as long as expenditures do not form an unduly large proportion of the overall budgets.

At present the recurrent expenditure on all rural water supply plus the shortfall on major villages is around 1% of Government's total recurrent budget. Given that the programme is supplying approximately half of the national population and that water is a vital service in Botswana with high political and social priority, this does not seem an unreasonable burden on the Government's finances. Furthermore if as is proposed below, government introduces a higher tariff in major villages that allows full recurrent cost recovery, the subsidy required for rural water supply would only represent 0.7% of the Government's recurrent budget. It is therefore argued that the programme is financially sustainable. Even if Government's financial situation were to continue deteriorating, the programme is still sustainable given a continuing high priority to the sector.

The greatest risk is not so much total central government grants to District Councils, although this is a factor, but whether the District Councils continue to allocate a sufficient part of their total recurrent budgets to their water departments. At present Councils depend upon revenue grant support from central government for 90-95% of their total income, and the 1995-96 estimate for the total grant to all Councils is approaching P300 million. Furthermore while there are various discussions regarding the widening of Councils' revenue bases, it is likely that they will continue to depend upon central government for the major part of their funding. In most Councils revenue from water fees constitutes well below 5% of the recurrent water supply costs. The scope for significant cost recovery is low, and even if water rate revenues were considerably increased, the resulting income would remain a minor part of water supply costs. Hence the adequacy of funds for maintaining rural water supplies will depend upon the adequacy of these grants and on Councils allocating a sufficient part of their deficit grants to their water departments. However there are a number of factors which suggest that this risk is not

high. Firstly on average the recurrent expenditure on water is well below 10% of their total budget, and the increase is likely to be limited now that most villages have supplies. Secondly there is scope for cost reductions since 60% of water department expenditure is for staff, and these could be reduced if industrial class staffing was rationalised. Thirdly water is a given high priority by the Councils, the councillors and their constituents. Hence there will be considerable pressure to ensure adequate provision is made. Fourthly there is currently a movement away from simply basing Councils' annual budgets on the previous year's budget, modified to allow for inflation, to budgeting by objectives.

It could be argued that the continuing provision of new very small schemes will undermine financial sustainability since they will result in high unit costs. On the other hand the absolute funding required should not be high, since there are only a limited number of villages which do not yet have water supplies. The main question regarding the ability of Government to meet future capital costs relates to the rehabilitation and upgrading programme. This is currently a very expensive exercise, partly due to the increased standards of reliability being incorporated, and the need to use more distant sources. Planned expenditures in the current year are over P37 million. This figure is high but it is still only 2% of the estimated national development expenditure. Nevertheless it is not possible to assert that augmentation expenditures would be sustainable if Government finances continue to deteriorate. In the event of capital constraints, design modifications could reduce cost and still protect the existing schemes. The additional recurrent costs arising from rehabilitation and even extensions should in most cases be relatively limited due to the high fixed costs associated with O&M.

It is concluded, that as long as high priority continues to be given to rural water supply O&M, the activity is likely to continue to be adequately funded. At present Government appears able to fund the expensive augmentation programme. However if Government finances were to significantly deteriorate, its ability to continue the high level of funding is uncertain. However if this were to occur there is considerable scope for reducing the costs of the augmentation programme, while still protecting existing investments. Hence one can be reasonably optimistic about the financial sustainability of the programme.

Given the urban character of most major villages, it should be possible for financial sustainability to be based on consumers at least paying for all recurrent costs. However to date major villages have a poor history of cost recovery.

Cost recovery in the major villages appeared to be given high priority at the start of the programme. Before any investments were made, councils had to sign agreements with government in 1972, under which the council became the formal consumer to be billed for all water consumed from public standpipes. They were supposed to recover these costs by levying water rates or charges by by-law. However this was never pursued and free standpipe water was later formalised. This has meant that the costs of standpipe provision in the major villages have fallen entirely on DWA. This is probably appropriate. What is less appropriate is the tariff for private connections. In 1987 SIDA funded a Rural Water Costs and Tariff Study. The study's recommendations regarding the structure of the tariff were subsequently implemented, but the level of the rates charged for private connections remained well below those recommended, with the result that large financial subsidies have continued to be required and that the management tool provided by pricing has not been utilised. Pricing has not been used to limit the increase in demand which has outstripped availability at many supplies. A further weakness of the tariff demonstrated by the SIDA study was that the subsidies arose by default, in that they were not explicit and quantified in advance. Furthermore they were not clearly targeted and in

practice were poorly directed. Better off private connection consumers were receiving higher subsidies than poor standpipe users.

While some elements of the tariff policy are sound; consumption is charged for on a metered basis, defaulters are disconnected, and connection fees in major villages reflect the costs of connection, the tariff is far too low. Government is currently bearing all major village capital costs and half the recurrent costs, even though the greater part of the water is being consumed at private connections. Government is also bearing all the capital costs of rural/small village supplies, while councils are only recovering a small fraction of their recurrent costs. In addition most district councils charge a fixed connection fee which falls well short of covering the costs of connection.

The larger major villages are now of an urban character and planning must take this into account. The supply problem of major villages should be solved by a combination of new investments and demand management using pricing. DWA intends to be recovering all its recurrent costs by 1997, but since major village supplies are essentially urban, immediate increases to meet this cost recovery objective would be appropriate. Furthermore in an urban environment, DWA should be making a significant operational surplus in order to contribute towards capital cost requirements.

The combination of rapid population growth and the continuing trend to private connections means that water consumption is continuing to increase at a high rate in major villages. This increase is exacerbated by the too low tariff which is not only increasing the subsidy needed, but is also adding to the supply constraints and augmentation requirements since consumers are not receiving the correct market signals.

Even in some rural/smaller villages the rapid increase in the number of private connections has been a major factor in creating capacity constraints, increased supply unreliability, the subsequent need for large augmentation expenditures, and increased recurrent costs. Hence the expansion of private connections will further undermine financial sustainability in all villages except those where there is considerable spare capacity. The combination of supply shortages and increasing costs to meet increasing demands shows that there is a need to use pricing as a tool both for managing water demands and for increasing long term financial sustainability.

However neither DWA nor councils have made any attempts to manage demand, and pricing has not been used as an effective management tool. In the future it is recommended that pricing should not only be used to recover an increasing proportion of all costs, to improve financial sustainability, but should also be used to ensure that past investments are used appropriately, and that future investments are fully justified, thereby limiting investment requirements.

One specific problem is that individual consumers at institutions do not have to pay for their water and they have no incentive not to waste water. It is proposed that wherever possible technical and administrative measures should be introduced so that individual consumers living in institutions have to pay for their own water, to the maximum extent possible, in both major and rural villages.

In the smaller villages water demand management should centre on increasing consumer awareness of the importance of water conservation, and translating this into careful use. Council water and community development staff, supported by Central Government should organise water conservation campaigns based on community participation and the fact that it is in the community's interest to use available water carefully.

In the major villages the main thrust towards managing water demands should be through "the consumers' pocket". This is because; (i) the problems of community involvement in urban areas are likely to be difficult, and (ii) the greater part of all major village consumption is taken from private connections. Nevertheless pricing should be supported by appropriate water conservation publicity campaigns, and other conservation measures should be investigated. For example, the benefit of changing certain building codes and introducing water saving devices should be examined.

It is concluded that appropriate tariffs should be introduced in all villages. In the major villages this will constitute an important measure; in improving financial sustainability, in targeting subsidies to the poorer residents, and in providing consumers with the correct market signals, so that the apparent needs for augmentations are in fact fully justified. In the largest rural villages tariff increases will have similar results.

In the smaller villages tariffs should also be increased to similar levels. This will remove poorly directed subsidies and will, when supported by conservation measures, lead to apparent needs for augmentations being justified. In addition connection fees should be increased so that all costs of connection are fully covered. However it has to be recognised that even large increases will not significantly increase financial sustainability. This is because only a very limited portion of the consumption is paid for, since the major part is taken from standpipes, and the financial effect of higher tariffs would be very limited, since any additional income would still be small in relation to the Councils' O&M costs. The financial effect will increase over time. As the number of private connections increases, the additional financial burden, and the potential lost income, will increase. Hence the very low connection fees and tariffs will increasingly impinge upon financial sustainability, although they are likely to remain a relatively minor factor for a considerable time.

By "appropriate" tariffs the consultants mean a tariff which overall fully covers all recurrent costs in the major villages and which makes a limited contribution to capital cost recovery. In addition it should involve a stepped tariff with a low rate, for the first 5m³/month, and progressively higher tariffs for increasing consumption. The rate for the second band should be similar to the unit O&M costs, while the higher band rates should include contributions towards capital costs. The tariff in other villages should be similar to the major village tariff, although given higher unit production costs and a higher proportion of unbilled water, it usually will only meet lower cost recovery criteria. The tariffs will still involve subsidies. This is acceptable since if they are based on "appropriate" tariffs, they will be clearly targeted, explicit, and quantified in advance.

3.7.2 Technical Sustainability

Technical sustainability, i.e. the long term retention of the schemes constructed in good working order, cannot be considered in isolation from the management and operational arrangements. If the villages were solely responsible for operation and maintenance, the borehole/motorised pumping/distribution network set up adopted for most schemes would not be technically sustainable. However the fact that the programme largely ignored the simpler technologies has not undermined the technical sustainability, since the Councils water departments which are responsible for O&M have been provided with the manpower and resources to operate and maintain the rural village supplies. Although they cannot undertake the "down the hole"

jobs, these services can be purchased. Hence technical sustainability is largely dependent upon institutional sustainability and on Councils continuing to possess the capability for effective O&M.

The sustainability of the initial programme was enhanced by relatively simple designs and a high level of standardisation. The requirements for operation and maintenance can be met given the easy access to spares in Botswana/South Africa and because the skills required for O&M have been developed. In a limited number of cases, the upgrading programme to meet higher levels of demand will increase the technical complexities and therefore require higher levels of skills. However it is likely that these needs will be met as long as Councils are able to retain trained staff. As far as new schemes are concerned, there should be no problem with technical sustainability, since they are likely to be based on similar technologies to that of existing schemes. Even though the technology adopted makes the systems heavily reliant on logistics support; transport, fuel, spares and skilled staff, these are being "delivered" and it is probable that they will continue to be delivered not too far out of line with requirements.

A good indicator of technical sustainability is the operation and maintenance performance in the period since the assistance programme terminated. Most schemes are currently operational, the number of breakdowns are within acceptable limits, and the majority of breakdowns are repaired within 48 hours of being reported. The main technical problems relate to a shortage of water either due to increased demands or to a fall in the aquifer. The shortages brought about by these factors are being addressed by the rehabilitation programme. This programme by protecting past investments has been a valuable element in contributing to technical sustainability. In fact in some instances where an element of the construction was initially of a low quality, upgrading has taken care of the problem. In such cases, rehabilitation is increasing technical sustainability. Furthermore the current moves to improve the quality of village operators will further increase technical sustainability. For example, as they become increasingly competent it may be possible to decentralise more tasks to village level.

It is concluded that current performance and O&M needs/resources analyses both suggest that the original and augmented programme schemes and probable future schemes are technically sustainable.

3.7.3 Institutional Sustainability

Institutional sustainability in the sense that the institutions involved in the programme would remain in place after the assistance was withdrawn was assured since no new organisations were established for the programme and all projects components were placed in existing institutions. Furthermore the use of existing structures for all components increased the probability of the sustainability of the different activities, although this is of course insufficient in itself, as witnessed by the demise of the water hygiene education component.

The main question relating to institutional sustainability is the ability of councils to continue maintaining supplies, with particular emphasis on management. This in turn relates to their ability to attract and retain the appropriate staff, and MLGLH's continuing ability to fund infrastructure and vehicle requirements. Sustainability is currently being furthered by the provision of the necessary infrastructure, (workshops/offices /transport etc.), under LG148. MLGLH's current plans suggest that by end of NDP VII all water departments should be properly equipped with offices, workshops, equipment and transport.

Sustainability has been promoted by the fact that although for much of the period localisation plans were not based on sound analyses, in practice local staff were never promoted before they were properly qualified, leading to institutions lowering their standards, and reducing their efficiencies.

The lack of management capability is a potential risk for sustainability of institutional capacity and performance. The lower the management capability, the lower the institution's capacity for any given level of its other resources. However this risk is closely related to the main risk for sustainability, whether the rural water sector and the District Councils in particular will be able to retain their technical and professional staff. Employment by Councils is generally considered less attractive than employment by central government, let alone the private sector. Although Council salaries for a particular grade are on a par with Central Government, staff members are often at higher grades in Central Government than very similar persons in District Councils. Last year only one of several engineering graduates offered positions with District Councils accepted the employment. Hence sustainability could be limited by Council salaries and conditions of service. Councils are caught in a dilemma. They must support the training of their water department staff. On the other hand, the better qualified their staff become, the greater is the risk that they will be attracted by better opportunities elsewhere. While the conditions of service are within Government control, the other factor, the siphoning off of trained staff by the private sector, is not. The current downturn in the private sector in Botswana is likely to improve the ability of DWA/Councils to retain the personnel that they require due to a reduction in alternative opportunities. On the other hand, the drawing power of South Africa represents a major threat.

Transport is another possible factor which could undermine O&M and hence sustainability. This is because vehicle replacement is the responsibility of the works department rather than the water department, and insufficient provision for vehicle replacement has been a feature for several years. Currently there is no serious problem because some development funds under LG148 are, in effect, being used for replacement, although they are claimed to be for expansion needs. However there is no evidence that funding for vehicle replacement is assured in the longer term. Another possible problem for institutional sustainability is that the resource/tasks relationship within councils is far worse in some other departments than in the water department. Hence the water department may be handicapped by the performance of treasury or personnel departments.

A number of factors suggest that despite the risks mentioned above, the manpower required for sustainability may be adequately provided for. Firstly the training/HRD programme will, in the near future, provide councils with a major part of their immediate needs. Secondly the calibre of water technicians coming out of the Polytechnic has been improving in recent years, due to an improved training course and to a higher calibre of trainee. Thirdly the production line for technicians is now firmly established. This should produce a continuous line of technicians with the best individuals going on to the established professional training route. It was reported that a critical mass of technicians has now been created. Inter alia this means that there will be increasing competition for HND places and subsequently for M.Sc. places, and that the calibre of personnel will continue to improve. Fourthly the development of an HND course in Botswana will maximise the relevance of the course content and reduce costs.

Institutional sustainability is considered probable because: (i) the institutional arrangements after the donor support was withdrawn remained unchanged, (ii) the programme has the support of

the beneficiaries, in that the services are well patronised, (iii) the project has strong political support to ensure its continuation, (iv) the programme has very significantly strengthened the capacity of the Councils for managing and maintaining the supplies since the capacity building elements were appropriate, (v) the maintenance system is fully institutionalised. The greatest risk is that councils are unable to retain trained staff. It is therefore vital that government ensures that the terms of employment remain sufficiently attractive that this risk is minimised. If this condition is not met, the sustainability of the RVWSP would be put seriously at risk.

3.7.4 Environmental Sustainability

Ground water has been the principal and dominant source of water for all purposes in Botswana. The National Conservation Strategy of Botswana¹³ points out that "There has been relatively little monitoring of the ground water levels and characteristics. It is feared that ground water recharge is often insufficient to balance the draw-off. As a natural consequence, this leads to gradual exhaustion of ground water resources." It further states "The objective is to ensure that the use, conservation, and development of both the renewable and non-renewable water resources is planned and executed, so as to achieve cost-effective, equitable and sustainable results.

Botswana's long-term objectives for development of its water resources are presented in the National Water Master Plan where it is stated¹⁴ that "it is possible to address the sustainable development ethic in a manner which allows development or mining of non-renewable resources at a rate compatible with the rate of development of technology adequate to provide equivalent new resources which are not available under current technology." It is further stated that "Mining of ground water should not therefore be the subject of a general embargo. ...As a guide it is recommended that any proposal involving extraction of more than 25% of the available reserves should be the subject of detailed study."

While in principle sound, this approach does carry risks, if the necessary technical solutions are not found. While one would not argue for a "general embargo" on mining groundwater, the main focus should be on the development of an approach which is known to be sustainable. As Prof. M. Falkenmark puts it "the task is to seek ways to successfully cope with actual environmental preconditions while satisfying societal demands. ...by asking how much water is there to share, and how can society best benefit from the limited amount"¹⁵. This resource-oriented approach has not yet gained adequate recognition. As pointed out by J. Gould "the National Water Master Plan has adopted a conventional demand oriented technical approach whereby future demands were forecast and technical solutions to meet these forecasts then proposed. An alternative 'resource oriented' approach involving the introduction of active measures to control demand and encourage water conservation has not, however, yet been given serious consideration."¹⁶

¹³ Botswana National Conservation Strategy, 1990, p. 21, 28.

¹⁴ Botswana National Water Master Plan Study, Volume 4A — Environmental Aspects: Report, 1991, p. 4-9.

¹⁵ Prof. M. Falkenmark, Stockholm University, "Successfully Coping with Complex Water Scarcity — An issue of Land/Water Integration", a paper presented at the Integrated Water Resources Management Workshop, March 1994.

¹⁶ J. Gold, University of Botswana, "Long-term Water Resource Management in Botswana: The Case of Controlling Demand", a paper presented at the Integrated Water Resources Management Workshop, March 1994.

The RVWSP has adopted the same approach, i.e. it has aimed to produce technical solutions which satisfy forecast demands, without attempting to manage those demands. However this is not to say that the volumes of water required for meeting programme demands in most non major villages cannot be sustained by the groundwater resource, even though between 1990 and 2020, the demand for water is forecast to increase nearly 3-fold in rural settlements. This is because the volumes required for rural supplies are quite limited. Even though much of the groundwater extraction in Botswana is believed to be mining of aquifers which have no, or an inadequate, recharge, (in some cases involving non renewable fossil ground water), this is not necessarily the case for rural water supplies. The data to provide a sound analysis does not exist. This is a result of the size of the data collection task, since it is noted that Botswana has undertaken a considerable range of groundwater studies, and SIDA has financed more groundwater studies in Botswana than in any other country.

It is concluded that the ability of the groundwater resource to sustain the increasing demands of the RVWSP is unknown. However the most important point is that the rural water supply requirements should not be seen in isolation. Consequently the demand oriented approach followed by the RVWSP is clearly inappropriate, and a resource oriented approach involving measures to control demand and encourage water conservation is necessary. It is likely that ground water resources alone may not be able to meet the increased demand for water in some villages. It is therefore recommended that the supply of water to villages, should become one element of a fully integrated approach to water management, involving both the use of surface and groundwater. This would increase the resource sustainability for all users including villages in the RVWSP.

In addition to focusing on only one source of water, groundwater, the RVWSP also concentrated on a single technology; motorised pumping with piped distribution. While the standardisation of technical solutions and components in the RVWSP contributed to the success of the programme, the technology used may not always have been the most appropriate from an environmental perspective. This applies in particular to the schemes built in the smaller villages with a relatively shallow ground water table, where other technologies would have been feasible.

The interest in alternative technologies as a substitute for the standard diesel pump installations increased in the mid-eighties and a technical assistant post at DWA for the development of small scale pumping technologies was funded by SIDA. In 1986, SIDA supported the installation of four solar (PV) units at village water supplies as part of a project aimed at determining their reliability in a non-experimental situation. A number of hand pumps were also installed, but mainly as standby supplies for small diesel powered systems and where the yield of the borehole was considered too low for a diesel pump installation. The high unit cost for schemes to be built in very small villages and the high cost of transporting diesel to distant villages was the major reason for consideration of other possible technical solutions. The annual sector review in 1985 stated that "...while the opportunities for hand pump installations at villages are limited, due to both distance to the village and pumping head constraints, it is suggested that more emphasis should be placed on hand pumps now that most of the remaining villages in the RVWSP are small."

The 1987 review pointed out that "From the testing it seems already clear that solar pumps, hand pumps and under certain conditions windmills have a place alongside diesel as technologically and economically viable pumping choices. For the future it is necessary to consolidate gained experiences and utilise the technologies where they are the most logical pumping choice. In order to do this, a concentrated effort to upgrade skills at both DWA and at the district level

will be necessary." In the 1988 annual review it was pointed out that "Funds allocated to alternative, small scale technology ...have been used but not to the extent envisaged." Despite all these observations, it is clear that support to research and development of appropriate technologies had very little actual impact on the implementation of the programme. As the Rural Industries Innovation Centre (RIIC) points out, "Awareness of technical options in the water sector or indeed general knowledge of appropriate solutions is very poor, both at government and community level."¹⁷ He stresses that alternative solutions are not widely researched since existing systems are presently affordable and meet expected service levels.

It is concluded that from an environmental sustainability perspective, a more flexible RVWSP approach with site-specific solutions to both water resources and technologies used would have been more beneficial and sustainable. This would have included the use of hand pumps; (i) at low yielding boreholes, some of which were unnecessarily abandoned and (ii) at improved traditional sources. Hence despite the lack of success, to date, in translating words into actions, support and incentives should be given to the adoption of alternative technologies.

In the 1970s, the emphasis in water conservation was on providing water so that the users of the village schemes could increase their consumption. For example NDP 3 (1973-78) stated that "It is proposed by 1980 to complete programmes of rural water supply development such as to provide a per capita consumption of at least 18 litres/day and preferably about 32 litres a day in all villages." The issue of water conservation was not addressed until the NDP 4 (1976-81) which stated "while Government accepts its obligations for minimal water supply it also recognises the dangers inherent in the wasting of a "free" resource. To this end, water pricing in rural areas has the secondary goal of discouraging waste." However Government has never used pricing as a method of discouraging waste. The fact that in 1979 the Government ended charges to rural standpipe users was not important since the NDP 5 (1979-85) correctly pointed out that "The labour involved in fetching water from a standpipe acts as an effective disincentive to waste water". But the opportunity to use pricing effectively to discourage wastage and/or misuse at private connections was never taken. Furthermore some wastage cannot be addressed by pricing. For example the mis-use through leaving standpipe taps open. Water conservation was not included among the major strategies for the water sector until the NDP 7 (1991-97) proposed: "to promote careful and efficient use of water in all its applications, and to encourage re-use of effluent of sewage systems whenever this is technical and economically feasible."

The RVWSP has been successful in providing water to rural communities and in initiating a process of increased demand for water. The fact that it never seriously addressed the issue of water conservation was one of the major weaknesses of the programme. Both technical, and educational aspects should have been considered. The introduction of mechanical water conservation measures to the supply infrastructure, such as self closing hydrants and taps, etc. would have been valuable in areas with limited water resources. Making water conservation, re-use and re-cycling an integral part of conceptual design for infrastructure and public facilities could have reduced water consumption significantly. Increasing awareness of the need for water conservation through an educational component, focusing mainly on schools, could have had a major impact of the misuse of water. Children playing at standpipes and water taps left open in schools are reported to be a major source of wastage. The lack of community participation has been one reason for poor water conservation.

¹⁷ R. Rydtun, Rural industries Innovation Centre, "Water Supply and Choice of Appropriate Technology in Botswana", a paper presented at the integrated Water Resources Management Workshop, March 1994.

In a situation where demands exceed water availabilities and where the provision of additional capacity is financially expensive, good management and careful use must be applied to ensure that supplies can continue to meet needs of growing communities in the future. More efficient water use will be vital for the sustainable use of the nations' water resources and for sustainable development.

It is concluded that the failure of the programme to address the issue of water conservation has resulted in higher levels of waste and mis-use than was necessary. In order to increase the probability of long term resource sustainability, water conservation must be addressed by a package which includes;

- (i) higher tariffs
- (ii) the promotion of the principles and importance of water conservation among policy makers
- (iii) dissemination of information on water conservation needs and methods to increase awareness among users.
- (iv) the promotion of appropriate technical measures

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Relevance

1. The programme was not relevant to SIDA's overall "independence" assistance objectives. But this was inevitable given the nature of the programme. However the specific programme socio-economic objectives related to improving the water quality, quantity, reliability and access were very relevant to the needs of the rural villages.
2. The programme was initially not well conceived, for example, it was assumed that the provision of water was primarily an engineering problem, although this was in part a reflection of the prevailing limited knowledge of the development process. However over time the relevance of the programme has been increased by amendments and by the addition of new components such as O&M strengthening. In general these amendments have been introduced later than was desirable. This was a result of no one being responsible for overall programme direction and strategy.
3. Despite the fact that the programme expanded in scope far beyond that which was originally envisaged, it has followed the general direction originally envisaged, and it has remained reasonably relevant to; (a) the needs of the rural consumers and (b) the socio-economic objectives of SIDA and the Government.

4.2 Physical Achievements

4. Although the programme had ambitious targets, for the most part the programme met its quantitative targets. Furthermore while completion of the targets for the different phases was usually late, the delays were not lengthy and were acceptable for such an ambitious programme. Nevertheless there was an over-emphasis on quantitative targets which should have been modified when circumstances changed. The result was that development constraints were created which lead to sub-optimum implementation.

5. Even though part of the cost over-runs was due to more expensive designs, inflation was the main factor, and the over-runs in real terms were not unreasonable given the nature of the programme.

4.3 Functioning and Utilisation

6. The village water supply systems are continuing to function reasonably well. In comparison with most other donor assisted rural water programmes in the sub-Saharan region, the reliability of the systems is impressive. Almost all systems in the SIDA assisted programme, except during occasional breakdowns, are continuing to deliver water to the rural population year after year. Furthermore breakdowns are normally attended to within an acceptable time.
7. However in some systems, the water source is only capable of providing part of current demand. This is partly due to large increases in demand arising from a greater provision of private connections than was originally envisaged, and partly to water sources drying up due to the prolonged drought conditions. The capacity constraints arising from the latter factor can, to some extent, be attributed to a limited vision during the planning phase in that the designs were based on the water supply conditions of a "wet" decade, rather than on longer term groundwater data.
8. The systems are highly utilised, and the vast majority of the inhabitants, make use of the system during the greater part of the year. However, even in the villages, over 30% of households occasionally use a secondary contaminated source. Furthermore when people move to the lands, only a minority (25%) have access to piped water. Hence while the village programme has provided a relatively safe supply of water to village residents, many do not have access to an improved supply throughout the year.

4.4 Benefits

9. The RVWSP has lead to significant socio-economic benefits. Major time savings are accompanied by corresponding drudgery saving benefits. Studies have also shown that RVWSP has tended to increase the level of water consumption, although the increases of standpipe users have been relatively limited. However there is no strong evidence to confirm the expectation that the RVWSP would lead to the consumption of improved quality water, due to post collection contamination. While there is evidence that the new supplies have encouraged income generating activities and the establishment of commercial activities, the extent of this development is uncertain.
10. Due to the limited quantitative data and the difficulty of attributing any health improvements to specific interventions such as water, the health impact of the programme is highly speculative. All that can be said is that taking the coverage of the programme, and the known linkages that exist between improved water supply and reduced diarrhoea and skin diseases into account, it is probable that the water programme together with other interventions such as hygiene education has had a positive health impact. However it is clear that the potential health benefits have been constrained by; the limited impact of the health education programme, the contamination of water by consumers, and the fact that the majority of those who use the supplies, but who spend part of the year in the lands, are exposed to water from unimproved sources during that time. It is recommended that the health impact of year round and intermittent use of piped village supplies be examined by

studying groups who (i) remain in the villages all year and (ii) who move between villages and lands areas.

4.5 Cost Effectiveness

11. The programme focused on a single technology based on motorised pumping. This meant that schemes are expensive both to construct and to operate. However the high cost was largely a function of unfavourable water supply conditions, and in the average village the technology was cost effective and appropriate. However little consideration was given to alternative technologies and the work undertaken on alternative technologies had little impact on the RVWSP planners. In particular the use of hand pumps should have been pursued in small high cost villages.
12. A major weakness of the programme is that where there was a supply problem or where costs were very high, the provision of a lower level of service was not adopted or even analysed. Given that the number of villages which might have been considered for such an approach was limited, and that a simple technology solution may only have been possible in a limited percentage of locations, the development cost saving would have been relatively small in the context of total programme cost. Nevertheless large savings could have been made in individual villages.
13. The initial major village designs failed to envisage the huge demand for private connections. As a result augmentations have had to be undertaken well in advance of initial expectations and it has not always been possible to integrate relatively new existing facilities into the augmented systems. This has not been a cost efficient approach. A major part of the blame should go to the failure, even to attempt, to manage water demands.
14. Revenue collection in the major villages is reasonably efficient. However the collection from council run supplies is costly and inefficient, due to difficult logistical problems. It is recommended that the possibility of contracting out collection at village level should be investigated.

4.6 Programme Implementation

15. The appropriateness of SIDA's entry, and other, points of assistance, the lack of ambiguity of responsibilities, (which closely followed national policy), and little overlapping, have been factors which contributed to programme success.
16. The main institutional problem affecting programme effectiveness was the lack of co-ordination/integration between the different activities resulting from too limited co-operation between the different ministries and departments involved, especially with the Ministry of Health. One result was that the health component was to a large extent undertaken as a separate activity and was an important contributory factor in its subsequent demise. The lack of co-ordination in part stemmed from weak formal co-ordination mechanisms, and a high staff turnover. However it is probable that one key reason was that many of those involved and their agencies were not convinced of the value of co-ordination. While co-ordination has improved in recent years, further improvement depends upon an increased appreciation of its value. Even today senior officers responsible for "hard" programme components are sceptical of "soft" elements. It is recommended that Government should give increasing emphasis to sensitising engineers to the value of "soft" components.
17. There was a lack of co-ordination between the RVWSP and ministries responsible for the provision of other social services. This has been a contributory factor in reducing the ef-

fectiveness of the programme and in contributing to the need for the very expensive upgrading/rehabilitation programme currently being implemented. It is recommended that Government should make greater efforts to integrate water supply planning with that of other sectors.

4.7 Capacity Building

18. In the early years there was no serious attempt to develop long term institutional capacity, the main effort was directed to increasing the short term implementation capacity. However capacity building became more explicit when the focus switched to O&M. The weakness of the capacity building element was that a systematic approach was not adopted until 1988/89.
19. Long term capacity building in DWA was never a priority, and the lack of an analytical HRD strategy contributed to the regular delay of localisation plans. Nevertheless the training component increased technical capabilities and has been the foundation of a significant part of DWA's current technical and professional capacity. The result is that the manpower situation in DWA has changed from one where there were few Batswana in professional posts to one where only a few expatriates are employed.
20. At present the manpower situation in the council water departments is far from satisfactory. The initial limited vision of the training programme was a key factor in the slow pace of localisation. HRD was not based on a needs assessment and comprehensive analysis, until 1988 when a more holistic approach was adopted. The modifications since 1988 have lead to a promising current manpower situation. To date the benefits have not yet been fully fed through to the water departments, but all posts should be localised within three years.
21. The effectiveness of the SIDA assisted strengthening of councils water departments is manifest in O&M performance which has improved over time, despite the increasing work load. Councils are operating their water supplies reasonably efficiently, although standards of supervision and preventive maintenance are still below desirable levels, but as the gap between staff requirements and capacities continues to close, this should be rectified.
22. Currently the institutional memory for rural water supply is extremely limited, with result that the benefit of past experience is not always available to present day staff. Even today management information systems within the sector are still weak and do not fully address the needs of monitoring and planning. This represents a key institutional weakness. It is therefore recommended that MLGLH should employ a short term management information specialist to assist in designing a suitable system, An appropriate system would, inter alia, enable the relative performance of the different districts to be evaluated by a series of different criteria and contribute towards the adoption of appropriate remedial actions.
23. Even in recent years inadequate attention has been given to management training. As a broad generalisation the technical ability of senior staff exceeds their management ability. The problem is starting to be addressed, and it is recommended that management training for water department staff must be a priority of the management training which will be provided to councils under DDSS V.
24. The "softer" institutional capacity building components of the SIDA programme have probably been more important than the construction activities. This is because even in the absence of SIDA, the Government may well have funded the development programme, but it is less likely that it would have been able to have replaced the manpower and training components.

4.8 Environmental Impact

25. RVWSP has had some adverse environmental impacts, but these have generally been limited, largely due to the very limited volumes of water involved. The main problem in deriving environmental conclusions is the lack of relevant data, notably recharge data, which means that any conclusions have to be largely based on judgements.
26. Over-pumping in the programme has had an impact in some locations, but the impact is only local. Even where groundwater yields have fallen significantly, the extent to which this can be attributed to the programme is uncertain, since the main factor has been the prolonged drought. It is concluded that although the programme was at fault in designing supplies based on the "wet" conditions of the 1970s, rather than on "dry" conditions, the effect of the programme itself in depleting aquifers has been very limited, except possibly in certain major villages. It is recommended that efforts to improve data relating to the recharge of aquifers and the impact of groundwater exploitation should be supported. Inter alia this should include support for relevant research and an integration of all existing data. For example, the records of the boreholes under district councils are not part of the data base established by DWA for monitoring groundwater.
27. Since inadequate monitoring of boreholes has exacerbated the problem of reduced yields because warnings of falling yields have not been provided early enough, it is recommended that a sound monitoring capability should be built into all new schemes and rehabilitations, with operators being taught the purpose and value of monitoring.
28. The increased volumes of waste water resulting from the programme has not created a major waste water problem, except in a few major villages. Furthermore in these situations the problem has often been brought about by additional capacities added after SIDA support was withdrawn from the major villages. In most rural and small villages there is no real threat of a significant waste water problem in the foreseeable future. Where such a threat does exist in some of the larger villages, it largely stems from their major institutions. The following recommendations are made;
 - (i) Since it is important that the volumes of waste water are minimised, recycling and re-use of water should be encouraged, and wastage discouraged, especially in the major villages. Such measures have the dual benefit of promoting conservation and minimising the waste water problem. The optimum way for government to encourage such appropriate consumer behaviour is to implement a sound pricing policy, in which consumers pay for the costs of the provision of water and the removal of waste water. This will also limit the volume of water threatening the groundwater resource.
 - (ii) Support should be given to research and pilot activities in the rural areas relating to water management techniques for re-using waste water.
 - (iii) Priority should be given to the efficient O&M of existing waste water facilities since these pose the greatest threat of all, if they are not properly run.
29. Inadequate programme planning contributed to the increased groundwater pollution in the 1970s. Measures taken prevented the situation deteriorating further, and even led to some improvement in the late 1980s. However sewage stabilisation ponds, septic tanks and pit latrines still pose a threat to groundwater resources. It is therefore recommended that in order to minimise future threats appropriate standards related to waste water disposal should be established, all waste water disposal facilities should be properly monitored and penalties imposed upon those, including public officials, who violate the standards.
30. The provision of rural water has attracted people to settle in serviced villages and has led to an increase in cultivated land close to villages, and hence to some decrease in the available

grazing land in the same vicinity. However it is unlikely that this has put a significant extra burden on the remaining grazing.

31. The new supplies have resulted in increased pressure on grazing areas close to villages. This has been caused by the increased population keeping more animals and by the illegal watering of livestock. The main impact is seasonal and is concentrated in the driest periods of the year when the rangeland is vulnerable. However it has been concluded that the long term environmental effect cannot be determined because; (i) even the short term effects cannot be quantified due to inadequate data, and (ii) the experts do not yet agree on the regenerative powers of the grazing areas.
32. Changes of land use brought about by piped water supplies may have affected aquifer recharge in some locations resulting from lower infiltration from settled/degraded land. This issue was ignored by RVWSP and there is no evidence to support or contradict this possibility.
33. The provision of water by RVWSP has had a major impact on the accelerated development and proliferation of settlements, even in areas with fragile eco-systems. It has led to the expectation that Government would provide a water supply where required by the population, and new settlements were established in the expectation that government would respond by providing water and other services. The problem has been that the proliferation was unplanned. Furthermore other Ministries have subsequently been pressured into providing other social services for very low populations which are unjustified on some criteria. RVWSP responded to the existing water demands without evaluating the environmental characteristics and without apparently recognising the impact which the programme would have on settlement development. Hence in some situations low yield, simple technology supplies may not only be cost effective for the water sector, but also for the government's overall development budget. In addition the low yield may be environmentally appropriate.
34. Since it is evident that the provision of water plays a key role in the development of settlements and is likely to have a direct effect on land use, a holistic approach to development is needed. Water supplies should be treated as one element of a wider development in which integrated land use plans are linked to the development and management of water resources. In the smaller settlements the provision of supplies which only provide a low level of service should be considered.

4.9 Financial and Technical Sustainability

35. Although SIDA support for the RVWSP ceased in June 1993, the rural water supply sector is still given as high a priority as during the period of SIDA involvement, and there is no evidence that the programme is not sustainable. Capital expenditure remains high, recurrent expenditures have been maintained in real terms, operational performance has not deteriorated, and the availability of technical staff is improving.
36. The rural and small villages are not financially sustainable by the communities themselves due to a low ability to pay and high unit costs.
37. The supplies are financially sustainable since government can afford to subsidise the operational costs as it has been doing throughout the programme. At present the recurrent expenditure on all rural village water supply is around 0.7% of the Government's recurrent budget. Given that the rural/small village schemes are supplying over one quarter of the national population, (the majority of the remainder of the population should not have their recurrent water supply costs subsidised), and that water is a vital service with high political and social priority, this is not an unreasonable burden on the Government's finances. Even

if Government's budgetary situation deteriorates, the programme is financially sustainable given a high continuing priority to the sector.

38. Since the number of unserved settlements which meet village criteria is small, and the increase in the number of settlements which justify piped supplies will be gradual, the capital funding required for new supplies is unlikely to undermine financial sustainability.
39. The recurrent costs of future supplies and rehabilitations should not significantly undermine financial sustainability because the additional funding is likely to represent a limited real increase on the current requirement. Firstly most villages are already supplied and secondly a major part of village O&M costs are relatively fixed.
40. At present government appears able to afford the expensive augmentation programme, but if budgetary constraints were to continue to tighten, there is scope for reducing the cost of the augmentation programme, while still protecting investments.
41. Given the increasingly urban characteristics of major villages, it would be appropriate for financial sustainability to be based on consumers at least paying for all the recurrent costs. However the tariff has remained far below that required to meet this level of cost recovery. Furthermore the subsidy was not clearly targeted and in practice was poorly directed, with better off private connection consumers receiving higher subsidies than poorer standpipe users.
42. The too low tariff has also contributed to the very rapid increase in demand, and is thereby adding to the supply constraints and augmentation requirements. Hence there is a serious need to use pricing as a demand management tool, as well as to increase cost recovery. Restricting demand and increasing revenues will both improve financial sustainability.
43. It is recommended that appropriate water tariffs should be introduced in all villages. In the major villages the tariff should be high enough to recover all recurrent costs, and make a contribution towards future capital costs. It would provide consumers with the correct market signals so that future augmentations are fully justified. A similar tariff should be introduced in the other villages, although here it will fall well short of recovering recurrent costs. However it should assist in ensuring that the subsidies, which should be quantified in advance and not arise by default, are better directed,
44. In the smaller villages demand management should centre on increasing consumer awareness of the importance of water conservation and translating this into careful use. It is therefore recommended that council water and community development staff should jointly organise water conservation campaigns using a participatory approach.
45. Technical sustainability has been promoted by the high level of standardisation and relatively simple designs. However it is largely linked to institutional sustainability and depends upon the councils water departments having the competencies required to maintain the motorised systems. There are an adequate number of increasingly competent staff in the training pipeline, but the key question is whether the councils will be able to retain the necessary professional and technical staff. This is considered to be the greatest risk for sustainability.
46. Programme sustainability is considered probable due to the strong political and beneficiary support and the increasing capacity of the councils for O&M which is fully institutionalised. However it is vital that the conditions of service for the council technical and professional staff remain sufficiently attractive that the main risk, i.e. their departure for other more lucrative employment is minimised. If this were to occur the sustainability of the RVWSP would be seriously at risk. Since the consultants were repeatedly told that despite recent developments, it can still be more attractive to work for central government than to be employed by district councils, it is recommended that the situation should be further examined.

47. Despite various proposals, little has been done to encourage the private sector, especially at the village level. However the involvement of the private sector could promote sustainability of the RVWSP because competition reduces costs and private sector motivations are compatible with sustainability. It is therefore recommended that DWA and councils should consider contracting out any services when private companies or individuals with the relevant competencies exist, especially at the village level, where success would significantly promote sustainability.

4.10 Environmental Sustainability

48. Although it is probable that in many individual villages, the ground water resource will be able to sustain the increasing demands, the ability of the groundwater resource to do so on a wide scale is not known. The data for a sound analysis does not exist. However the RVWSP requirements should not be seen in isolation from the demands of other sectors. Hence it is recommended that a resource oriented approach involving measures to control demand and encourage water conservation and re-use should be adopted, and be used in the design of scheme augmentations. Furthermore the supply of water to villages should become one element of a fully integrated approach to water management.
49. A more flexible site specific approach with respect to source and technology would have been appropriate in the smaller villages where a relatively shallow ground water table existed. It is recommended that, in future, the use of hand pumps should always be considered in those smaller villages where they are technically feasible. In addition to being fitted to "successful" boreholes, they could also be installed at low yielding boreholes and at improved traditional sources.
50. Even in a situation where demands do not exceed availabilities, and where depletion of resources is not an obvious risk, efficient water use is important for environmental sustainability, since the provision of improved supplies will contribute to demand increases. But while the RVWSP has initiated a process of increasing demand for water it has never seriously addressed the issue of water conservation. This has resulted in higher levels of wastage and misuse than was necessary. This was possibly the greatest weakness of the programme. It is therefore recommended that water conservation should be addressed by a package of measures which includes;
- (i) an appropriate tariff policy,
 - (ii) the promotion of the principles and importance of water conservation among policy makers
 - (iii) dissemination of information on water conservation needs and methods to increase awareness among users
 - (iv) the promotion of appropriate technical measures

5. LESSONS LEARNED

The conclusions presented above arise directly from the main text of the report, while this section presents some of the more general lessons arising from the evaluation. The majority are more relevant for Sida's future development assistance programme, than for the Government. The lessons include:

1. A holistic approach must be taken to development programmes, and the needs of operation and maintenance and the responsible institutions must be considered at the initial planning stage. The focus should be on capacity building requirements, and O&M should be covered as part of a wider institutional support rather than as a main focus in itself. As late as 1987, the annual review noted that management at DWA had concentrated on expansion of water supply, and personnel development and planning had been given a low priority. The post 1988 training programme, which has attempted to adopt a holistic approach has been a vital element in increasing the probability of sustainability. Hence wherever SIDA assists in the provision of training, a similar approach should be adopted, with training being based on a medium term needs assessment, and not restricted to fulfilling the immediate requirements.
2. Flexibility should be a key requirement of programme planning and implementation. A weakness of the project in the early years was the "blinkered" pursuit of the blueprint targets. When the project direction was gradually amended the probability of long term success was improved. Had the approach been more flexible, appropriate changes may have been made earlier. With hindsight, the project strategy should have been based on a process approach to planning. Within the framework of the main objectives and the overall budget, policies, strategies, activities and resource allocations should have been adjusted as knowledge was gained from experience. The broad outline plan for the longer term should have been regularly modified on a rolling basis, and shorter term plans finalised just before the relevant period commenced. Inter alia, this may have resulted in institution capacity building in the RVWSP being given priority sooner than it was. This should not be taken as a criticism of the programme since process planning is a relatively recent concept. However the RVWSP experience suggests that such approaches should be endorsed for similar future programmes. Furthermore it has to be recognised that the continuous incorporation of the lessons learned into regularly revised plans places a greater work load on project management than if they were only expected to follow "blueprint" plans.
3. Long term programmes should be based on a comprehensive integrated strategy. In the early years the strategy was to achieve implementation targets through the provision of funding and technical assistance to DWA. While this strategy was modified and became more appropriate over time, cohesion remained limited. Hence in large long term development programmes SIDA should employ a project co-ordinator, with a very limited involvement in the day to day problems, whose job should be to constantly monitor programme direction and strategy.
4. SIDA did little to try to reduce the RVWSP's emphasis on quantitative targets rather than on qualitative aspects. Its own reporting, was based largely on quantitative characteristics. There appears to be a contradiction between the bureaucratic nature of donor agencies and their objectives. It is recommended that SIDA's follow-up and programme monitoring should be widened to become more relevant. For example in reporting on health education, mention should be made of changes in health behaviour, as well as the quantitative parameters such as the numbers of people trained.
5. The regular review of the programme, both annual reviews, evaluations and other studies were extremely valuable and sometimes brought about some important changes in the programme. However they had less effect than one might have hoped for. This was partly due to their terms of reference which were often related more to quantifiable targets. Essentially they tended to concentrate on tactics rather than on strategy. Had a process approach been adopted they would have played a more important role and lead to the programme changing direction sooner. However the most serious omission was that regardless of the approach, there appears to have been no follow mechanism for ensuring that recommendations were implemented or reasons given for subsequently rejecting them.

6. The consideration of sustainability should be given high priority during the planning stage and throughout the implementation of a programme. Until towards the end of the rural water programme very limited thought was given to achieving sustainability. This failure is only partially excused by the fact that sustainability was not usually given explicit consideration at the time, because SIDA has always intended to support programmes which are able to continue after its support is terminated. Furthermore even towards the end of the assistance period, no actions were taken which gave the water hygiene education component a good chance of being sustained. One key factor in the achievement of sustainability of the water supply component was the fact that the programme continued for a long period during which time the issue was given increasing consideration.
7. If the RVWSP had been terminated in the late 1970s, it is unlikely that sustainability would have been achieved. Hence it is suggested that the appropriate time frame for aid programmes may be considerably longer than is normally considered by donors. Programmes either have to be extended, or support ceases before a reasonable level of performance and sustainability have been achieved. Even in a situation where the Government was able to provide considerable financial support, a long term commitment was necessary to achieve long term success.
8. Sustainability, of both the overall programme and of individual components, requires the genuine support of the recipient government. The most important single reason why the water supply component is sustainable while the water hygiene education component was not, is that the former had genuine support at all levels of government for financing and manpower.
9. The extent of donor influence is not an easy issue. The "hands off" approach that SIDA tried to follow meant that the programmes have "slotted" into the Government's national development plans and there has been a high level of co-operation and trust. On the other hand SIDA made no serious attempts to discourage Government from following policies which reduced the probability of programme success, such as ignoring the importance of water conservation. It is also questionable whether SIDA should have contributed to the funding of the very small villages towards the end of the programme due to the lower level of cost effectiveness. It should have encouraged the use of the marginal resources to provide a better service in the villages actually served.
10. Programmes based on a high concentration of aid may be more effective than those based on a more dispersed approach which is usually adopted. Where the resource availability/programme objective ratio is low, the critical point required for sustainability may not be reached.
11. The provision of funds to countries such as Botswana which can afford to provide all the matching finance required and to assume the subsequent recurrent burdens, means that; (i) external funds may be used more effectively than in poorer countries, and (ii) constructed facilities and improved organisations have a better chance of being sustained.
12. Although SIDA has income redistributive and other social aims high in its aid priorities, it should not necessarily give low priority to countries such as Botswana with GDP/capita figures which are apparently too high to justify assistance. In such countries support to social sectors is essential to reduce rural poverty. SIDA assistance has encouraged the Botswana Government to put its own resources into rural social services. While the distribution of incomes in rural Botswana over the last 20 years has not significantly improved, and is still extremely skewed, the provision of subsidised services such as water supply has been one element which has had a positive redistribution of income effect. Not only has the water programme achieved its objectives of targeting the rural poor, but it has also had a continuing redistributive effect inasmuch as it has created a need, which is being, and is likely to continue to be, fulfilled, for a continuing subsidy to rural villages.

13. Methods of financial control which enable SIDA to follow how its funds are being spent should always be established and adhered to. During the latter years of the programme when SIDA RVWSP and DDSS funds were both financing LG 148, it was not possible to reconcile payments with activities and accounting for the funds was a major headache. It was only possible for SIDA to know what the funds had been spent on much later.
14. If the "soft" elements of development programmes, such as hygiene education are to succeed, they must not only be placed in the appropriate institution, but should also be an integral part of the overall programme, preferably from the commencement of the programme. Furthermore the resources and priority given to such components must enable the activities, needed to match the requirements stemming from the overall programme, to be undertaken. The integrated approach is best done through utilising existing structures and personnel, for example health workers, but with an extra education effort in the village during scheme implementation.
15. In providing technical assistance to similar development projects SIDA should promote a multi-disciplinary approach, thereby avoiding the mistake of allowing the engineers to dominate programme direction and strategy. However the RVWSP has shown that a lack of understanding between the different professional disciplines is an obstacle to an integrated approach. Engineers often do not understand the importance of community participation and health education and they view the programme as providing a technical solution for water provision. Even if they have some appreciation of the need for the "soft" elements, they, (and politicians), give them lower priority than tangible activities such as construction. Hence it is important that; (a) engineers and others holding key positions in water development programmes should be sensitised to the importance of an integrated approach, and of the "soft" components, (b) there is improved communication between the different professional disciplines. (c) there should be integrated implementation plans for the integrated project at village level with a scheduled specification of what should be done within every component.
16. When representatives of the people, whether at local or national level, have no financial responsibility and are not accountable for development decisions, they try to promote policies and developments on behalf of their constituents, such as small expensive high technology village supplies, regardless of the financial implications, and appropriateness.

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