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CD/HELVETAS CO-OPERATION IN CAMEROON  
1964 - 1989

INTERNATIONAL REFERENCE CENTER  
COMMUNITY WATER SUPPLY AND  
SANITATION PROGRAM

EVALUATION OF  
WATER SUPPLY SYSTEMS,  
CONSTRUCTED FROM 1964 TO 1989

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Water intake NKAR: WS system constructed 1969-77;  
Project well maintained by population (gen.rating 2; ref.no. 55).

824-CM-7046

Comments in this report represent the personal opinion of the author and do not necessarily coincide with the opinion of the International Reference Center for Community Water Supply and Sanitation (Geneva, Switzerland, 1969-89).

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Yaoundé, 3/6/89 by OG



NSEH water treatment station: Constructed 1977-87; gen.rating 2; ref.no. 61.  
Rapid sand filter (front), 3 slow sand filters and project store room.



## 1. GENERAL

### 1.1. Definitions

A CD/HELVETAS water supply system (= WS) may consist of all or some of the following parts:

- Catchment(s) to collect water from spring(s), stream(s) or a river.
- Collection chamber(s) usually after spring catchments.
- Sedimentation tank(s) to prevent sediments (sand, soil etc.) from entering the system: always after stream or river catchments and after spring catchments, if necessary.
- Filter station: **Slow sand filters** and **rapid sand filter** to purify water from rivers or streams (bacteriological treatment process, working without chemicals).
- Storage tank(s) to store sufficient water especially in the nights for the consumption during peak hours.
- Pipelines from catchment to storage tank and from there to the supply points (usually within a village). In older systems mainly asbestos pipes were laid which have been replaced later on by plastic pipes (PVC). The more expensive galvanized steel pipes are used for "open installations" (storage tanks, outlets or part of supply lines above ground).
- Interruption chamber(s) for reducing high water pressure in pipelines to acceptable levels.
- Control chambers usually at pipeline branches and distribution points.
- Outlets:
  - Standpipes (= sp); 1 tap = single sp; 2 taps = double sp);
  - Washplaces (= wp) with basin in masonry work;
  - Fountains (=ft) with 4 taps;
  - Shower houses (no more built since some years);
  - Private connections to private houses or private compounds like missions, hospitals, Chief's quarter etc;
- Drainages or soakage pits to avoid "water pools" around public outlets.
- Various pipe fittings like valves, couplings, taps etc.

Around 90 % of all completed CD/HELVETAS water supply systems in Cameroon are pure gravity systems: water is flowing by gravity from catchments to distribution points.

At around 10 % of the systems, water is pumped from catchment(s) into storage tank(s). After the storage tank water is flowing by gravity to the outlets. The following pumping devices were installed:

- Diesel pumps (pump driven by diesel engine);
- Electric pumps (pump driven by electric motor);
- Turbines (driven by water from a river);
- Hydrams (driven by excess water of spring or stream catchment).





For practical reasons we divided the projects into two groups:

- Small water supply systems with maximum 10 public outlets (sp, wp, ft).  
Such projects have in this report reference numbers from 100 to 130 (see lists or computer print-outs).
- Medium and large water supply systems with over 10 public outlets, including all systems with filter stations.  
These projects have reference numbers from 1 to 81.

A few villages have instead of one WS two or more smaller systems or several waterpoints. Only one questionnaire was filled for the following projects:

- OSHUM, ref.no. 36 (3 independant systems);
- ACHA-TUGI HOSPITAL, ref.no. 38 (2 systems);
- WIDIKUM-DICHE, ref.no. 37.

For the other villages with several independant systems we received for each water supply or water point a separate questionnaire, eg.

- MMEN NEW TOWN & MMEN OLD TOWN, ref.nos. 116 & 117 (MMEN has in addition also several waterpoints);
- AKUM (-NSOH, -MUCHO etc.), ref.nos. 45, 46, 109, 111 & 112.

## 1.2. Number of projects

From 1964 till 1988, CD/HELVETAS constructed and completed together with the villages concerned

- 110 water supply systems within the 3 provinces North West (NW), South West (SW) and West (W) (reconstructions not included!) and
- 4 water supply systems in other provinces.

A detailed list is given in section 1.6.

All 110 projects within NW, SW and W were visited during 1988/89 either by CD technicians/engineers and/or by a HELVETAS engineer. For the project in ALME (Adamoua province, ref.no. 130) the questionnaire was filled in by the priest of the local mission. Information on the present state of 111 Ws out of the total number of 114 projects is therefore included in this evaluation.

In the statistical review compiled in 1981 (20 YEARS CO-OPERATION) 11 additional projects were listed under water supply systems. Reasons for not including them here are:

- 8 were considered as waterpoints:
  - KOMBONE HEALTH CENTRE (SW; WP ref.no. 9),
  - EKONDO TITI (SW; WP ref.no. 23),
  - NJIFOR (NW; WP ref.no. 117),
  - WOWO (NW; 4 WPs with ref.nos. 126-129),



BABA 1	(NW; WP ref.no. 50),
BAMESSING	(NW; WP ref.no. 54),
BAMUNKA	(NW; WP ref.no. 56),
FOUTOUM	(W; WP ref.no. 144).

- EKONA WS (SW, Fako Division) was built before 1964 (probably with little assistance from HELVETAS).
- BAFUT MFONTA WS (NW, Mezam Division) was only partly constructed with the assistance of CD/HELVETAS.
- BOME WS (NW, Momo Division) is not yet completed (already under construction in 1980!).

### 1.3. Projects not included in evaluation

From 1978 to 1983, HELVETAS engineers were also working within the newly created CD construction services Yaoundé and Ebolowa (Central/South provinces). During the same period a few WS projects were started in the Littoral province with the assistance of the HELVETAS engineer for South West. We were unable to visit these projects, mainly because of time limits. Below the project names with a few remarks:

NDANKO WS (CE, Mefou): Completed in 1975; overhauled in 78/79; system with pumps and 3 standpipes was serving around 500 people; no information about present state of system (till 1983 often not working).

ONDONG AJAP WS (SU, Ntem): Constructed from 1978-83; system with pump and 6 standpipes serving around 1000 people; regular problems with diesel pump; not working in 1988.

NGUET WS (SU, Ntem): Constructed 1982/83; extension started 83; small gravity system; no information about state of system in 88.

The following projects were only started with the assistance of HELVETAS and later on handed over to CD and engineers of German Volunteer Service (ded):

- NKONG MITOM (SU, Océan),
- MEYO ELIE (SU, Ntem),
- MA'AMEZAM (SU, Ntem),
- BOMONO GARE (LT, Moungo),
- MBOUROUKOU (LT, Moungo).

Three of them have now SCANWATER systems (MEYO ELIE, BOMONO GARE and MBOUROUKOU), one is not working (MA'AMEZAM) and about the fifth (NKONG MITOM) we have no information.



#### 1.4. Location of projects with respect to provinces

A little more than 50% of all WSs built by CD/HELVETAS are within the NW province. The average number of people benefitting from a project is the same for NW and SW province and for W province even less (see below!).

We also compared the number of completed projects with the number of service years of HELVETAS engineers within the NW and SW provinces:

NW = around 47 service years and 59 WS projects;  
 SW = around 51 service years and 37 WS projects.

Out of these figures we might conclude that the working conditions within NW province have been more favourable towards efficiency of HELVETAS engineers than within the SW province. Similar observations are made by comparing number and size of other village projects like waterpoints, roads or bridges.



#### **Location of WSs according to provinces**

#### 1.5. Benefitting population

All CD/HELVETAS WS systems still in use are serving a total population of around 350'000 people in rural areas. Figures received for 103 projects are ranging from around 500 beneficiaries for small WSs upto 16'000 for large WSs.

Average benefitting population per project are approximately:

- NW province = 3'500 (52 projects, 184'000 people);
- SW province = 3'500 (36 projects, 126'000 people);
- W province = 2'900 (15 projects, 43'000 people);
- overall = 3'400

Details are given in the list under section 1.6. Exact figures are not available since no census was carried out for many years. The numbers are therefore only estimates which varied a lot according to persons involved in filling in the questionnaires.



### 1.6. List of projects and its characteristics

The projects are arranged according to Provinces and Divisions. Within a Division they are listed in alphabetical order.

Name	Location	Ref. No.	Popul. 1988	Constr. period	Add. work	Water source	System	Pipe km	P.outl. Sp-Wp-Ft	Gen. rating
<b>North West Province</b>										
<b><u>Bui:</u></b>										
DJOTTIM	Kumbo	57	8000	1966-67	rep/ext	river	gr-sed/fil	5,8	10-3-0	3
DZENG	Kumbo	58	2000	1982-87		spring	gr	4,3	14-0-0	2
LASSIN	Kumbo	59	2500	1982-87		spr 4	gr-sed	9,3	14-0-0	2
MBABU	Kumbo	120	500	1971-72		spr 2	gr-sed	1,3	4-0	3
NGONDZEN	Kumbo	60	3000	1971-72	ext	stream	gr-sed/fil	3	8-8-1	3
NKAR	Jakiri	55	4000	1969-77	ext	stream	gr-sed/fil	7,7	55-25-0	2
NSEH	Kumbo	61	5000	1977-87		stream	gr-sed/fil	19,4	30-1-3	2
OKU (ELAK)	Jakiri	118	500	1969-73		spring	gr	,3	0-4	1
SHISHONG HOSPITAL	Kumbo	62	hp+400	1975-77	rep	spr 3	gr-sed	2,5	6-4-0	2
SOB AREA	Jakiri	56	6000	1975-87		spr 2	gr-sed	6	33-0-0	3
TADU	Kumbo	63	3000	1972-77	ext	spr 4	gr-sed	2,7	9-3-0	3
TATUM	Kumbo	64	5000	1975-82	ext	spring	ep-sed	8,6	21-13-2	2
VEKOVI KISENJAM	Jakiri	119	800	1971		spring	gr	,5	3-0-1	2
WAINAMA	Kumbo	65	2000	1973-76		spr 2	gr-sed	4,3	7-4-1	2
<b><u>Donga Mantung:</u></b>										
BINKA	Nkambe	66	5000	1976-79	ext	spr 4	gr	6,2	10-8-2	3
BINSHUA	Nkambe	67	3000	1981-88		spr/str	gr-sed	12,2	17-0-1	1
JIRT	Nkambe	68	2700	1971-79	rep	spr 2	gr	3,8	12-9-1	3
LOWER MBOT	Nkambe	69	3000	1973-79	rep/ext	spr 6	gr	3,1	9-6-2	2
MBAH	Nkambe	121	1000	1976-79	rep	spring	gr	3,1	5-4	2
MBAHFUH	Nkambe	70	900	1979-88		spring	gr-sed	4	15-0-0	2
MBIPGO	Nkambe	71	2000	1969-72	rep/ext	spring	gr-sed	5,1	15-10-1	2
NDU	Nkambe	72	3500	1967-70	rep	stream	dp-sed/fil	4,1	13-6-0	3
NTUMBAN	Nkambe	73	7500	1980-83	ext	spr 5	gr-sed	12,8	25-0-1	3
SEHN	Nkambe	122	1500	1976-78	rep/ext	spr 3	gr-sed	2,5	4-3	3
TABENKEN / MULLAH	Nkambe	74	3000	1979-88		spr 3	gr-sed	15,5	32-0-0	3
<b><u>Menchum:</u></b>										
BELO / NJINIKIJEM	Fundong	52	10000	1971-80	ext	stream	gr-sed/fil	20	46-15-0	3
ESSU	Wum	53	12000	1979-83	ext/rep	str 2	gr-sed	16,1	40-10-1	2
MNEM (BAFHENG) NEW TOWN	Wum	116	4000	1977-84		spring	hyd-sed	1,2	2-2	3
MNEM (BAFHENG) OLD TOWN	Wum	117	4000	1977-84		spring	hyd-sed	,9	2-2	3
NJINIKOM RCH HOSPITAL	Fundong	115	800	1975-77		spr 3	gr	5,2	2-0	1
WEH	Wum	54	11000	1976-78	ext	spr 2	gr & hyd	14,7	73-10-2	2
<b><u>Mezam:</u></b>										
AKUM (DISPENSARY)	Santa	45	hc+500	1970-71	rep	river	gr-sed/fil	,7	3-0-0	4
AKUM CENTRAL	Bamenda	109	1500	1985-88		spr 2	gr	2,4	9-0	1
AKUM KAPCHO	Santa	46	2000	1976-78	ext	spring	gr	3,8	11-0-1	3
AKUM MUCHO	Santa	111	800	1976-78	ext	spring	gr	1,4	1-3	2
AKUM NSOH	Santa	112	1000	1984-87		spring	gr-sed	3,3	8-0	3
AMING	Santa	47	8000	1984-88		spr 3	gr	12,4	26-0-2	2
BABUNGO	Ndop	43	5000	1982-86	ext	spr 4	gr	11,9	31-6-4	3
BAFUT MAMBU (HEALTH-C.)	Tuba	113	2500	1981-82	rep	spr 3	ep & hyd	2,8	2-0	3
BAFUT MANKAHA - NSANI	Tuba	48	3000	1974-78	ext	spr 4	gr	9,7	21-7-2	2
BALIKUMBAT (HEALTH-C.)	Ndop	110	nil	1965	rep	spring	gr-sed	,3	0-2	5
BAMBILI	Tuba	49	3500	1982-87		spring	gr-sed	11,5	16-0-0	3
IRZ BAMBUI	Tuba	50	centre	1982-87	ext	stream	gr	8,4	2-1-0	3
MANKOM IRZ	Tuba	51	centre	1980-83		stream	ep-sed/fil	6,7	0-0-0	4
MUNDUM HEALTH CENTRE	Tuba	114	200	1979-83		spring	gr-sed	,7	1-1	2
NDOP	Ndop	44	hp+250	1976-78	ext	stream	gr-sed/fil	4,3	8-0-0	3

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Name	Location	Ref. No.	Popul. 1988	Constr. period	Add. work	Water source	System	Pipe km	P.outl. Sp-Wp-Ft	Gen. rating	
<b>North West Pr. (cont.):</b>		<b>Momo:</b>									
ACHA-TUGI HOSPITAL	Mbengwi	38	hp+1200	1966-68	rep/ext	spr/str	gr-sed (2)	2,9	4-0-0	3	
AMBO	Batibo	30	2000	1978-85	rep	spr 2	gr	10,0	25-11-1	3	
ASHONG	Batibo	31	5000	1981-87	ext	spr 4	gr-sed	19	19-13-5	2	
BIFANG	Batibo	32	1500	1972-77	rep	spr/str	gr-sed/fil	4,3	6-5-0	3	
GUZANG	Batibo	33	3500	1968-70	rep/ext	stream	gr-sed/fil	13	22-31-3	3	
GUZANG - AWOM	Batibo	34	3000	1975-80	rep/ext	stream	gr-sed/fil	8,8	14-10-1	3	
KAI	Mbengwi	39	1600	1974-78	rep/ext	spr/str	gr-sed/fil	3,9	12-5-1	2	
KUGNE-EFAH	Batibo	35	1500	1983-87		spr 3	gr	7,7	9-7-0	2	
NYEN - MBEMI	Mbengwi	40	6000	1977-80	rep/ext	spr 5	gr	8,3	20-10-2	2	
OSHIE	Mbengwi	41	6000	1978-83	rep/ext	spr 10	gr-sed	18,3	45-11-1	3	
OSHUM	Batibo	36	1300	1978-83	rep	spr 3	gr (1)	2,7	8-5-0	2	
TEZE	Mbengwi	42	4000	1980-88		spr 2	gr	5,8	12-7-2	2	
MIDIKUM-DICHE	Batibo	37	4000	1984-87	rec	spr/str	gr-sed (3)	7,6	10-12-3	3	
<b>South West Province:</b>		<b>Fako:</b>									
BATOKE	Limbe	4	1800	1966-67	rep/ext	stream	gr-sed	1,2	13-1-0	4	
BOLIFAMBA	Buea	1	3500	1979-88		spring	gr	1,4	14-2-0	3	
BOMADIKOMBO	Limbe	5	4500	1973-81	rep/ext	spring	gr	5,9	10-8-0	3	
BULU BLIND CENTRE	Buea	101	nil	1969-70	rep	spring	hyd	,8	2-1	5	
MUEA	Buea	2	5000	1967-69	rep/ext	spring	gr-sed	2,5	14-3-0	4	
MUTENGENE	Tiko	6	16000	1971-78	ext	spring	gr-sed	9,7	47-6-0	3	
MOTUTU	Buea	3	900	1969-70		spring	gr	1,6	8-3-0	4	
		<b>Manyu:</b>									
AKWAYA	Akwaya	19	2000	1972-74	rep/ext	stream	gr-sed/fil	4,7	7-3-0	3	
BACHUO - NTAI	Manfe	25	3000	1968-69	rec/ext	str 2	gr-sed	4,5	11-3-0	3	
BACHUO AKAGBE	Manfe	26	2000	1968	rec/ext	stream	gr-sed	5	8-3-1	3	
BADI RIVER (T-D-N-N)	Eyumbojock	20	12000	1971-80	rep/ext	river	tb-sed/fil	15,6	25-20-2	3	
BAKEBE	Manfe	108	1000	1981-83	rep	stream	gr-sed	2,6	6-3	3	
BESONG-ABANG-NCHANG	Manfe	27	7000	1969-74	rep/ext	river	tb-sed/fil	7,5	21-10-0	5	
EWOGAF	Eyumbojock	21	5000	1981-84	ext	spring	gr-sed	14,3	15-7-2	2	
FONTEN	Fonten	24	6000	1973-83	rep	stream	gr-sed/fil	13,2	29-0-1	4	
KEMBONG	Eyumbojock	22	10000	1965-67	rec/ext	spring	gr-sed	6,3	13-4-2	3	
MBAKANG	Eyumbojock	107	1000	1974-79		spring	dp-sed	4,2	4-0	3	
MBINJONG/NFAINCHANG	Manfe	28	1000	1983-87		stream	gr	8,8	10-0-1	1	
NFUNI	Eyumbojock	23	2000	1981-84		spring	gr-sed	16,7	10-5-1	3	
TINTO MBANG	Manfe	29	5000	1972-81		spring	gr-sed	12	16-16-2	3	
		<b>Mene:</b>									
BAI BIKOM	Kumba	102	2000	1978-79		spring	gr-sed	1,3	6-1	3	
BANGEM	Bangem	7	6000	1975-87		spring	gr	12,6	28-1-0	3	
BASSENG	Tombel	12	600	1977-81		spring	gr-sed	4,9	7-2-0	1	
BEKOMDO	Kumba	8	6000	1981-88		stream	gr-sed	7,6	24-3-0	2	
EKOMBE THREE CORNERS	Kumba	9	2500	1980-84		spring	gr-sed	4,3	15-5-0	1	
KURUME	Kumba	103	1200	1965-66	ext/rep	stream	gr-sed	1,0	9-0	1	
MBAKWA SUPE	Kumba	10	3000	1980-85		stream	gr-sed	2,7	7-2-0	1	
MBETTA MISSION/MATERNITY	Nguti	104	500	1981-82	rep	spring	gr	,5	2-0	1	
MBULE	Tombel	105	500	1965-66	rep	spring	gr-sed	,7	5-2	4	
MELONGO	Tombel	106	700	1978-80	rep	stream	gr-sed	1,4	2-2	2	
MPAKO	Tombel	13	2000	1966-69	rep	stream	gr-sed	9,2	14-10-0	2	
MUAKU	Nguti	11	1100	1984-87		spring	gr-sed	3,2	10-3-0	2	
MUAMBONG-NGOMBOKU	Tombel	14	1500	1969-74	ext	spring	gr	11,6	7-10-0	4	
NDOM / KACK	Tombel	15	2600	1977-81		spring	gr-sed	4,4	20-6-0	3	
NGUSI - ATOB	Tombel	16	2200	1968-73	rep	spring	gr-sed	4,2	8-6-0	3	
NYANDONG	Tombel	17	2500	1981-86		stream	gr-sed	2,6	10-3-1	1	
NYASSOSO	Tombel	18	2000	1986-87	rec	stream	gr-sed	3,3	11-1-0	1	

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Name	Location	Ref. No.	Popul. 1988	Constr. period	Add. work	Water source	System	Pipe km	P.outl. Sp-Wp-Ft	Gen. rating
<b>West Province:</b>										
<b>Bamboutos:</b>										
BAMELO-POUOT (BABADJOU)	Mbouda	127	1500	1983-87		spring	gr	3,5	9-0	2
BANGANG	Batcham	75	10000	1978-86		str 2	gr-sed	15,4	24-14-4	3
GALIM IRRIGATION SYSTEM	Galim	126	350	1974-77		stream	gr-sed	1,5	0-0-1	2
<b>Haut Mkam:</b>										
FAMDOU MANILA	Bafang	76	4500	1979-81	ext	spring	gr-sed	3,6	16-0-0	2
FAMKEU	Bafang	124	600	1982-85		spr 4	gr	3,1	5-0	2
FOTOUNI	Bafang	77	3000	1982-85		spr 3	gr-sed	2,8	10-0-1	1
<b>Menoua:</b>										
BANGCHANG HEALTH CENTRE	Penka Michel	128	hc+400	1987-88		well	dp	,9	2-0	2
FOMBAP	Santchou	78	3000	1984-88		spr 4	gr	7	8-7-0	2
FONDOMERA	Santchou	129	500	1984-87		spring	gr	1,2	5-0	2
<b>Mifi:</b>										
BAYANGAN	Bangou	125	1600	1980-82	ext	spring	gr	2,1	3-0	3
<b>Nde:</b>										
BANTOUM 1	Bangangte	123	1500	1976-80	rep/ext	well	dp	2,7	6-1	3
<b>Noun:</b>										
BAIGOM	Foumbot	79	11000	1977-85		spring	gr-sed	13,4	25-12-2	3
NKEUTLIEUM	Foumbot	80	2300	1982-87		spr 3	gr	4,2	11-1-0	1
NKOUANDJA	Foumbot	81	1600	1984-88		spr 3	gr	7,4	18-1-0	1
<b>Adamaoua Province:</b>										
ALME	Faro et Deo	130	1200	1984-85		spring	gr	4,6	4-0	1

**TOTAL approxim.: population 350'000**

**pipeline 700 km / 1500 standpipes  
500 washplaces  
60 fountains**

**Explanations:**

Ref. No.	For further details see corresponding project No. (computer print-out).
Popul. 1988	Number of people benefitting from water supply in 1988; figures not reliable. hp = hospital / hc = health centre.
Add. work	rep = once or more major repairs/overhaul(s) carried out by CD/HELVETAS. rec = reconstructed (original project no longer existing). ext = original system once or more extended.
Water source	spr 3 = number of springs supplying water to system. str = stream
System	gr = gravity dp = diesel pump(s) / ep = electric pump(s) / hyd = hydram(s) / tb = turbine sed = with sedimentation tank(s) / fil = with filter station(s) (1) = 3 independant systems for OSHUM water supply. (2) = 2 systems; filterstation and pumps only for water from stream. (3) = 2 independant systems for WIDIKUM-DICHE water supply.
P. outlets	Number of public outlets; Sp = standpipes / Wp = washplaces / Ft = fountains.
Gen. rating	"general rating" = overall state of project in 1988 (5 categories). See section 5.10.

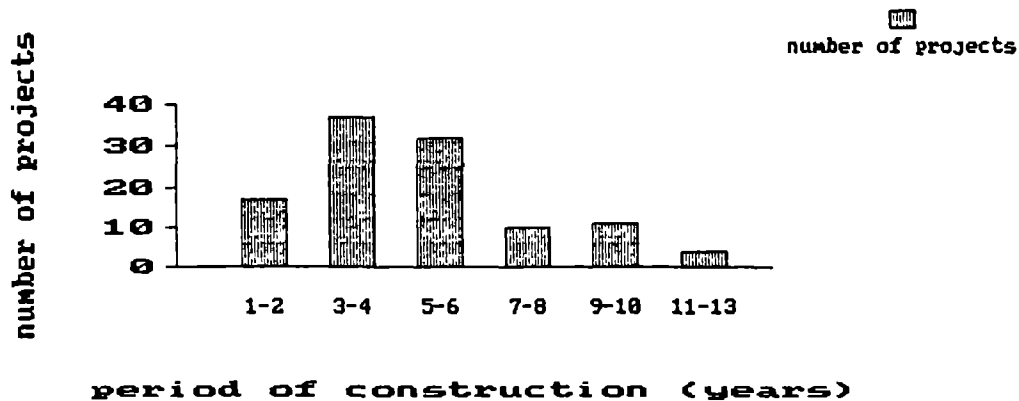


## 2. CONSTRUCTION DETAILS

### 2.1. Average period of construction

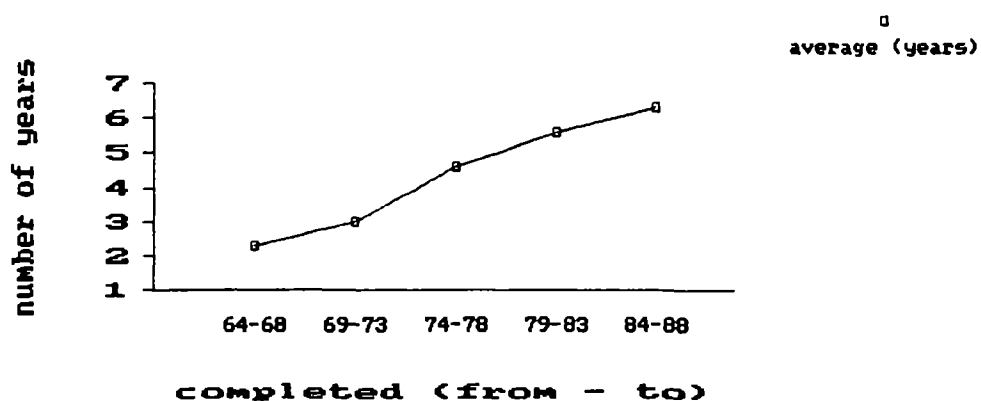
The average period of construction for the 111 CD/HELVETAS WS systems completed from 1964 till 1988 was around five years.

- 17 projects took 1-2 years to complete;
- 37 projects took 3-4 years to complete;
- 32 projects took 5-6 years to complete;
- 25 projects took over 6 years to complete (maximum 13 years).



The average time for completing WS systems increased steadily during the 25 years CD/HELVETAS co-operation as shown below:

- 1964-68 average 2.3 years ( 8 projects);
- 1969-73 average 3 years (14 projects);
- 1974-78 average 4.6 years (18 projects);
- 1979-83 average 5.6 years (30 projects);
- 1984-88 average 6.3 years (41 projects).



If the worksite is well organised, funds and material available and the villagers ready to bring in their share in time, a medium sized WS system could be completed within 3 years. For more than half of the projects, the construction takes much longer than planned.



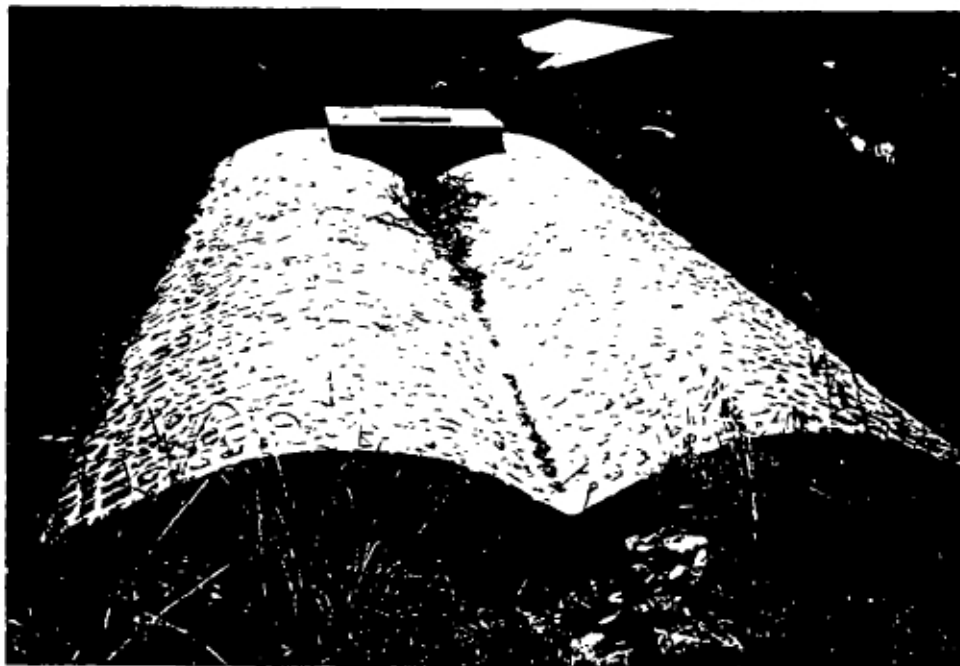
Main reasons for long construction periods are:

- Projects started without sound financial basis.
- Promised contributions from villagers and Government not forthcoming as planned.
- Too many projects under construction (leading to strong splitting of project grants from Government and to insufficient supervision by CD staff). See under section 2.2.
- Projects started without proper studies, plans and cost-estimates (an increasing problem!).

As a result of long construction periods, the total project cost are seldom within the original estimate. Fifty and more percent higher project cost than estimated are common. This means usually further delays till additional funds are available. It's also obvious that a long construction period has a negative impact on the level of village participation and motivation towards the "never completed project":

Solutions to tackle these problems are known and regularly proposed for over 15 years:

- Carefull project studies with detailed cost estimates.
- At least half, better 70 to 100% of the village contributions in cash should be available before construction starts.
- Other financial contributions should be secured.
- Less projects at the same time.



NSEH storage tank (100m<sup>3</sup>)

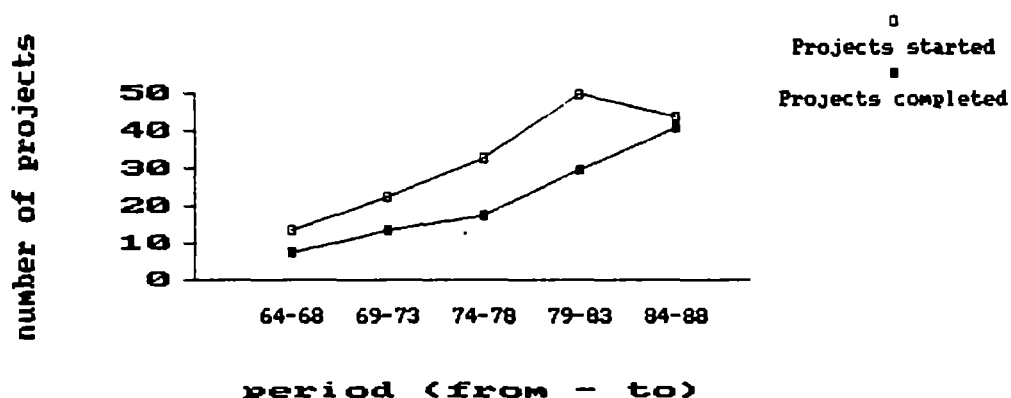




## 2.2. Number of projects started and completed

We counted the number of projects started and completed within 5-year periods and got the following figures:

- 1964-68: 14 projects started and 8 completed;
- 1969-73: 23 projects started and 14 completed;
- 1974-78: 33 projects started and 18 completed;
- 1979-83: 50 projects started and 30 completed;
- 1984-88: 44 projects started and 41 completed.



Considering the average time it takes to complete a WS system, the number of started and completed projects should be the same after an initial period of around 5 years (after 1968). Instead of this, increasingly more projects were started than completed.

The trend changed after 1985 because of a simple reason: Since 1986, HELVETAS gave (with few exceptions) only financial grants to complete and no longer to start WS projects!

## 2.3. Extensions, overhauls and reconstructions

Out of 111 water supply projects constructed and completed from 1964 to 1988,

- 42 systems were extended;
- 40 systems were once or several times repaired, overhauled or reconstructed with the assistance of CD/HELVETAS.

Compared with the age of the projects, our interventions are in percentage of the total number of WS systems completed as follow:

- After 10 years = 60% overhauled/repaired and 60% extended;
- After 20 years = 100% overhauled/repaired/reconstructed and 75% extended.

Implications: For projects which were completed between 15 to 20 years ago, CD/HELVETAS invested more on human resources and finances for repairs/overhauls/reconstructions and extensions



25-WS/15. Juni 1989

than for their original construction. Village contributions in percentage of the expences for such interventions were remarkably lower than contributions to initial construction cost (see "HISTORY OF WS PROJECTS, CONSTRUCTED FROM 1964 TO 1970!").

With the number of projects completed within the past 10 years (71 projects or over 60% of all CD/HELVETAS WS systems) we can foresee that the CD will soon no longer be able to cope with such work if the present policy is maintained. This means that either

- much more personnel and financial resources (mainly foreign aid) will be necessary to keep the earlier completed WS systems in running condition or
- more and more projects will break down or
- the villagers have to look themselves after their WS systems.

#### 2.4. Water sources

Out of the 111 WS systems included in this evaluation,

- 73 (66%) have one or several spring catchments;
- 31 (28%) have stream or river catchments;
- 5 (4%) have combined stream and spring catchments;
- 2 (2%) have a ground water well.

#### 2.5. Water transport

97 or nearly 90% of all projects are pure gravity systems. 14 WS systems have the following pumping devices to bring the water into the storage tanks:

- 4 with hydrams;
- 1 with hydram and electric pump;
- 4 with diesel pumps;
- 1 with diesel and electric pumps;
- 2 with electric pumps;
- 2 with water driven turbines.

#### 2.6. Water treatment

- 18 (16%) of the 111 WS projects have sedimentation tanks and sand filters (16 with slow sand filters, 1 with a rapid and slow sand filter and one with only a rapid sand filter).
- 53 (48%) have only sedimentation tanks;
- 40 (36%) have no treatment facilities (2 with wells, 36 with spring catchments and 2 with stream catchments).



## 2.7. Storage tanks

105 WS systems have storage tanks for the total capacity of around 7'000 m<sup>3</sup> (average 65 m<sup>3</sup>, ranging from 6 to over 200 m<sup>3</sup>).

6 projects have no storage tanks (always sufficient water or only sedimentation tanks which are also serving as storage tanks).

## 2.8. Pipelines

Approximately 700 km of pipes were used for the distribution systems of the 111 completed CD/HELVETAS WSs.

- 21 systems have below 2 km pipelines;
- 41 systems have between 2 - 5 km pipelines;
- 26 systems have between 5 - 10 km pipelines;
- 14 systems have between 10 - 15 km pipelines;
- 9 systems have between 15 - 20 km pipelines.

During the first 15 years, mainly asbesto pipes and galvanized steel pipes were laid. Afterwards plastic pipes (PVC) were used instead of asbesto pipes.

In 1988, around 200 km asbesto pipelines were still in use.

## 2.9. Outlets

For all 111 WS systems we counted around

- 1'500 standpipes (with one or 2 taps each);
- 60 fountains (standpipes with 4 taps);
- 500 washplaces;
- 40 showerhouses;
- 1'200 connections to private houses or compounds.

For the 99 village WS systems we calculated an average of approximately 170 persons/public outlet (standpipes, washplaces and fountains).

There is a difference between the number of average persons/outlet for small, medium & large WS systems:

- small systems (upto 9 public outlets, 24 projects)  
= average 221 people/outlet;
- medium/large systems (10 and more public outlets, 73 projects)  
= average 169 people/outlet.

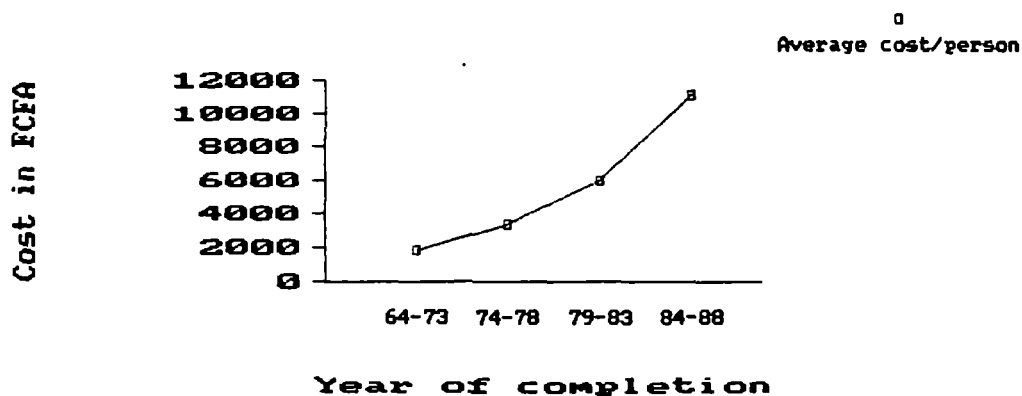


### 3. FINANCIAL INFORMATION

#### 3.1. Average cost according to project reports

Average cost per person for a WS system increased during the 25 years of CD/HELVETAS co-operation as follow:

- 1964-73: approximately 1'800 FCFA/person;
- 1974-78: approximately 3'400 FCFA/person;
- 1979-83: approximately 6'000 FCFA/person;
- 1984-88: approximately 11'100 FCFA/person.



The average cost in FCFA to complete a CD/HELVETAS WS system were during the first 10 years (1964-73) over 6 times lower than during the past five years (1984-88). Three main reasons can be attributed to this cost development:

- Inflation (higher cost of living),
- longer average construction periods and
- higher population figures for older projects in 1988 compared with the number of benefitting people at the time the WSs were completed.

However, project cost shown in our financial reports do not represent the actual expences for CD/HELVETAS WS systems. We have enormous "hidden cost" which are not booked under individual project accounts. The 20 to 25% "supervision" included in our usual calculations are not even sufficient to cover transport expences of CD and HELVETAS staff, visiting the projects during the whole construction period. Further below we'll give some indications about actual project cost (see 3.4.).

Details about accounted cost of each project, village and Government contributions as well as foreign aid are given in the following list. "Supervision" is always 23% of the total cost (average of "CD/HELVETAS kind contributions" mentioned in project reports and cost estimates).





### 3.2. List of projects with financial information

The projects are arranged according to Provinces. Within a Province they are listed in alphabetical order.

Name	Ref. No.	Popul. 1988	Contr. Village		Contr. Cameroon		Foreign aid FCFA	Supervision FCFA	TOTAL cost FCFA
			FCFA	%	FCFA	%			
<u>South-West Province:</u>									
AKWAYA	19	2.000	500.000	5	2.459.000	25	4.732.000	2.307.300	9.998.300
BACHUO - NTAI	25	3.000	879.000	53	200.000	12	202.000	384.300	1.665.300
BACHUO AKAGBE	26	2.000	1.040.000	44	500.000	21	260.000	540.000	2.340.000
BADI RIVER (T-O-M-N)	20	12.000	10.500.000	13	7.891.000	10	41.880.000	18.081.300	78.352.300
BAI BIKOM	102	2.000	800.000	17	850.000	19	1.878.000	1.058.400	4.586.400
BAKEBE	108	1.000	3.850.000	28	0	0	6.900.000	3.225.000	13.975.000
BANGEM	7	6.000	6.005.000	16	5.260.000	14	17.373.000	8.591.400	37.229.400
BASSENG	12	600	1.710.000	21	1.180.000	15	3.245.000	1.840.500	7.975.500
BATOKE	4	1.800	490.000	29	721.000	42	94.000	391.500	1.696.500
BEKONDO	8	6.000	9.950.000	17	4.950.000	8	30.739.000	13.691.700	59.330.700
BESONG - ABANG - NCHANG	27	7.000	2.737.000	14	5.175.000	27	7.105.000	4.505.100	19.522.100
BOLIFAMBA	1	3.500	1.412.000	7	5.404.000	27	8.795.000	4.683.300	20.294.300
BONADIKOMBO	5	4.500	1.747.000	8	6.669.000	31	8.384.000	5.040.000	21.840.000
BULU BLIND CENTRE	101	nil			0	0	2.452.000	735.600	3.187.600
EKOMBE THREE CORNERS	9	2.500	4.654.000	15	3.650.000	12	15.822.000	7.237.800	31.363.800
EWOGAF	21	5.000	12.580.000	20	11.700.000	19	23.184.000	14.239.200	61.703.200
FONTEM	24	6.000	4.833.000	13	8.880.000	23	15.530.000	8.772.900	38.015.900
KEMBONG	22	10.000	1.500.000	18	1.435.000	17	3.500.000	1.930.500	8.365.500
KURUME	103	1.200	1.257.000	16	1.425.000	18	3.294.000	1.792.800	7.768.800
MBAKANG	107	1.000	4.500.000	23	650.000	3	9.950.000	4.530.000	19.630.000
MBAKWA SUPE	10	3.000	3.055.000	11	1.739.000	7	15.648.000	6.132.600	26.574.600
MBETTA MISS./HEALTH-C.	104	500	not known		0	0	(2.720.000)		not known
MBINJONG / NFAINCHANG	28	1.000	5.770.000	17	6.500.000	19	13.784.000	7.816.200	33.870.200
MBULE	105	500	296.000	29	480.000	48	0	232.800	1.008.800
MELONGO	106	700	928.000	16	500.000	9	2.901.000	1.298.700	5.627.700
MFUNI	23	2.000	10.900.000	19	5.600.000	10	26.875.000	13.012.500	56.387.500
MPAKO	13	2.000	2.080.000	42	1.179.000	24	516.000	1.132.500	4.907.500
MUAKU	11	1.100	4.700.000	18	0	0	15.834.000	6.160.200	26.694.200
MUAMBONG-KGOMBOKU	14	1.500	1.617.000	14	1.000.000	9	6.345.000	2.688.600	11.650.600
MUEA	2	5.000	563.000	18	1.500.000	48	327.000	717.000	3.107.000
MUTENGENE	6	16.000	4.233.000	19	6.600.000	29	6.494.000	5.198.100	22.525.100
NDOM / KACK	15	2.600	2.315.000	10	3.153.000	14	11.689.000	5.147.100	22.304.100
NGUSI - ATOB	16	2.200	1.149.000	26	2.000.000	45	304.000	1.035.900	4.488.900
NYANDONG	17	2.500	6.949.000	17	4.500.000	11	20.696.000	9.643.500	41.788.500
NYASSOSO	18	2.000	2.000.000	7	0	0	21.000.000	6.900.000	29.900.000
TINTO MBANG	29	5.000	14.168.000	25	4.907.000	9	25.242.000	13.295.100	57.612.100
WOTUTU	3	900	711.000	24	1.200.000	41	339.000	675.000	2.925.000
<i>Total (SW):</i>		126.000	132 Mio (16½%)		110 Mio (14%)		373 Mio	185 Mio	800 Mio
<u>North-West Province:</u>									
ACHA-TUGI HOSPITAL	38	hospital					hospital		not known
AKUM (DISPENSARY)	45	unknown	200.000	8	0	0	1.800.000	600.000	2.600.000
AKUM CENTRAL	109	1.500	6.190.000	40	5.168.000	33	675.000	3.609.900	15.642.900
AKUM KAPCHO	46	2.000	1.050.000	21	1.110.000	22	1.689.000	1.154.700	5.003.700
AKUM MUCHO	111	800	456.000	33	354.000	26	251.000	318.300	1.379.300
AKUM NSOH	112	1.000	2.500.000	24	3.500.000	33	2.100.000	2.430.000	10.530.000
AMBO	30	2.000	6.644.000	20	4.250.000	13	14.237.000	7.539.300	32.670.300
ASHONG	31	5.000	20.800.000	23	12.700.000	14	35.006.000	20.551.800	89.057.800
AMING	47	8.000	12.806.000	24	6.175.000	12	21.899.000	12.264.000	53.144.000
BABUNGO	43	5.000	10.383.000	22	7.700.000	16	18.790.000	11.061.900	47.934.900

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Name	Ref. No.	Popul. 1988	Contr. Village		Contr. Cameroon		Foreign aid FCFA	Supervision FCFA	TOTAL cost FCFA
			FCFA	%	FCFA	%			
<b>North-West Pr. (cont.):</b>									
BAFUT MAMBU (HEALTH-C.)	113	2.500	0	0	0	0	10.400.000	3.120.000	13.520.000
BAFUT MANKAHA - NSANI	48	3.000	1.700.000	11	2.850.000	19	7.130.000	3.504.000	15.184.000
BALIKUMBAT (HEALTH-C.)	110	nil	32.000	12	157.000	57	22.000	63.300	274.300
BAMBILI	49	3.500	5.326.000	19	0	0	15.741.000	6.320.100	27.387.100
BELO / NJINIKIJEM	52	10.000	3.591.000	8	10.328.000	24	18.604.000	9.756.900	42.279.900
BIFANG	32	1.500	2.600.000	18	2.600.000	18	6.200.000	3.420.000	14.820.000
BINKA	66	5.000	3.400.000	14	3.149.000	13	12.150.000	5.609.700	24.308.700
BINSHUA	67	3.000	3.618.000	5	2.500.000	3	54.217.000	18.100.500	78.435.500
DJOTTIN	57	8.000	1.500.000	14	2.250.000	21	4.330.000	2.424.000	10.504.000
DZENG	58	2.000	3.790.000	16	1.500.000	6	13.280.000	5.571.000	24.141.000
ESSU	53	12.000	12.250.000	24	5.863.000	11	21.169.000	11.784.600	51.066.600
GUZANG	33	3.500	2.500.000	22	770.000	7	5.613.000	2.664.900	11.547.900
GUZANG - ANOM	34	3.000	3.400.000	14	1.500.000	6	14.456.000	5.806.800	25.162.800
IRZ BANBUI	50	centre			not known				not known
JIRT	68	2.700	890.000	10	2.090.000	24	3.700.000	2.004.000	8.684.000
KAI	39	1.600	1.517.000	16	1.500.000	16	4.295.000	2.193.600	9.505.600
KUGWE - EFAH	35	1.500	13.405.000	30	3.000.000	7	18.181.000	10.375.800	44.961.800
LASSIM	59	2.500	2.406.000	10	4.000.000	16	12.656.000	5.718.600	24.780.600
LOWER MBOT	69	3.000	2.300.000	17	1.500.000	11	6.400.000	3.060.000	13.260.000
MANKOM IRZ	51	centre			not known				not known
MBABU	120	500	338.000	21	200.000	13	692.000	369.000	1.599.000
MBAH	121	1.000	757.000	10	2.100.000	28	2.833.000	1.707.000	7.397.000
MBAHFUH	70	900	1.726.000	8	3.950.000	19	10.081.000	4.727.100	20.484.100
MBIPGO	71	2.000	1.000.000	15	380.000	6	3.680.000	1.518.000	6.578.000
MNEN (NEW TOWN)	116	4.000	2.000.000	15	2.570.000	20	5.536.000	3.031.800	13.137.800
MNEN (OLD TOWN)	117	4.000	2.000.000	15	2.570.000	20	5.536.000	3.031.800	13.137.800
MUNDUM HEALTH CENTRE	114	200	800.000	22	500.000	14	1.549.000	854.700	3.703.700
NDOP	44	hospital	6.812.000	49	2.150.000	16	1.675.000	3.191.100	13.828.100
NDU	72	3.500	1.325.000	11	6.722.000	54	1.500.000	2.864.100	12.411.100
NGONDZEN	60	3.000	578.000	9	1.690.000	28	2.454.000	1.416.600	6.138.600
NJINIKOM RCM HOSPITAL	115	800			0	0	mission		not known
NKAR	55	4.000	2.000.000	9	1.300.000	6	13.000.000	4.890.000	21.190.000
NSEH	61	5.000	11.000.000	12	16.960.000	19	42.190.000	21.045.000	91.195.000
NTUMBAN	73	7.500	not known		not known		not known		not known
NYEN - MBEMI	40	6.000	3.774.000	18	3.080.000	15	8.919.000	4.731.900	20.504.900
OKU (ELAK)	118	500	50.000	4	850.000	73	0	270.000	1.170.000
OSHIE	41	6.000	8.750.000	21	6.800.000	16	16.815.000	9.709.500	42.074.500
OSHUM	36	1.300	1.670.000	17	1.000.000	10	4.765.000	2.230.500	9.665.500
SEHN	122	1.500	1.217.000	13	800.000	9	5.165.000	2.154.600	9.336.600
SHISHONG HOSPITAL	62	hospital					hospital		not known
SOB AREA	56	6.000	4.672.000	9	17.053.000	31	20.232.000	12.587.100	54.544.100
TABENKEN / MULLAH	74	3.000	4.790.000	5	28.800.000	32	35.320.000	20.673.000	89.583.000
TADU	63	3.000	790.000	12	450.000	7	3.761.000	1.500.300	6.501.300
TATUM	64	5.000	1.952.000	6	4.960.000	16	16.946.000	7.157.400	31.015.400
TEZE	42	4.000	5.779.000	14	6.400.000	15	19.953.000	9.639.600	41.771.600
VEKOVI KISEMJAM	119	800	304.000	29	0	0	505.000	242.700	1.051.700
WAINAMA	65	2.000	586.000	9	1.060.000	16	3.459.000	1.531.500	6.636.500
WEH	54	11.000	6.000.000	16	5.400.000	14	17.400.000	8.640.000	37.440.000
WIDIKUM - DICHE	37	4.000	3.185.000	9	5.500.000	16	17.640.000	7.897.500	34.222.500
<b>Total (NW):</b>		<b>184.000</b>	<b>199 Mio (15%)</b>		<b>210 Mio (16%)</b>		<b>587 Mio</b>	<b>299 Mio</b>	<b>1'294 Mio</b>

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Name	Ref. No.	Popul. 1988	Contr. Village		Contr. Cameroon		Foreign aid FCFA	Supervision FCFA	TOTAL cost FCFA
			FCFA	%	FCFA	%			
<b>West Province:</b>									
BAIGOM	79	11.000	7.428.000	17	13.404.000	30	13.598.000	10.329.000	44.759.000
BAMELO-POUOT (BABADJOU)	127	1.500	1.438.000	6	10.000.000	39	8.300.000	5.921.400	25.659.400
BANEHANG HEALTH CENTRE	128	400	1.425.000	9	0	0	10.987.000	3.723.600	16.135.600
BANGANG	75	10.000	13.170.000	18	17.022.000	23	25.734.000	16.777.800	72.703.800
BANTOUM I	123	1.500	not known		not known		not known		not known
BAYANGAM	125	1.600	300.000	4	0	0	6.000.000	1.890.000	8.190.000
FANDOU MANILA	76	4.500	1.428.000	17	1.956.000	23	3.208.000	1.977.600	8.569.600
FANKEU	124	600	1.385.000	12	3.200.000	27	4.464.000	2.714.700	11.763.700
FOMBAP	78	3.000	6.000.000	20	4.000.000	14	12.631.000	6.789.300	29.420.300
FONDOWERA	129	500	550.000	4	5.500.000	43	3.889.000	2.981.700	12.920.700
FOTOUMI	77	3.000	4.968.000	24	4.000.000	20	6.700.000	4.700.400	20.368.400
GALIM IRRIGATION SYSTEM	126	350			not known		not known		not known
NKEUTLIEUM	80	2.300	2.680.000	17	3.480.000	22	5.962.000	3.636.600	15.758.600
NKOUANDJA	81	1.600	4.207.000	11	9.300.000	25	14.637.000	8.443.200	36.587.200
ALME (Adamoua Province)	130	1.200	2.452.000	27	0	0	4.505.000	2.087.100	9.044.100
<i>Total (W):</i>		43.000	47 Mio (15%)		72 Mio (23%)		121 Mio	72 Mio	312 Mio

**TOTAL FCFA approximately:** 379 Mio      391 Mio      1'081 Mio      555 Mio      2'406 Mio  
**In % of "TOTAL cost":** 16 %      16 %      45 %      23 %      (100 %)  
**TOTAL population approxim.:** 350'000 people

Explanations:

Ref. No.      For further details see corresponding project No. (computer print-out).  
Popul. 1988      Number of people benefitting from water supply in 1988; figures not reliable.  
Contr. Village      Village contributions in kind (usually estimated) and cash and % of total cost.  
Contr. Cameroon      Funds from government departments or local councils.  
Supervision      23 % of total cost or 30 % of "Contr.Village" + "Contr.Cameroon" + "Foreign aid".



TATUM generator station: Turbine is generating electricity for water pumps and general use in mission (constr. 1975-82; ref.no. 64).



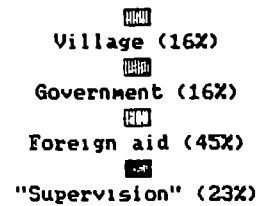
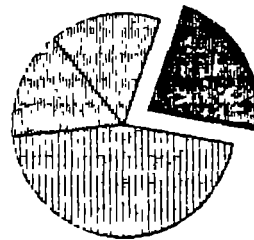
**3.3. Cost sharing**

a) **All projects**

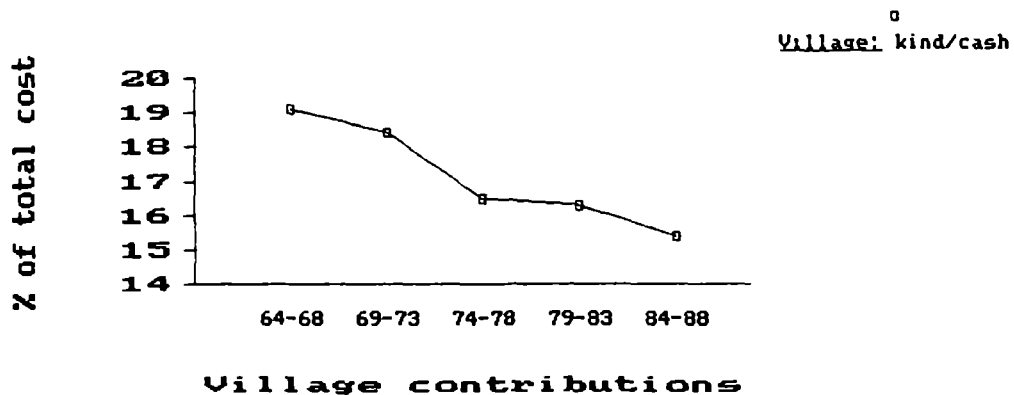
Average contributions towards accounted cost of CD/HELVETAS WS projects from villagers (beneficiaries), from other Cameroonian sources (Government) and from foreign donors were as follow:

Period:	Contributions in % of total cost				Projects completed
	Village	Cameroon	Foreign	"Supervision"	
1964-68	19.1	21.8	36.1	23	7
1969-73	18.4	26.3	32.3	23	14
1974-78	16.5	17.0	43.5	23	15
1979-83	16.3	14.0	46.7	23	25
1984-88	15.4	16.7	44.9	23	40
<b>TOTAL:</b>	<b>16 %</b>	<b>16 %</b>	<b>45 %</b>	<b>23 %</b>	<b>101 **</b>

\*\* Private projects for missions (hospitals, dispensaries) are not included.



**Average cost sharing (in % of total cost)**



According to HELVETAS guidelines, contributions from villagers, CD and foreign donors should be equal in size. In reality, foreign donors contributed towards all completed WS projects more than the villagers and CD (Government) together.





Village contributions were in over 80% of all projects lower than according to our guidelines and decreased steadily throughout the 25 years.

Government contributions fluctuated, but general trend is also downwards.

Village contributions towards original cost compared with the number of completed projects were:

- below 6 % of total cost = 6 projects;
- 6 - 10 % of total cost = 19 projects;
- 11 - 15 % of total cost = 21 projects;
- 16 - 20 % of total cost = 27 projects;
- 21 - 25 % of total cost = 15 projects;
- 26 - 30 % of total cost = 7 projects;
- over 30 % of total cost = 6 projects. (total 101 WSs)

#### b) Projects completed between 1984-88

Contributions towards accounted cost of WS projects completed between 1984-88 and according to provinces were:

Province	Village	Government	Foreign	"Superv."	Projects
North West	15%	17%	45%	23%	19
South West	16%	12%	49%	23%	11
West	15%	24%	37%	23%	10
-----	-----	-----	-----	-----	-----
<u>TOTAL:</u>	15%	17%	45%	23%	40

- Village contributions were in all 3 provinces nearly the same.
- Government contributions in % of total cost were significantly higher for projects within the West province (coincidence or political reasons?) and contributions from foreign donors accordingly lower.

#### 3.4. Estimated real cost of CD/HELVETAS projects

The calculated total cost of CD/HELVETAS projects as shown in our project reports are only a fraction of the real cost. If we compare the average cost of CD/HELVETAS WS systems with the cost of a system constructed by a private contractor (e.g. SNEC or SCANWATER WSs), we have also to consider the "hidden cost".

We tried to get a rough idea about such "hidden cost" for the CD technical service West province with the following assumptions:

1. Average total amount spent during one year for all CD/HELVETAS projects was between 40-50 Mio CFA from 1985 to 1988 (accounted cost for all WPs, WSs, bridges and roads).



2. Additional cost for HELVETAS engineer and HELVETAS employees (e.g. salaries, transport, office expences) plus a share of the expences for the HELVETAS directorate Yaoundé mounts up to approximately 50 Mio CFA/year.
3. Only salaries for all CD employees within technical service West province (provincial and divisional offices) are probably around 50-60 Mio CFA/year.
4. Additional expences for CD offices, rents for buildings (CD & HELVETAS) etc. paid by Government are probably over 30 Mio.

Additional cost for CD/HELVETAS were therefore around 130-150 Mio or minimum 3 times the accounted cost. There are further "unaccounted expences" not included in the above estimates, e.g. share of expences of CD directorate in Yaoundé (technical service) or HELVETAS head office in Switzerland.

Conclusion: Estimated real cost per person for CD/HELVETAS WS systems were probably around 40-50'000 FCFA during the period 1984-88 or roughly four times the cost on the basis of project reports (see previous section 3.1.).



BELO/NJINIKIJEM: Standpipe of extension (done by population). One of the largest CD/HELVETAS WS systems; constructed 1971-80; gen.rating 3; ref.no.52.



## 4. MAINTENANCE

### 4.1. Introduction

Soon after completion of the first few projects, HELVETAS found that motivating the people to maintain regular a completed WS was much more difficult than getting their assistance during the construction period. Appropriate maintenance of completed village infrastructure projects remained throughout the 25 years our biggest problem.

### 4.2. Levels of maintenance

#### a) Preventive maintenance

of CD/HELVETAS WSs requires mainly periodic checking and cleaning of the whole system in order to

- maintain a regular supply of clean drinking water (short term benefits);
- minimize expences for repairs (medium term benefits);
- extend the lifespan of each part of a system to its maximum (long term benefits).

Preventive maintenance usually doesn't require special skills beside a good understanding of the functioning of a system. It can and should be done by the caretakers and villagers without assistance from outside. Typical preventive maintenance works are e.g.

- Regular cleaning of sedimentation tanks, control chambers and storage tanks to prevent soil, sand or other sediments from entering the pipelines. Dirty water, blockages in pipelines and taps and accelerated corrosion of pipes are often the consequences of no or irregular cleaning.
- Removing of leaves, wood or soil at intakes of stream catchments.
- Cutting grass and bushes along pipelines and near constructions (control chambers, tanks) to enable checking and to prevent roots from entering pipelines (blockages!).
- Maintenance of sandfilters (removing "mud cover", cleaning and refilling of sand).
- Maintenance of pumping devices (cleaning, greasing, changing of engine oil etc.).

#### b) Minor repairs

Repairing or replacing of used and broken parts of CD/HELVETAS WS systems can be carried out by the trained caretakers with little or no assistance from outside. Samples:

- Replacing of broken taps.
- Repairing or replacing of damaged valves and pipes,



- Minor repairs on masonry work.

Beside necessary skills, the caretaker needs for such work a few basic tools (standard toolbox, often issued free of cost or at subsidized rates to caretakers by HELVETAS) and of course money to purchase material and spare parts.

c) Major repairs, overhaul (rehabilitation), partial or complete reconstruction

requires usually technical assistance either from public sector agencies (e.g. CD) or from the private sector (local enterprises or mechanical workshops). Such work may include e.g.

- repairs of leaking catchments,
- replastering of tanks,
- major repairs on pumps.

It was and is our declared policy (though never implemented or: always decided and worked in contrary to it!) that villagers should also pay in full for all expences.

4.3. Contributions of CD and HELVETAS

a) Technical innovations:

Minimizing maintenance work and maintenance cost through appropriate design and solid construction, e.g.

- when ever possible pure gravity systems to avoid the installation of pumps, even at relatively high initial cost (long pipelines from remote catchments);
- use of locally available construction material.

Achievements: Good or reasonable success already after a few years.

b) Education and motivation of villagers

towards maintenance work through CD and HELVETAS staff: Regular meetings and discussions with all villagers or project committees during implementation and after handing over of projects (see also "PACT" maintenance programme!).

Results: Meagre or nil with few exceptions.

c) Training of caretakers

Usually soon after the construction of a WS started, the villagers had to choose suitable men out of their communities as future caretakers who were then employed and paid like normal project labourers. Our intention was to give them practical knowledge about each part of the WS and to let them understand





the functioning of the system as a whole from the catchments upto the outlets. These men were later on admitted to caretaker courses, organised by the HELVETAS Building Training Centre in Kumba (BTC) where they could acquire special knowledge and skills in maintenance work (repairing and replacing of broken taps, valves and pipes, maintenance of slow sand filters etc.). In recent years, several refresher courses for trained caretakers were organised.

Achievements: Around 95 % of all WSs and some WPs have at least one trained caretaker who took part once or several times at HELVETAS caretaker training courses and caretaker refresher courses from 1973-88. But their performance is rather questionable:

The majority soon lost interest in their duties, mainly because of lack of support by their respective communities (no compensation for work, no assistance, no interest in maintenance as long as water is flowing).

#### d) Maintenance manuals

Several engineers took the initiative to write "duty sheets" for caretakers with necessary details and explanations about the WS system and its functioning, eg. "DUTY SHEET FOR MAINTENANCE AND CONDITIONS OF SERVICE FOR THE CARETAKER" (1981; Mamfe, SW for BESONG-ABANG-NCHANG WS).

A more comprehensive manual can be obtained since end of 1987 through the CD Provincial service SW ("Completed Water Supplies Maintenance Manual for Rural Area"; Kumba, Oktober 1987).

Results: Not much feed back from the caretakers (BESONG-ABANG-NCHANG WS is now in a deplorable state!).

#### e) Repairing and overhauling of completed projects

40 completed WS projects were later on once or several times repaired, overhauled or reconstructed by CD/HELVETAS. Of course, the fact itself that even very simple and solid constructions need after some years a general overhaul can be expected. More problematic regarding maintenance performance and HELVETAS policy are the facts that

- a major part of such work carried out by us was attributed by all HELVETAS engineers to insufficient or lack of normal maintenance (preventive maintenance, minor repairs in time to avoid further damages);
- HELVETAS and CD usually initiated and carried out repair/overhaul programmes with little and often without any financial contributions from the villagers.

For more details about work done on CD/HELVETAS projects see "HISTORY OF WATER SUPPLY PROJECTS, CONSTRUCTED FROM 1964-1970".



### Results:

- We kept the water running. Without our interventions, we can assume that several WS systems would no longer function.
- We paid the bill for the negligence of the villagers (lack of maintenance).
- We violated regular basic principles of community development philosophy like "self-help" or "self-reliance".
- We surely didn't motivate the people to take care of completed projects themselves with their own resources.

#### 4.4. "PACT" maintenance programme

Under the pressure of increasing repair cost for completed WS projects, HELVETAS sought in 1981 financial assistance from PACT (Private Agencies Collaborating Together, headquarter New York) to analyse the maintenance problem and to develop suitable solutions.

CD, HELVETAS and PACT agreed on a joint 3-year programme which was initiated in 1982 (later on extended till 1987) and popularly known as "The PACT programme".

Foreseen stages of the "PACT" programme were:

1. Take inventory of necessary repairs and maintenance work to be carried out on a limited number of projects in Meme Division (SW, 12 projects), Momo Division (NW, 6 projects) and Donga Mantung Division (NW, 8 projects).
2. Mobilize and motivate the respective villagers to take part in the overhaul programmes.
3. Repairing/overhauling of the projects according to the inventory taken in step one.
4. Training of sufficient caretakers (at least one for each project), offering of regular refresher courses to appointed caretakers and issuing of standard toolboxes for all completed WS projects.
5. Evaluation of the programme after 3 years and, if possible, extension to other Divisions.

After a short period, the "PACT" programme ran into difficulties (low village participation, disagreements between some CD and HELVETAS actors, staff problems) and deteriorated towards the end more and more to a mere "repair and extension programme" for some projects with little village participation.

The financial contributions of the partners were as follow:

PACT:            Approximately 22 Mio FCFA for salaries, transport and other allowances (to 4 CD/HELVETAS employees, engaged in the programme), training of caretakers.



CD: Around 25 Mio FCFA direct contributions to selected projects for repair/overhaul cost (material, labour). An important part of these project grants were used for extensions.

HELVETAS: Mainly for caretaker courses, project grants (repairs/overhauls), some toolboxes and office expences. Detailed figures are not available (expences integrated in normal budgets without specifications), but only contributions for caretaker courses and repairs on projects exceeded 20 Mio FCFA within the programme period.

Villages: Average contributions below 15 % of cash expences for all maintenance work, repairs/overhauls and extensions carried out in the projects.

#### 4.5. Information on maintenance from questionaries

##### a) Number of caretakers and toolboxes

Out of the 111 WSs visited,

- 79 projects have one caretaker trained by HELVETAS;
- 20 projects have two, three or five caretakers trained by HELVETAS;
- 3 projects have appointed caretakers who didn't follow HELVETAS caretaker courses (SOB AREA, AKUM DISPENSARY and NKAR);
- 6 projects have no caretakers with the following reasons given:
  - priest of mission is looking after WS (MBETTA);
  - very small projects (BANEGHANG HEALTH CENTRE, VEKOVI KISENJAM);
  - caretaker left village (TADU);
  - WS out of use (BULU BLIND CENTRE, BALIKUMBAT HC).

40 projects received a standard toolbox from HELVETAS (basic tools, with or without dycing sets). The two toolboxes from FONTEM WS and BELO WS disappeared (caretakers left villages and took toolboxes with them).

##### b) Duty performance

When the caretakers were asked about their maintenance work, they usually told the interviewers what they are supposed to do and not what they are actually doing. By comparing the answers with the state of the projects, we had to assume that

- "regular" mostly means "sometimes",
- "irregular" means "rarely" and
- "rarely" means more or less no maintenance work done, except urgent repairs if no water is flowing.



Since the caretakers and villagers were informed in advance about our visits, they often took the pain to clean at least some parts of the system what may have never been done since months or years.

The following answers were given in the questionnaires under "duty performance":

- 31 regular (-irregular);
- 42 irregular (-rarely);
- 32 rarely or no. (total 105)

In general maintenance work is understood as "doing the minimum if water is no longer flowing out of the taps". Preventive maintenance is very rare.

Beside the WS systems maintained by hospitals or missions (e.g. ACHA TUGI HOSPITAL, BAFUT MAMBU HEALTH CENTRE), we found only 2 projects which are regular and well maintained:

MUTENGENE WS (Fako, SW; ref.no. 6): The caretaker is receiving a monthly salary of 45'000 FCFA from the well organised project committee. Funds were up to now mainly received through selling of new private connections (connection charges sometimes over 100'000 FCFA) and irregular contributions from part of the villagers. Presently the MUTENGENE WS has over 300 private connections.

NKAR WS (Bui, NW; ref.no. 55): The caretaker is receiving per month 15'000 FCFA from the project committee. Funds are collected yearly from villagers (300 CFA/woman, 500 CFA/man). Beside normal maintenance work, the caretaker and villagers undertook 1986 an extension to two quarters, replastered the sedimentation tank (also 1986) and repaired in 1988 several broken slabs of valve chambers. Remarks of our engineer after visiting NKAR for this evaluation: "The first project I saw, where the community is really taking care of maintenance".

An interesting detail: The caretaker in NKAR, Mr. Jaff Shey, didn't follow a HELVETAS caretaker course!

#### c) Payments or other compensations received by caretakers

We received the following answers from the caretakers (total 105):

- 52 not compensated;
- 8 rarely (in kind by clearing the caretaker's farm, a bottle of beer or another small "dash" for urgent repairs);
- 11 irregular (e.g. a few thousand CFA once a year);
- 34 regular (monthly payments).

From the regular paid caretakers,

- 7 are employed by missions or hospitals (private employees);
- 6 are Government employees (e.g. IRZ);





- 6 are paid by project committees (MUTENGENE 45'000 CFA, BADI RIVER 13'000 CFA, BAMBILI 10'000 CFA, EKOMBE THREE CORNERS 10'000 CFA, NKAR 15'000 CFA and MUAMBONG-NGOMBOKU 2'000 CFA - always per month).
- 15 are paid by the Rural Councils of the respective areas with 5'000 to 25'000 CFA/month.

Salary payments from Rural Councils have become very irregular during the past 2 years and stopped in some cases already completely (less revenues due to the "economic crisis").

Around half of all caretakers interviewed complained about the unavailability of tools, the lack of co-operation of the villagers and of course about not being (sufficiently) compensated for the service rendered.

#### d) Contribution of villagers towards maintenance/repairs

- 6 WSS: everything paid by missions/hospitals.
- 3 WSS: projects fully maintained by Rural Councils.
- 2 WSS: regular yearly contributions of villagers (NKAR = salary caretaker and repairs; BADI RIVER = salary caretaker and sometimes repairs).
- 31 WSS: irregular, for urgent repairs.
- 65 WSS: no village contributions (including projects recently completed).

(total 107)

Without a minimum regular income, no proper maintenance even of a very simple WS system is possible. From the village contributions towards maintenance we can therefore conclude:

- Not more than 5 % of all CD/HELVETAS WS systems are regularly maintained (private WSS from missions/hospitals excluded).
- 20-30 % of the projects are maintained to some degree (urgent repairs, occasional cleaning).
- 60-70 % of all WSS are not maintained by the beneficiaries.

#### 4.6. Maintenance cost of CD/HELVETAS water supplies

There are no detailed figures available about maintenance cost of CD/HELVETAS WSS. However we can assume that an average cash contribution of around 200 CFA/person/year would be sufficient to cover all expenses for regular preventive maintenance, minor repairs and savings for occasional bigger repairs/overhauls or extensions (till now, average contributions have been below 10 % of the assumed rate!).

3 samples for verification:

##### a) MBAKANG, small WS for around 1000 people

Income: 1000 x 200 CFA

200'000 CFA



Expences:

- caretaker 2-3000 CFA/month	30'000 CFA	
- normal minor repairs around	50'000 CFA	
- savings for bigger repairs	<u>120'000 CFA</u>	200'000 CFA

b) TEZE, medium WS for around 4000 people

Income: 4000 x 200 CFA 800'000 CFA

Expences:

- caretaker 5000 CFA/month	60'000 CFA	
- normal minor repairs around	140'000 CFA	
- savings for bigger repairs	<u>600'000 CFA</u>	800'000 CFA

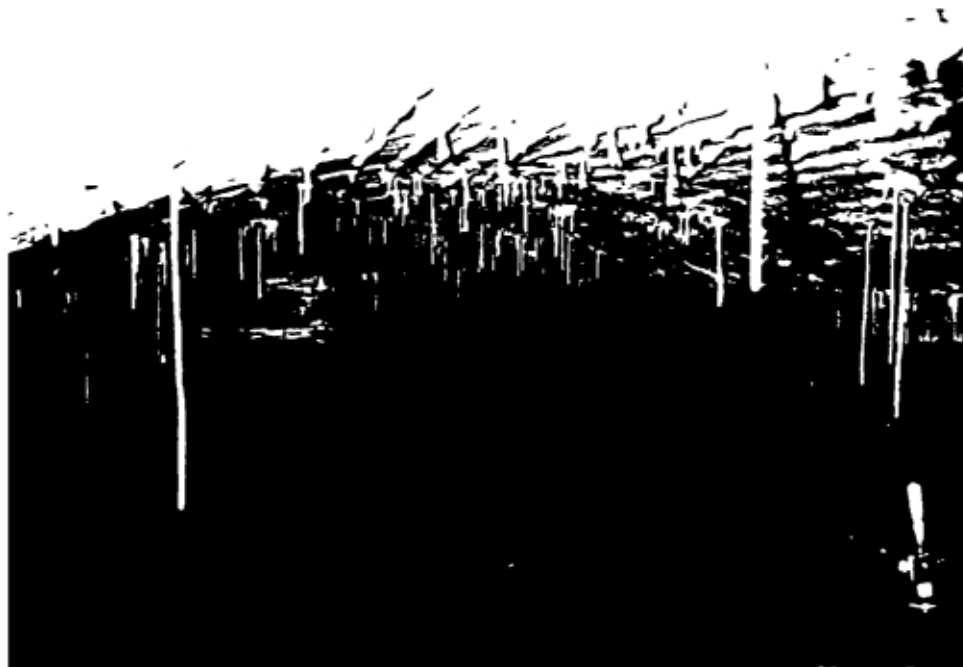
c) BELO/NJINIKIJEM WS, large WS for around 10000 people

Income: 10000 x 200 CFA 2'000'000 CFA

Expences:

- caretaker 20'000 CFA/month	240'000 CFA	
- normal minor repairs around	460'000 CFA	
- savings for bigger repairs	<u>1'300'000 CFA</u>	2'000'000 CFA

There is no doubt that even low income groups in Cameroon could easily afford such contributions. In return they would have good and sufficient drinking water throughout the year.



BELO storage tank (inside): Formation of stalactites on ceiling (precipitation of cement). Tank never cleaned since its construction!.



## 5. STATE OF WATER SUPPLY PROJECTS IN 1988

### 5.1. Summary

109 out of 111 WS systems visited by CD/HELVETAS engineers and technicians were in use. But these are not always the original projects (see "HISTORY OF WATER SUPPLY PROJECTS, CONSTRUCTED FROM 1964 TO 1970").

Below a summary about the overall state of different parts of the systems still in use.

Good = In good working condition, perhaps beside cleaning.

Minor rep. = Minor repairs or improvements necessary which could be done by caretaker or villagers with relative low investments in time and money.

Various rep. = Various, often expensive repairs or improvements, general overhaul or reconstruction necessary.

Part of WS system	Overall state in % of all projects			Number of projects
	Good	Minor rep.	Various rep.	
Catchment(s)	25 %	47 %	28 %	107
General constr.	48 %	15 %	37 %	109
Storage tank(s)	53 %	21 %	26 %	102
Pipeline	62 %	9 %	29 %	109
Outlets	22 %	18 %	60 %	108

### 5.2. Catchments

Main defects or problems stated in the questionnaires are:

- Not or no longer protected: no or unsuitable trees (earlier planted eucalyptus trees are creating often problems!), farming around catchments, people living close by or above (toilets!). In BAYANGAM (ref.no. 125) someone has built a poultry directly on the catchment.
- Neglected, never cleaned, overgrown.
- Blocked: usually by roots from trees, bushes or high grass.
- Leaking: construction damaged or not properly done.
- Construction mistakes: wrongly placed, wrong design or no proper construction.

12 catchments should be reconstructed (severly damaged, wrongly placed).



### 5.3. General constructions

Under "general constructions" we included collection chambers, sedimentation tanks, interruption chambers, valve chambers and pump houses with pumps. Main defects mentioned:

- Valve chambers: no or broken covers, no valve chambers built for later extensions and specially private connections.
- Hydraulic installations: damaged valves.
- Sedimentation tanks: replastering necessary, leaking, not cleaned.
- Pumps: short lifespan due to no or insufficient maintenance. More than half of the pumps, hydrams and turbines are in bad condition or are no longer working (expensive repairs or replacement necessary).

### 5.4. Filterstations

#### a) Construction

Out of the total 18 filter stations,

- 9 are in good condition;
- 1 needs minor repairs;
- 6 need various or expensive repairs;
- 2 have to be reconstructed (AKUM DISPENSARY, MANKON IRZ; ref.nos. 45 & 51).

#### b) Filtration

- 4 filters were properly working ("mud cover" regular removed, clean, filtration sufficient).
- 5 filters had insufficient filtration rate (partly blocked, irregular cleaned).
- 3 filters were still connected, but didn't work properly:  
NSEH = rapid sand filter blocked, not cleaned (ref.no. 61);  
DJOTTIN = not cleaned since a long time (ref.no. 57);  
BADI RIVER = filter blocked, water flowing through some gaps in sand, no proper filtration (ref.no. 20);
- 5 filters were not in use (no sand, bypassed):  
FONTEM (ref.no. 24), NDOP (no. 44), GUZANG-AWOM (no. 34),  
MANKON IRZ (no. 51), BESONG-ABANG-NCHANG (no. 27);
- 1 filter was under repair (ACHA-TUGI HOSPITAL, ref.no. 38).

To maintain a good filtration (sufficient water), the sandfilters have to be cleaned (removing "mud cover") between one to four times a year (information from caretakers).





### 5.5. Storage tanks

Main defects mentioned:

- Leaking: replastering necessary, cracks in walls.
- Hydraulic installations: damaged valves.
- Windows, doors: rotten, corroded, no longer there or never fixed.
- Drainages blocked, not properly constructed.
- Not cleaned, sand and mud inside.

### 5.6. Pipelines

Compared with other parts of the WS systems, the pipelines are usually even after 10 to 15 years in relative good condition. Properly laid, they do not need much maintenance.

Main defects stated are leakages (mainly due to bad private connections or damages caused during maintenance/construction of roads) and damaged valves.

Special attention was given to evaluate the asbesto pipes still in use. In some projects they were already replaced by PVC pipes. For the others we can summarize:

- There is **no need to replace** all asbesto pipes.
- **Corrosion is evident**, but under normal conditions, the pipes have an average lifespan **not lower than other parts** of the systems (catchments, storage tanks etc.).
- **Main problems** with asbesto pipes:
  - a) No spare parts: Old stocks of pipes and fittings with CD or individual projects are soon exhausted. New parts are no longer available.
  - b) Blockages due to roots entering pipes: Asbesto pipes seems specially unsuitable if laid within forests or if trees are planted along pipelines. Growing roots can cause minor leakages at pipe joints. Through these leaks, roots enter the pipes and develop fast (sufficient water for plants, also during dry season!). This brings further damages to the pipes and the roots slowly block the flow of water.

### 5.7. Outlets

The most vulnerable parts of WS systems are outlets (various repairs in 60% of all projects). Most common defects:

- **Bad taps**.
- **Soakaways/drainages blocked**: once blocked or damaged, soakaways are only cleaned and repaired in exceptional cases. People just do not see the need of proper drainages. Outlets on extensions done by the population have usually no drainages.



- **Bad private connections:** fittings for proper branches from main pipe lines are expensive and only available through CD or in bigger towns. People who intend to tap the pipelines for private connections often try to avoid such expenses.
- **Damaged pavements** because of no maintenance and soil erosion (e.g. most of the projects in Manyu division).
- **Not cleaned, surroundings muddy and dirty.**

### 5.8. Water quantity

From 111 questionnaires filled, we extracted the following answers:

- 50 projects supply sufficient water throughout the year;
- 48 projects have shortages during dry season;
- 8 projects have always water shortages;
- 4 WS systems were not working (no water);
- 1 project: no information given.

Reasons given for water shortages:

- Insufficient supply at source (27): fast growing population, system overloaded, deforestation;
- Leakages (11): bad private connections, damaged valves, taps and pipes, leaking tanks;
- Sandfilters blocked (6): not maintained, not cleaned;
- Catchments (6): repairs/improvements necessary;
- Pumps (5): pumps or hydrams damaged, not enough fuel;
- Storage tank not sufficient (1).

For further details regarding water measurements and daily consumption see "EVALUATION OF WATER POINTS AND WELLS"!

Average water collection per person per day from public outlets is probably below 15 liters.

They are no clear indications about daily consumption of families with private connections. The number of people benefitting from such connections is usually low compared with the total benefitting population. It seems that the main problem with private connections is not the actual consumption, but the waste of water because of leakages and open/damaged taps.



### 5.9. Water quality

The water quality was mainly determined according to taste, colour and the surroundings of catchments (possible sources of pollution). At more than half of the projects within SW province, water tests were carried out (MILLIPORE test set). Results of these tests confirmed general judgements (colour, taste, catchments).

Out of 109 WS systems still in use, the water was judged

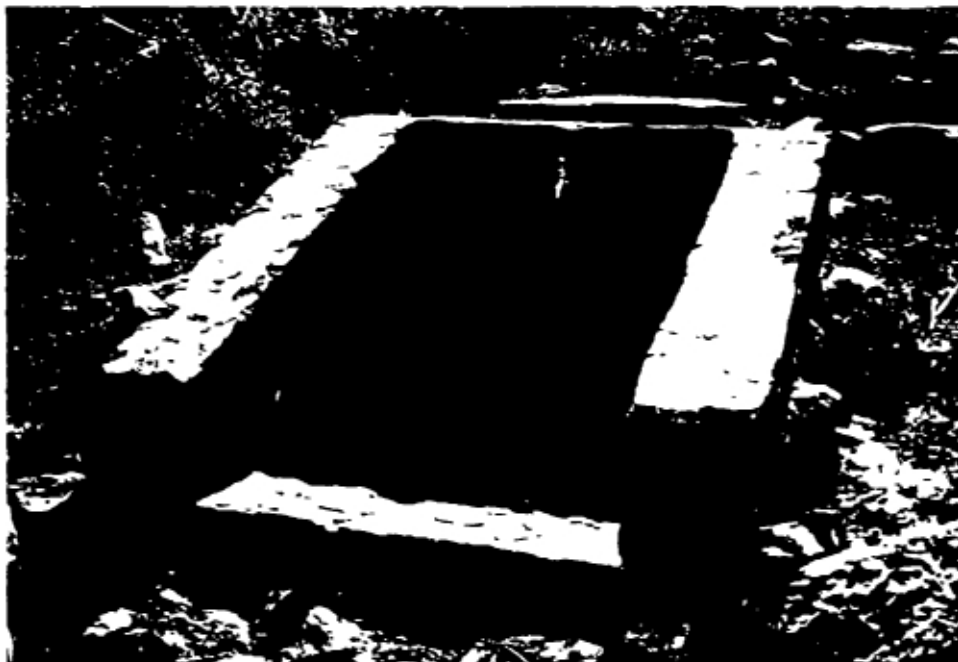
- "good in colour and taste" for 77 projects;
- "medium" or "sometimes polluted" for 24 projects;
- "polluted" or "not acceptable" for 8 projects.

#### Sources of pollution:

- Sandfilters not (properly) working: 6 projects;
- Surface water enters catchments or chambers: 14 projects;
- Reddish matter from raffia palms: 5 projects;
- Cattle and people (inhabited): 5 projects;
- Worms in test sample: 1 project.

Worms were already found earlier in water from some springs around Mount Cameroon, but they do not pose any health risk (information HELVETAS engineer after analysing water tests).

The water from MANKON IRZ is not used for human consumption (animals only).



Hillside standpipe in MBIPGO: Constructed 1969-72; gen.rating 2; ref.no. 71.

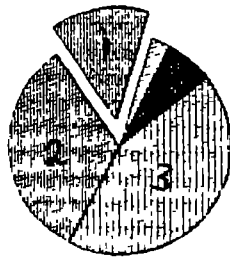


### 5.10. General rating

Ratings were given to projects according to the following criteria:

- 1 = In good working condition, perhaps few minor repairs necessary (e.g. changing of taps).
- 2 = Various minor repairs/improvements necessary; system still in relative good condition.
- 3 = Various urgent repairs/general overhaul necessary; flow and quantity of water affected.
- 4 = System in bad state; expensive overhaul and/or partly reconstruction necessary.
- 5 = No longer working or abandoned.

"1" was given to 16 WS systems or 14% of all projects;  
"2" was given to 36 WS systems or 33% of all projects;  
"3" was given to 48 WS systems or 42% of all projects;  
"4" was given to 8 WS systems or 7% of all projects;  
"5" was given to 3 WS systems or 3% of all projects.



- 1 (16) In good condition
- 2 (36) Minor repairs nec.
- 3 (48) Overhaul/expensive rep.
- 4 (8) Reconstruction nec.
- 5 (3) Abandoned, not used

**General rating (all water supplies)**





## 6. SUMMARY

### 6.1. Number and location of projects

114 water supply projects were constructed and completed with the assistance of HELVETAS from 1964 till 1988 within the provinces

- North West = 59 (52%)
- South West = 37 (32%)
- West = 14 (12%)
- others = 4 (4%)

42 completed projects were later on once or several times extended (around 40% of all WS systems).

40 projects were after completion once or several times repaired, overhauled or reconstructed with financial and technical assistance of CD/HELVETAS.

Throughout the 25 years CD/HELVETAS co-operation, regularly more new projects were started than completed. This policy led to an ever increasing number of ongoing projects with little progress and other undesirable side effects like higher cost, reduced motivation of villagers or planning and construction mistakes. HELVETAS could have relative easily controlled this situation through allocation of foreign funds (own grants and funds channelled through HELVETAS).

### 6.2. Technical details

90% of all projects are pure gravity systems; the others have pumping devices to drive the water up to the storage tanks. 2/3 have spring catchments; 1/3 are taking water from streams and rivers or have combined spring/stream catchments.

For 18 projects (16%), treatment stations with sedimentation tanks and sandfilters were installed; 53 WSs (48%) have only sedimentation tanks and around 1/3 have no water treatment facilities.

In 1988, we counted around 2000 public outlets (standpipes, washplaces and fountains) and 1200 connections to private houses/compounds for all CD/HELVETAS WS systems still in use.

Total length of pipelines for the completed WS projects is approximately 700 km with around 200 km asbesto pipes still in use. Average length of pipeline for a CD/HELVETAS WS system is therefore around 6 km.

### 6.3. Construction periods

The average construction period for all CD/HELVETAS WS systems was around 5 years, ranging from 1 to 13 years. It increased steadily from 2.3 years for the first 5 years of CD/HELVETAS co-operation to 6.3 years for the last 5 years.



Main reasons for long construction periods are: Projects started without proper studies and sound financial basis, too many projects under construction.

It would be easy to reduce construction periods by adhering to a few basic rules:

- Proper project studies beforehand.
- Village contributions in cash must be ready to at least 70%, better 100% before construction starts.
- Other financial contributions must be available.
- Large projects should be divided from the beginning into reasonable stages; the population should benefit after each stage to a higher degree.
- No new project before an old one is completed (e.g. within a province).

In future, HELVETAS should not support any project for which such or similar basic rules are not observed.

#### 6.4. Cost and cost sharing

Average cost per person for the construction of a CD/HELVETAS WS system was from 1984-88 around 6 times higher than during the first 10 years of co-operation (1964-73).

Average accounted cost per person was 11-12'000 CFA from 1984-88. Estimated actual cost are at least 4 times higher (40-50'000 CFA per person for the same period).

The villagers and Cameroon (Government, Councils and other local bodies) contributed each in the average 16% to the total accounted cost of all completed projects. The rest was covered by foreign aid.

Average village contributions in kind and cash towards the cost of WS projects decreased steadily from 19% (1964-68) to 15% (1984-88).

#### 6.5. Benefitting population and water consumption

In 1988, approximately 350'000 people in rural areas were taking water from all CD/HELVETAS WS systems.

In the average, one project is serving around 3'100 people, ranging from 500 for small systems to 10-15'000 for large WSs.

One public outlet (standpipe, washplace or fountain) is serving in average 170 people.

Average water collection per person per day from a public outlet is probably not over 15 liters (see also "EVALUATION OF WATER POINTS AND WELLS"!).



### 6.6. Private connections

CD/HELVETAS projects are mainly designed to supply villagers with sufficient drinking water through public outlets in the surroundings of their compounds. If there is sufficient water and the interested people are ready to pay for the additional expences, there is no reason to suppress private connections.

However, the conditions under which private connections were usually installed have led in many projects to regular and serious water shortages, mainly due to leakages at pipe joints and wastages in the compounds with private connections.

Families with private connections should pay in full all expences for proper connections from the main supply line (including valve chambers) to their compounds. In addition they should pay for the water consumption (fixed yearly rates or charges per m<sup>3</sup> if meters are installed). Such charges do not have to be as high as the ones from SNEC (presently 7680 CFA/year basic charges and 196 CFA/m<sup>3</sup> water consumed), but they should represent a reasonable contribution towards investments, maintenance and repairs of a project (e.g. yearly water tax of 5-10'000 CFA without meters or around 100 CFA for measured consumption).

### 6.7. Water quality and water treatment

In 77 (70%) of all 109 WS systems in use, the water can be considered as safe for human consumption.

Main sources of pollution for the other projects are surface water which can enter the systems, encroached or unprotected catchments (farming, cattle, people) and sandfilters not properly maintained.

5 out of 18 installed sandfilters are properly working and regular maintained (2 are private systems from hospitals). The other filterstations are only irregularly cleaned and sometimes bypassed (8) or always bypassed (5).

### 6.8. Maintenance

Not more than 5% of the CD/HELVETAS village WS systems are regularly maintained (preventive maintenance). 20-30% are maintained to some degree (occasional cleaning, urgent repairs), and 60-70% are not maintained by the beneficiaries.

CD/HELVETAS contributions towards reducing maintenance cost and maintenance problems were considerable with differing results:

- Reducing maintenance cost with simple design and solid construction: good results.
- Education of villagers: meagre effects.
- Training of caretakers: training sufficient in quality and number, but the majority of the caretakers are doing little or nothing for the maintenance of "their" WSs, usually because of no support by the respective communities



- (no compensation for work).
- "PACT" maintenance programme 1982-87: deteriorated soon to a "repair and extension programme" for a number of WS projects with little or no village participation.
  - Maintenance manuals: not much feed back from caretakers.

Average cost for maintaining CD/HELVETAS WS systems in good working conditions are below 200 CFA per person per year -, an amount which is affordable also by families from low income groups.

We consider it therefore a mistake that HELVETAS and CD regularly paid the major part for repairs, overhauls or extensions of completed WS systems. Our interventions after completion of a project should be limited for:

- a) Motivation/education of villagers towards proper maintenance;
- b) Technical assistance if villagers consult us (with reasonable charges, e.g. transport expences).

For further details regarding repairs, overhauls and reconstruction of "old" WS systems see "HISTORY OF WATER SUPPLY PROJECTS, CONSTRUCTED FROM 1964 to 1970"!

#### 6.9. State of projects

109 out of 111 WS systems inspected are in use. 47% were found in good or reasonable working condition (only minor repairs necessary, good and regular flow of water).

42% of the projects need various, often expensive repairs and improvements or general overhaul.

8 projects (7%) were found in very bad state (expensive overhaul, partial or complete reconstruction necessary).

3 projects were no longer working.

Most of the defects were found on outlets (damaged taps, broken foundations, blocked or no drains, surroundings muddy and dirty).

#### 6.10. Acceptance and general benefits

CD/HELVETAS WS systems are well accepted. Villagers appreciate the facilities and regularly collect drinking water from public and private outlets.

Washplaces and especially showerhouses haven't been so widely used as expected. Newer projects have therefore no more showerhouses and the number of washplaces was reduced in favour of more standpipes.

High acceptance and low participation or interest in maintenance could be interpreted as follow:

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- High assistance from outside: as long as we are paying for the repairs and the consequences of not doing preventive maintenance, there is no need for the villagers to do it themselves.
- Different perception of "acceptable working condition": As long as water is flowing, villagers do not care much about leaking tanks, pipes and taps or blocked drainages and damaged standpipes.
- Low communal spirit, lack of leadership: The various families within a community are unable to organise themselves for contributing towards maintenance and repair cost of a project on communal basis.

Although the HELVETAS WS construction programme in Cameroon didn't include any complementary measures like primary health care, health education or construction of toilets, it can be assumed that general health conditions of the villagers with CD/HELVETAS WS systems (or waterpoints and wells) increased with the usual side effects: less water borne diseases, lower infant mortality and accelerated increase in population.



Washplace near filter station in NDU town.  
Constructed 1967-70; gen.rating 3; ref.no. 72.

