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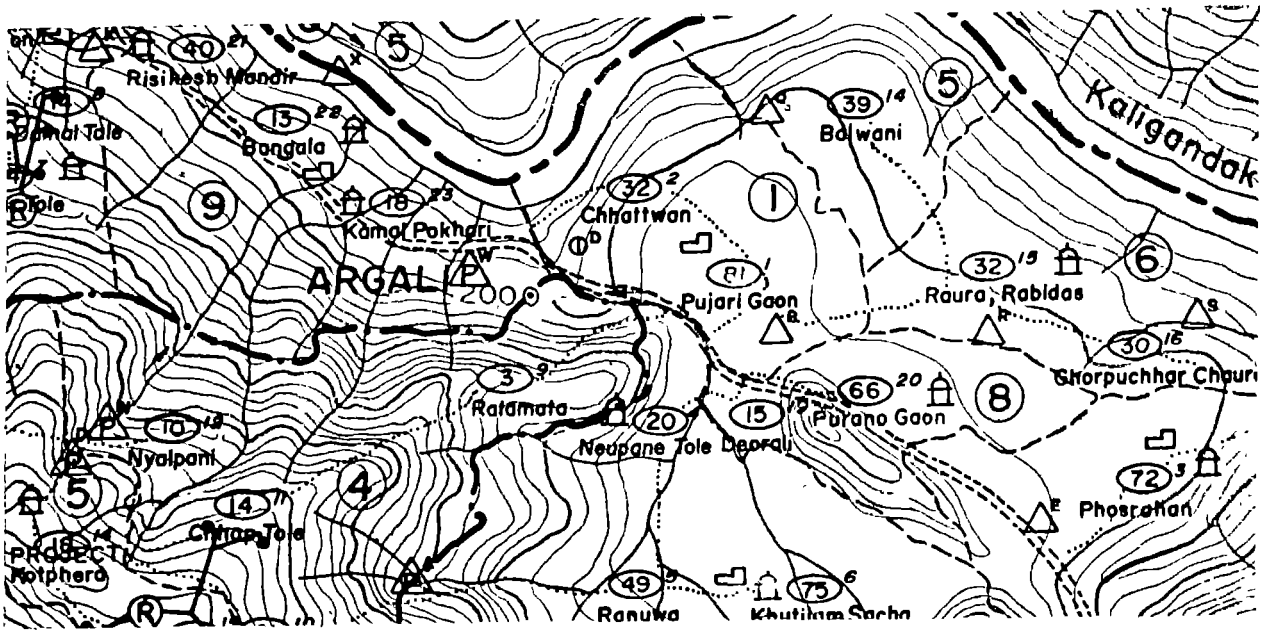
MINISTRY OF HOUSING AND PHYSICAL PLANNING

DEPARTMENT OF WATER SUPPLY AND SEWERAGE

PALPA DISTRICT

WATER SUPPLY AND SANITATION

DEVELOPMENT PLAN



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February 1994

HMG/FINNIDA

RURAL WATER SUPPLY AND SANITATION PROJECT

LUMBINI ZONE

PALPA DISTRICT

WATER SUPPLY AND SANITATION DEVELOPMENT PLAN

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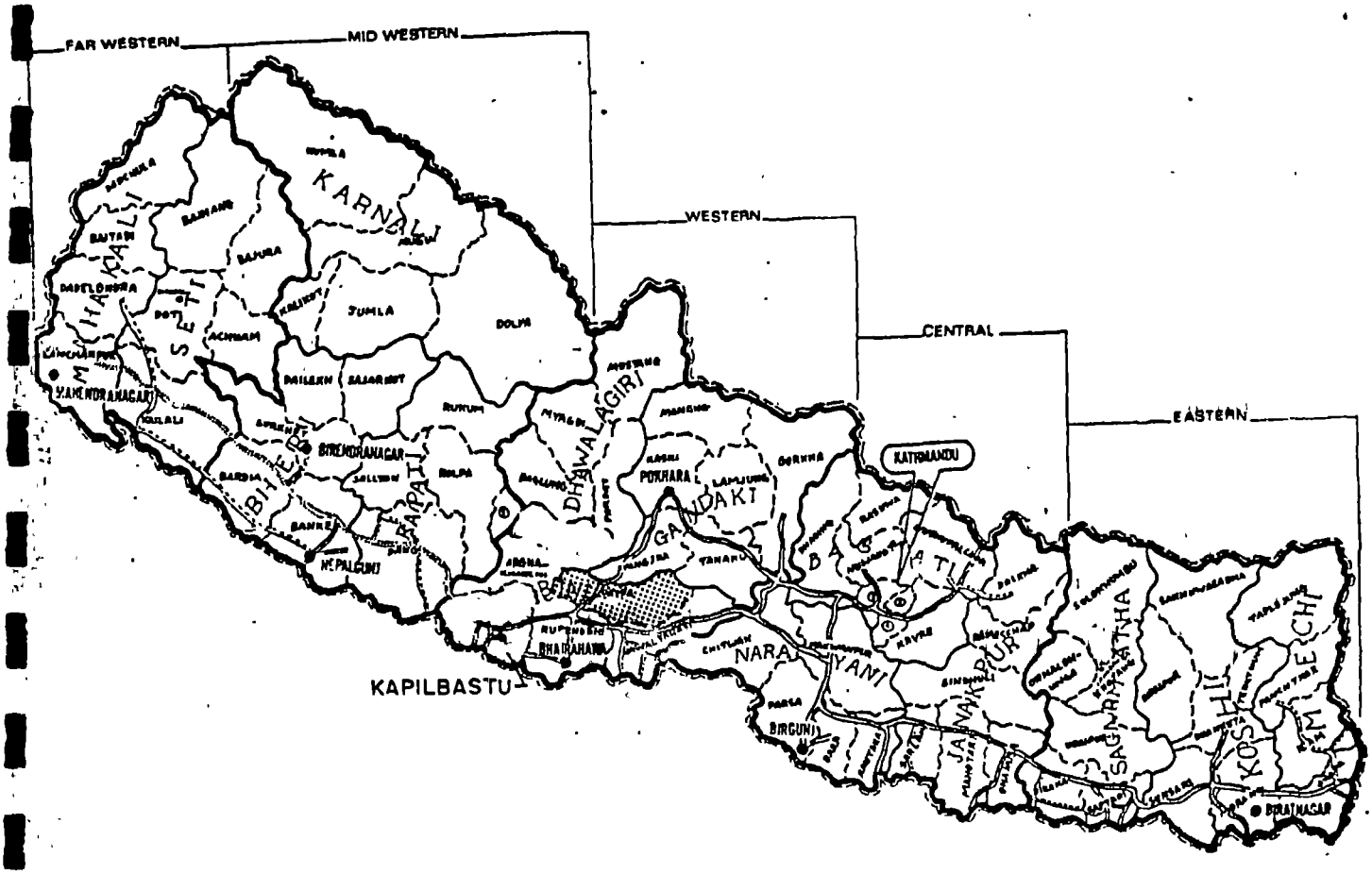
LIST OF ACRONYMS AND ABBREVIATIONS

ADB	=	Asian Development Bank
BGN	=	British Gorkha, Nepal
CHV	=	Community Health Volunteer
CWSS	=	Community Water Supply and Sanitation (Project)
CDO	=	Chief District Officer
DDP	=	District Development Plan (here refers to water supply development plan)
DEO	=	District Educational Officer
DHO	=	District Health Officer
DWE	=	District Water Engineer
DWSO	=	District Water Supply Office
DWSS	=	Department of Water Supply and Sewerage
FIM	=	Finnish Mark
FINNIDA	=	Finnish International Development Agency
HP	=	Health Post
LDO	=	Local Development Officer
MCH	=	Mother and Child Health (care programme)
MHPP	=	Ministry of Housing and Physical Planning
MLD	=	Ministry of Local Development
MOEC	=	Ministry of Education
MOH	=	Ministry of Health
NGO	=	Non-Governmental Organization
NRs	=	Nepalese Rupee
NPC	=	National Planning Commission
O&M	=	Operation and Maintenance
PHC	=	Primary Health Care
PIA	=	Pensioners of the Indian Army
RWSSP	=	Rural Water Supply and Sanitation Project (Lumbini Zone)
S.L.	=	Service Level
SWC	=	Social Welfare Council
UC	=	Users' Committee
UNICEF	=	United Nations' Children's Fund
VDC	=	Village Development Committee
VHP	=	Village Hygiene Promotor
VHW	=	Village Health Worker
VIP	=	Ventilated Improved Pit-Latrine
WHO	=	World Health Organization
WSST	=	Water Supply and Sanitation Technician

Figure 1. Nepal. Location of Palpa District.



EXECUTIVE SUMMARY

The District Water Supply and Sanitation Development Plan of Palpa has been written to be used as the framework guideline when selecting projects for annual implementation programmes and setting priorities.

Palpa District Present Situation

Palpa District is located in the Lumbini Zone and consists administratively of 9 Ilakas and 65 Village Development Committees and 1 Nagarpalika. The total area of the District is 1449 km2.

The environment of the district is mountainous, altitude varying form 251 m to 1943 m. 52 % of the district is classified as forest land and 22 % as cultivated land. Intensive use of land cause erosion and landslide problems. High population density and shortage of cultivable land creates a pressure to take steep slopes under cultivation.

The total population of the district was 288,829 and rural population was 272724 in 1993 consisting of 40,907 (rural) households. The average household size is thus 6.67 persons/hh and average population density 199 people/km2. Major ethnic groups are brahmin-chettris, gurungs, magars, sarki, kami and newars.

The economy of the district is entirely based on agriculture - mostly subsistence farming.

The health statistics of the district show, that major groups of the disease are water and sanitation related, skin diseases, dysentery, diarrhoea and worms being most common reasons for seeking the medical help.

The district has a rural settlement pattern and infrastructure, most common settlement size being 5 - 30 houses only. Motorable roads are few and subject to landslides during the monsoon. Network of paths is the main means of communication.

Sector Policies and Plans

The Eight Five Year Plan 1993-97 has published general nationwise development targets. With regard to water supply and sanitation, the target is to serve 72 % of population by improved water supplies and 9 % by improved sanitation facilities by the year 1997.

HMG has stipulated the water supply implementation with the

communities' full participation in planning, construction and management. This is to ensure the sustainability and enable the communities' to take full responsibility for the completed schemes. These policies have been formalized in the MHPP "Directives for Construction and Management of Water Supply Projects of 2047" and in the "Drinking Water Supply and Sanitation Sector Review and Development Plan (1991-2000)". The target of the Sector Plan is to increase the national water supply coverage from 37% in 1990 to 77% in 2000. This is to be perceived as a national average and individual districts may have higher and lower coverage targets.

Sector Agencies

The overall sector responsibility lies with the MHPP. The lead government agency within the sector is the DWSS. The Social Welfare Council coordinates the activities of the NGO's. Ministry of Health is managing the health activities through it's district and field (Ilaka and sub-Ilaka health post) level organization. The DDC programmes are managed through the district level organization of the Ministry of Local Development, i.e. LDO.

Donor agencies active in the district at present is FINNIDA through Rural Water Supply and Sanitation Project. Helvetas is providing O & M support for the schemes completed by the UNICEF/Helvetas.

The NGOs have been active in Palpa and contributed considerably towards the water supply development in Palpa. Red Cross, Redd Barna (Save the Children, Norway), United Mission and a number of smaller NGOs are implementing rural water supply development programmes in the district. They have supported the implementation of 26 % of all the improved water supply systems in the District.

Sector Financing

Total annual expenditure in the sector in Palpa District has been NRs 10.4 million in 91/92, NRs 18 million in 92/93 and the budgeted/estimated amount for the fiscal year 1993/94 (2050/51) is NRs 22.9 million. The estimated share of HMG of the total financing in 1993/94 is 44 %, the donor share 26 % and the rest will be covered by the beneficiaries and small scale donors like NGOs and DDC.

Present Water Supply and Sanitation Situation

In order to find out the actual water supply situation in the district a field survey covering all settlements was carried out in 1993.

According to survey the primary source of water supply was as follows:

Primary Source	Population	% of the Total Population
Gravity water supply	168,680	61.85 %
Protected spring	11,100	4.07 %
Unprotected spring	28,363	10.40 %
Open well (kuwa)	50,317	18.45 %
Stream	11,182	4.10 %
Irrigation channel (kulo)	3,082	1.13 %

This Plan uses 5 parameters to describe the service level from the users point of view i.e. quality, quantity, accessibility, reliability and continuity. The service level classification and coverage indicators used in the Plan is given below:

Category	Requirements to be met (the poorest characteristic decides the service level)				
	Quality	Quantity (l/c/day)	Accessibility (min)	Reliability (months/y)	Continuity (hr/day)
Service Level 1. Good	Protected source	≥ 45	≤ 15	12	≥ 6
Service Level 2. Intermittent	Spring or better	≥ 25	≤ 30	≥ 11	≥ 5
Service Level 3. Poor	Any source	≥ 15	≤ 60	≥ 10	≥ 4
Service Level 4. Very Poor	All other water supplies				

The population of the Palpa District falls into various service categories as follows:

- Level 1. Good 14 %
- Level 2. Acceptable 33 %
- Level 3. Poor 11 %
- Level 4. Very Poor 42 %

In this Plan the coverage of improved water supply is taken as the same as the % of people falling into Service Level 1. "Good". Thus in Palpa the coverage of improved water supply is 14 %.

Major implementing agencies - at present and in the past - were found to be DDC, DWSS, CWSS/UNICEF and the NGOs. A large group of people, about 64,000, receive water through a system which only has HDPE pipe, but no structures like tapstands, intakes, reservoir tanks or valve chambers. These are either private water supply systems or systems constructed by the village development committee, with a grant from the DDC. These systems are referred to as "temporary" in the Plan.

The average size of the existing permanent water supply systems was found to be 229 users/scheme.

The operational status of the existing gravity systems was analyzed and some characteristics grouped by implementing agency have been shown below:

Implementor or donor agency	No of systems	Population presently served	Operational status: % of taps operating well	% of taps in good condition	% of intakes with good protect.
-Br.Gorkha Army	21	2,530	87 %	65 %	81 %
-DWSS	43	15,568	62 %	76 %	24 %
-DDC	165	34,015	83 %	52 %	30 %
-DWSS/FINNIDA	4	1,267	96 %	100 %	100 %
-HELVETAS	29	5,622	91 %	69 %	31 %
-PIA	15	2,823	92 %	67 %	27 %
-RED CROSS	14	3,046	91 %	91 %	86 %
-REDD BARNA	131	20,571	95 %	90 %	54 %
-SFDP	2	122	60 %	0 %	0 %
-UMN	35	10,676	82 %	72 %	52 %
-UNICEF	34	18,055	92 %	81 %	36 %
-WDP	2	155	50 %	30 %	100 %
-VILLAGERS	11	835	78 %	67 %	19 %
-TEMP.WATER SUPPLY		64,000			
Total	506	179,800	..	..	..

The FINNIDA scemes have been only completed in 1993, just before the survey, as most of the other programmes have both old and new systems. This partly explaines the apparently good condition of the FINNIDA schemes.

Sanitation Situation

11% of the households in Palpa were found to have some kind of sanitation facility: 4,226 latrines and 332 septic tanks.

Water Resources

The average annual rainfall in Palpa District varies between 1500 mm and 2000 mm. Most of the rainfall comes during the 5 monsoon months, the rest of the year being almost dry.

The groundwater recharge of the District has been estimated to be around 130 mill m3/year. This is a relatively high figure, compared with the estimated consumption/demand in 1993, which is 5.9 million m3/year.

All recharged groundwater is naturally not available for consumption. The spring density is highest in the central parts of the district (7-14 springs/km2) and lowest in the Western part of the district (0.35-2 spring/km2). The majority of the springs would have dry season yield of less than 1 l/s. The availability of springs as a asource of gravity water supply is especially good in the northern part of Palpa District.

The district is drained through Kali Gandaki river and Tinau Khola. Main tributaries of Kali Gandaki are Nisti Khola, Barandi Khola and Ridi Khola. Similarly main Tributaries of Tinau Khoal are Doban Khola and Jhumsa Khola. Human activity has polluted many rivers and fluctuations in flow are enormous due to the steep slopes in the catchment area.

With regard to water supplies springs form the most feasible source because of their good water quality, steady flow, and location often near the consumers at relatively high elevations.

Water Demand

The consumption rates used for water demand calculations in this plan are as follows:

- domestic consumption, 45 l/c/d
- cattle, 20 % of 45 l/head/d (or 9 l/head/day)
- additional provision is made for schools, health facilities, commerce and administration

The water demand calculations in this plan are briefly presented in the table below:

Consumption, m3/d	1993	2000	2010
Domestic	13300	13700	14400
Domestic animals	1700	1800	1900
Schools	470	490	520
Health posts and hospitals	466	625	932
Commercial, workshops and others	100	110	115

Total Water Demand, m3/day	16000	16800	17900
" , mill.m3/year	5.9	6.1	6.5

Socio-Economic, Cultural and Health Factors Related to Water Supply

The community should feel, that the water supply improvement is their priority and they want to invest their time and effort in the project. A request for starting the work should always come from the community.

Different groups of the community should be represented in the Users' Committee and served by the system on an equal basis.

Best situation would be if settlements could be served by their own small systems. If larger systems are to be introduced, the boundaries of the subsystems should be decided on the basis of the community management, e.g. following ethnic boundaries.

The design guidelines recommended in this plan have certain inbuilt health impacts. These are the design consumption rate 45 l/c/day, continuous water supply and large platform around the tapstand. If these recommendations are followed, the individual users will be able to increase their consumption, wash more regularly on the water point and go to the tapstand any time of the day without queuing. The users will also switch to using the improved water supply, because they are reliable and abandon the rivers etc. as sources of drinking water. Together with health education and sanitation programme this will lead to a better health status of the village.

Water Supply Development Plan 1994-2002

The water supply development in the Palpa District will be based on the community involvement and community management, thus the emphasis will on small gravity schemes or point sources whenever possible and feasible. Target is to provide acceptable service level of water supply service for 72 % (new programme 55 567 people) by year 1997 and 100 % (new programme 84 707 people) by year 2002.

The springs are recommended as primary options for the drinking water sources, for constructing small gravity systems and point source improvements.

Stream sources must be found in an uninhabited forest areas, where the hygienic quality can be assumed to be good.

Small gravity systems up to 10 taps, with ferrocement tanks can be recommended suitable for community water supply. Springs with low yield can be constructed with short pipelines and 1 to 2 taps.

The costs of the water supply implementation programme for the periods 1994-1997 and 1998-2002 are presented below.

WATER SUPPLY IMPLEMENTATION PROGRAMME

Item	1994-1997			1998-2002		
	No.of sch.	Popul. served	Cost mill NRs.	No.of sch.	Popul. served	Cost mill NRs.
1. Completion of the ongoing projects	22	10,234	8.2	-	-	-
2. Rehabilitation of existing schemes	90	20,300	20.3	-	-	-
3. Construction of new gravity sys tems	150	53,600	53.7	270	59,300	94.9
4. Construction of new point sources (protected springs)	220	22,000	8.8	250	24,400	10.2
5. Renewal of facilities 5%/year			51.0			97.4
Total	482	86,134	142.0	520	84,700	198.5

The capital and recurrent costs are presented in the table below.

Costs, NRs mill.	1994-1997	1998-2002
Water Supply Development	142.0	198.5
DWSS Institutions Costs		
- Facilities	5.0	5.0
- Equipment	5.0	5.0
O&M of Water Supplies	13.0	24.3
DWSS staff and operations	10.0	10.0
Total	175.0	242.8

The total cost are presented in the table below.

Costs, NRs mill.	1994-1997		1998-2002	
	Total	Annual	Total	Annual
Water Supply				
-Capital Costs	152.0	38.0	208.5	41.7
-Recurrent Cost	23.0	5.8	34.3	6.9
Total	175.0	43.8	242.8	48.6

The financing of the above presented programme is envisaged as follows:

	1994 - 1997 NRs mill.			1998-2002 NRs mill.		
	Total	Annual	%	Total	Annual	%
CAPITAL COSTS						
-Government	40.0	10.0	26 %	50.0	10.0	24 %
-Donors	49.6	9.9	33 %	76.8	15.4	37 %
-NGO's	32.0	8.0	21 %	40.0	8.0	19 %
-Beneficiaries	30.4	7.6	20 %	41.7	8.3	20 %
	152.0	38.0	100 %	208.5	41.7	100 %
RECURRENT COSTS						
-Government	10.0	2.5	43 %	10.0	2.0	29 %
-Beneficiaries	13.0	3.3	57 %	24.3	4.9	71 %
	23.0	5.8	100 %	34.3	6.9	100 %

Sanitation Development

The general approach of the sanitation programme recommended in this plan is to promote household latrine construction without subsidy as a part of the general hygiene education programme. The basic programme would be implemented by training health post staff, school teachers and community health volunteers. Permanent latrines would only be constructed in schools and healths posts by the District Water Supply Office.

The development target is to cover 50 % of all households by the year 2000.

Total cost for the sanitation development for the years 1994-2002 would be about 48 million NRs, including the training costs in the community level and investment cost of the school latrines.

1. INTRODUCTION

The implementation of the water supply and sanitation activities in Nepal is presently suffering from the lack of long term plans and comprehensive descriptions of the existing situation of the water supply and sanitation in the districts.

This has been noted in the recently prepared Water and Sanitation Sector Review and Development Plan which proposes that a water and sanitation sector plan is prepared for each district and then updated annually. The Project Document of the first phase of the FINNIDA assisted Rural Water and Sanitation Project in Lumbini Zone also emphasizes the need for long term planning and has therefore included in its programme the preparation of District Water Supply and Sanitation Development Plans for all six districts within the project area.

The Palpa District Water Supply and Sanitation Development Plan will form basis for planning, coordination and implementation of the water supply and sanitation development in the district. It will be a source of information on the existing situation and inventory of resources available for sector development in the district. *The Plan is to be used as a framework guideline when selecting projects for annual implementation programmes and setting priorities.*

Although the Plan is focusing on the rural areas of Palpa District a short review on Tansen town water supply has been included in the report and it has been taken into account when water resources utilization, costs and manpower requirements have been considered.

The Plan should be updated annually based on additional data to be collected on water resources, water supply situation and the actual development.

2. PALPA DISTRICT

2.1 Administration

Nepal is divided into 5 Regions, 14 Zones and 75 Districts. A district is further divided into 9 Ilakas (Sectors) and one Ilaka consists of a number Village Development Committees (VDC) which are again divided into 9 Wards. A Ward is the smallest political and administrative unit.

Palpa District is located in Lumbini Zone, Western Region. Its 9 Ilakas consist a total of 65 VDC's and 1 Nagar Palika (municipality). The location of the district is shown in Figure 1, and the administrative areas in Figure 2. More detailed District Maps 1:25,000 are available in Volume II.

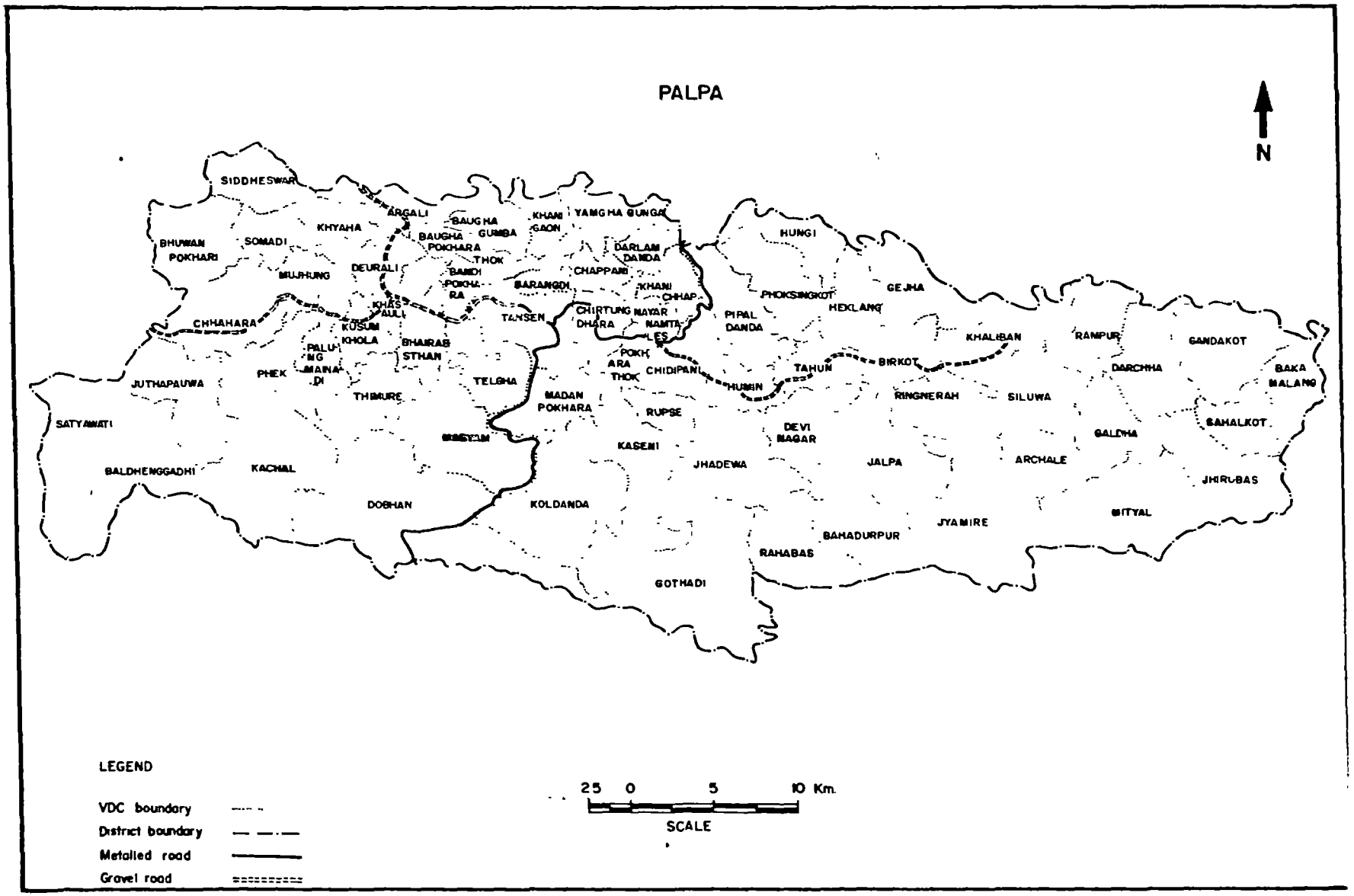


Figure 2. Palpa District, Administrative Boundaries.

The district administration is headed by the Chief District Officer (CDO) and the Local Development Officer (LDO) is in charge of the general development activities of the district. The administration personnel is mainly stationed in Tahsen, except for the VDC secretaries who work at the VDC headquarters.

Local elections were held in May 1992 and councils were formed at ward, VDC and district levels. These councils are increasingly having an important role in initiating, planning and monitoring development activities, including water supply and sanitation development. LDO as the member secretary of the District Development Council is planning, coordinating and monitoring the development activities and reporting to the council. He also has the supervisory responsibility over the line ministries engaged in development activities.

2.2 Physical Features of the District

The total area of the district is 1,449 km^2. It belongs entirely to the hilly area and the altitude varies from 251 m to 1943 m above sea level. A simplified topographic map is given in Figure 3.

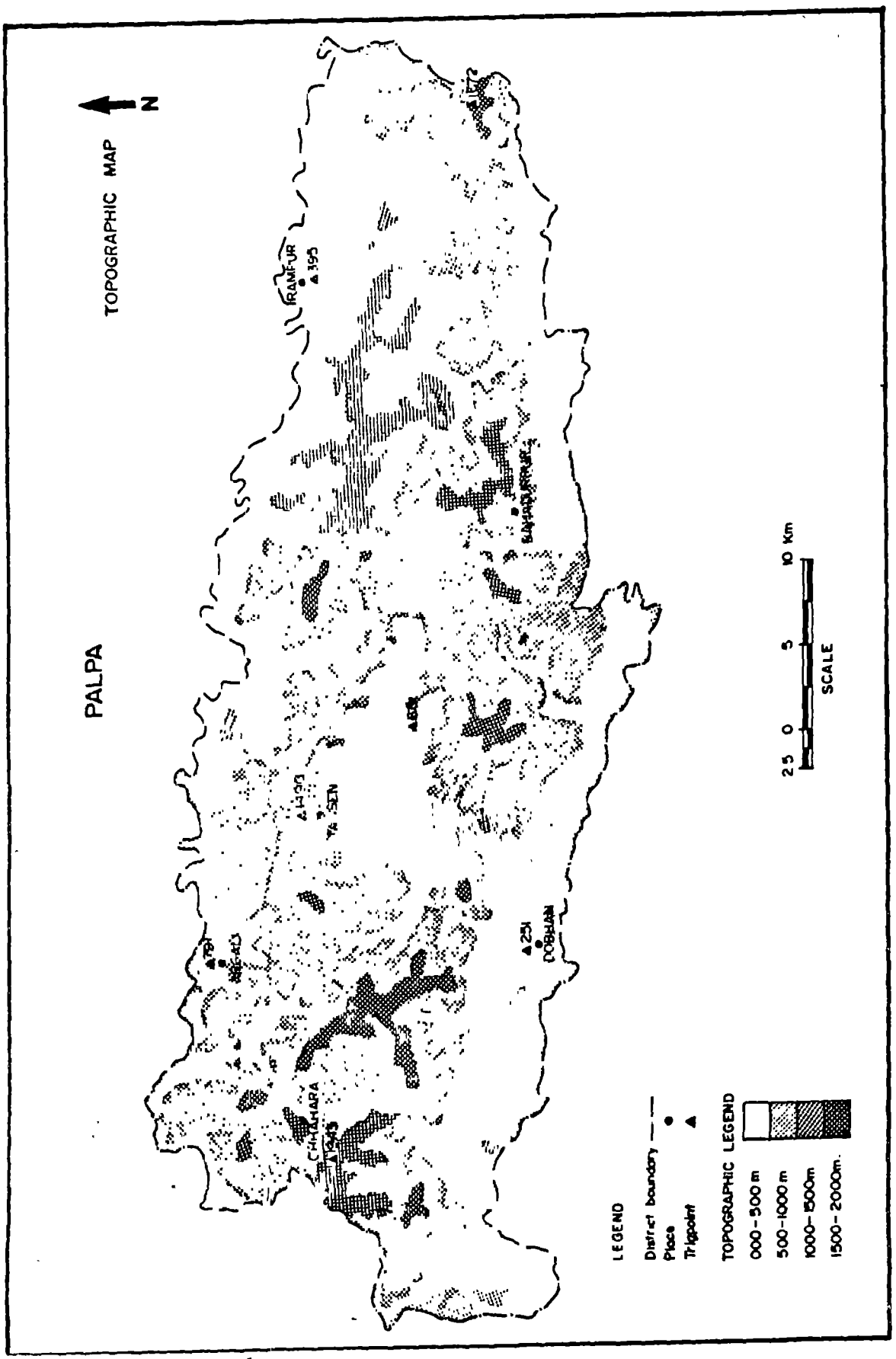
About 52 % of the district is classified as forest land, 22 % is cultivated land and the remaining 26 % grass land, barren land and water bodies. Due to the population pressure considerable parts of the forest land has been taken for agricultural use during the last ten years.

2.3 Environment

Palpa District consists of mountainous environment where erosion is the most common environmental problem, occurring more commonly in the Siwalik region, i.e. in the Southern parts of the district. Landslides are also common in steep slopes of the foot hills and along the fault lines in the district. Both erosion and land slides are more intense during the monsoon season. The removal of vegetation has accelerated the erosion. Ecologically unfeasible lands, in the slopes greater than 30 °, have in many areas, especially in the North of the district, been taken under cultivation.

The VDC's in the central part of the district are comparatively heavily populated and cultivated. The use of water for agriculture and cattle watering in these areas is high and pollution due to human activities is therefore also increased. This concerns mainly the streams, whereas the water quality of the springs can be considered good.

Figure 3. Topographic Map of Palpa District.



There are no industries which cause any noticeable water pollution but there is a sewerage system in Tansen covering part of the town. The system does not include any treatment and the signs of water pollution are clearly visible in Hulangdi Khola into which the sewage water is discharged.

2.4 People

According to the 1993 field survey undertaken by the RWSSP during the preparation of this plan (see Annex 1) the total population of the district was 288,829 people, whereas the rural population was 272,724 at that time, consisting of 40,907 households which gives the average household size as 6.67 persons. The national census was undertaken in Nepal during 1991. The census figure for the population of Palpa District is 236 238 consisting of 41 872 households.

The average population density was 199 persons/km2, varying from 69 people/km2 in Kachal VDC to 417 people/km2 in Chirtung Dhara VDC. (Tansen municipality does have a higher density, but it was not included in the field survey). The variation in the population density is demonstrated in Figure 4.

The major ethnic and caste groups in the rural areas of the district and their proportions are presented in Table 1.

Table 1. Ethnic Groups in Palpa

Ethnic group	% of households in Palpa
Brahmin, Chettri, Thakuri	33 %
Gurung, Magar, Rai, Limbu, Lama, Sherpa	48 %
Sarki, Kami, Damai, Badi, Dhobi, Nepal	12 %
Newars	3 %
Others	4 %

People of different ethnic groups are usually settled in same village, so clear areas of one particular ethnic group can not usually be defined.

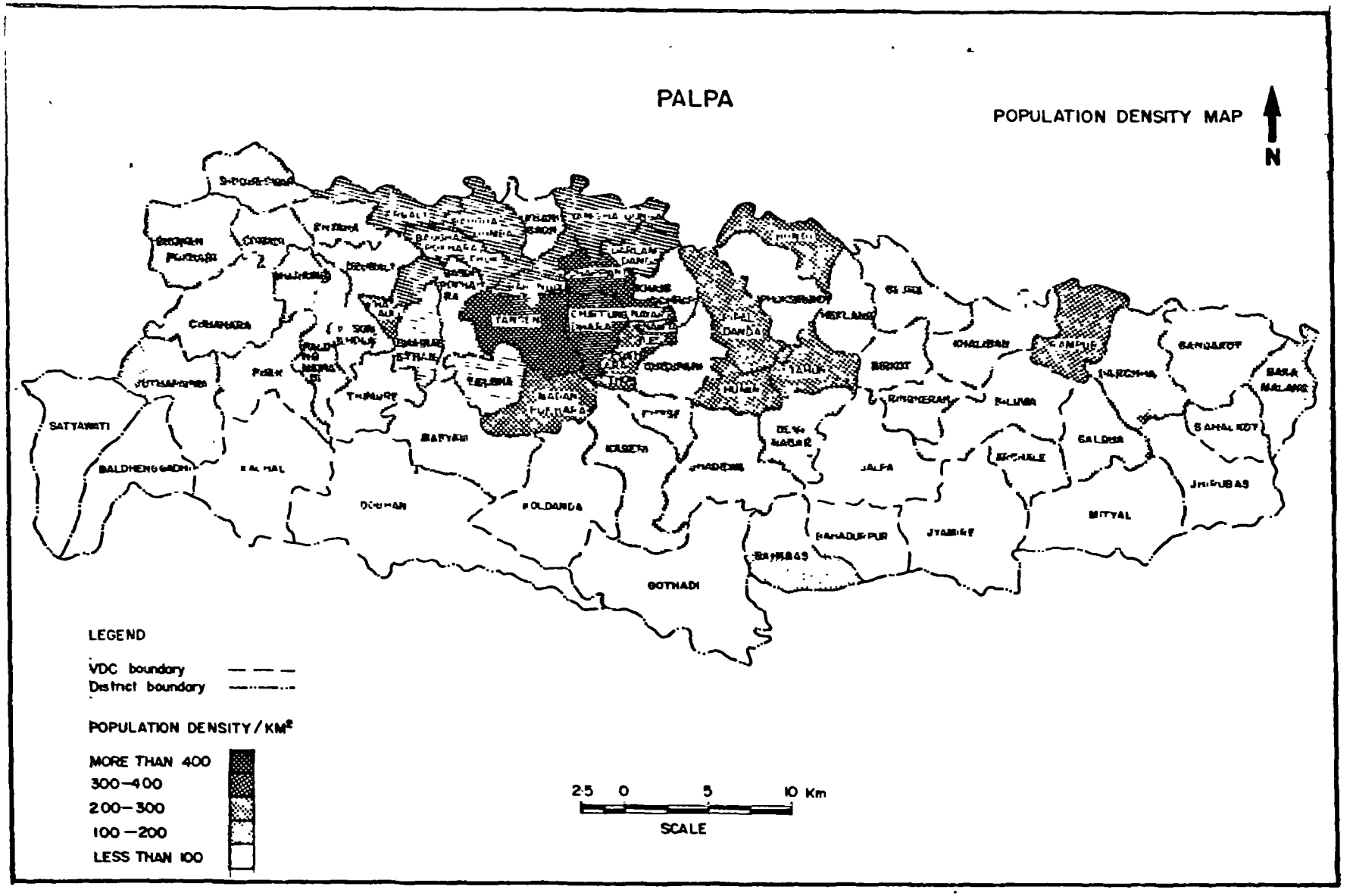


Figure 4. Population Density of Palpa District.

2.5 Social and Cultural Features

The main religion in the area is hindu with the main minority formed by buddhists. Majority of people are showing a changing attitude towards religion. Orthodox follower are mainly found amongst the older generations.

The family pattern in the whole Nepal in changing, due to the modernization, from the previously prevalent extended family towards joint family (two generations in one household) and nuclear family. Also in Palpa, households with extended families are not common, the average household size being 6.7 persons/household.

The women's situation in the brahmin and chettri communities is bound to traditions, and they are mostly dependant on their husbands or male relatives. They take care of the household and employment outside home is very rare. Brahmin-chettri women are not, for example, allowed to travel alone. Magar and other hill ethnic women are somewhat more independent, in comparison with the brahmin-chettris.

Especially in magar and gurung communities active women's groups, so called mothers' groups can be found. They raise funds and work for social issues in the village.

Nepali language is widely spoken amongst all ethnic and caste groups. Magars and gurungs speak their own language as a mother tongue. Women in these communities can find it difficult to communicate in nepali language.

The literacy rate in 1981 was only 29 %.

The communities were traditionally organized for communal works, like school construction, road improvement, building of temples, irrigation works etc. It is, however, possible, that the enforced community participation projects during the Panchayat period, have weakened the community spirit. But many of the old practices are still very much followed, like school construction and upkeep by the villagers themselves, where the government cannot provide this service.

2.6 Economy

The economy of the district is based entirely on agriculture - mostly subsistence farming. There are no industries and the commercial activities are limited to serving the local population only. In general, Palpa District can be considered as a deficit area where consumption exceeds production. The balance is made up by government subsidies and remittances from people working outside the district.

The agricultural land is divided in small and fragmented plots. The distribution of land holding sizes of the farming families is presented below:

landless labourers	5 %
< 5 ropani	11 %
6-10 ropani	21 %
11-20 ropani	38 %
> 20 ropani	25 %

(20 ropani = 1 hectare)

The main crops are rice, wheat, maize and millet. Livestock is an important part of agriculture. Based on the results of the field survey of the RWSSP the present (1993) number of domestic animals can be estimated as follows:

-	cows	101,157
-	buffaloes	76,818
-	horses	87
-	sheep/goats	129,232
-	pigs	23,401

The agricultural products exported from the district are ghee, honey, fruits and jute. The quantities of these exports are, however, small.

Reliable statistics on the income level in the district do not exist but it can be assumed to be near the average of the hill districts, which was estimated at 1,125 NRs per household per month in 1988 (457 NRs cash and 668 NRs kind). (Source: Multipurpose Household Budget Survey, Nepal Rasta Bank, 1988). This would in 1993 level be about 1,590 NRs/month.

An important source of cash income are the remittances of the family members, normally male, working outside the district, many of them in India and particularly in the Indian Army.

2.7 General Health Status of the District

Table 2 below illustrates the occurrence of different diseases in the health posts of Palpa.

Table 2. Health Statistics of the Health Posts, 1990

Group of diseases	% of all cases
Infectious parasitic diseases	25 %
Skin diseases	28 %
Diseases of the respiratory and circulatory system	11 %
Diseases of the digestive system	9 %
Diseases of the nervous and sensory system	7 %
Diseases of the bones and joints	2 %
Diseases of the genito-urinary system	2 %
Accident and poisoning	5 %
Miscellaneous or unknown diseases	11 %
	100 %

The health facilities of the district consist of one district hospital in Tansen, with 15 beds, one UMN managed mission hospital also in Tansen with 127 beds, 3 auyrvedic hospitals, 9 Ilaka health posts and 4 ordinary health posts. There are at the moment 2 medical doctors, 64 other medical staff, 67 village health workers and 108 other staff in the district attached to the DHO's office, district hospital and the health posts. These figures do not include the staff of the mission hospital. The catchment area of the mission hospital is much larger than Palpa district only.

The auyrvedic and herbal treatment have in the villages in many cases preference over the modern medicine. Patients who visit doctor, expect immediate relief, therefore diseases which require treatment over an extended period (e.g. tuberculosis and leprosy) are difficult to treat. Lot of the medicines are dispensed by small local pharmacies, often without proper supervision or prescription.

As sanitation is almost non-existent in the villages, the fecal-oral transmission route for the diseases is the main source of infection.

2.8 Infrastructure

The district is practically entirely rural, only the district headquarters, Tansen, can be regarded as town with its government offices, hospital, schools and bazaar areas. The total population of Tansen Nagar Palika is 21,400, out of which 16,100 is urban population and the rest in 5 rural wards. The rest of the district consists of scattered small settlements of 5-30 houses - clusters - usually located on the upper reaches of the hills. The district has about 2710 clusters, according to the RWSSP field survey 1993.

The distribution of the settlements by size is presented in Table 3. This information has been obtained from the field survey 1993.

Table 3. Distribution of the Settlement Sizes

Settlement size, households/settlement	% of all settlements
0 - 10	44 %
11 - 20	31 %
21 - 30	15 %
Over 30	10 %

The road system of the district consists of 63 km of tarmac road connecting Tansen to Butwal and Pokhara, 106 km of fair-weather roads for heavy traffic. Except for the tarmac roads these roads become impassable for 3-5 months as a result of the monsoon rains. The rest of the area is covered by a network of tracks and paths, some of them improved and maintained by the villagers.

Palpa, i.e. Tansen, has a telephone system which is connected to the national telephone network.

There is a electricity network in Palpa connected to the national grid but covering Tansen and few major trading centres only. There are also some separate local hydropower systems serving few houses.

2.9 Development

The main national planning tools are the Five Year Plans. The Eight Plan has been recently announced, covering the years 1992-97. The Plan gives the framework for development, sets the levels of public financing, and identifies emphasis sectors and priority projects. The Plan forms basis for the annual budgets.

The Five Year Plans are also used at the district level and no separate district development plans exist. However, during the preparation of a Five Year Plan, districts and the district level

offices of the line agencies submit priority project proposals to be included in the Plan.

3. PRESENT WATER SUPPLY AND SANITATION SITUATION

3.1 Sector Policies and Plans

The government policies for water and sanitation sector are described by the Decentralization Act and the Directive No. 2047 "Directives for Construction and Management of Water Supply Projects", which emphasize decentralization and community involvement and management in both water supply development and operation and maintenance. The new government has also pledged to implement rural water supply development through active community participation and the National Planning Commission is preparing new, more specific policies to that effect.

A draft document of the National Planning Commission, giving outlines for the Users' Committees' work in water supply has recently been published.

Eight Plan 1992 - 1997

The National Planning Commission has also prepared the Eight Five Year Plan 1992 - 97 and in it set the national targets for the drinking water and sanitation as follows:

"The basic objective will be to:

1. provide drinking water facilities to 72 % of the population by the end of the Eight Plan period, consistent with the long term objective of providing drinking water facilities to the entire population wihtin the next 10 years.

2. extend knowledge and services related to personal and domestic hygiene and environmental sanitation to the maximum number of people."

A summary of the Eight Plan recommendations for the rural water supply sector is given in the Appendix 2.

Sector Review and Development Plan 1991 - 2000

The government has prepared a "Drinking Water Supply and Sanitation Sector Review and Development Plan (1991-2000) which,sets the goals and strategies for the sector development:

"The development goal for the water and sanitation sector during the 1990's will be a sustained improvement in health

status and productivity for Nepal's population as a whole, with particular emphasis on lower income groups. The goal will be achieved through the provision of adequate, locally sustainable water supplies and sanitation facilities in association with improved personal, household and community hygiene behaviors."

The target of the Sector Plan is to increase the national water supply coverage from 37 % in 1990 to 77 % in 2000 (rural from 34 % to 75 % respectively) and the sanitation coverage from 6 % in 1990 to 31 % in 2000 (rural from 3 % to 25 % respectively)

The Sector Plan estimates that the total investment requirement in the sector is 2.200 mill.NRs annually, 47 % coming from the government, 47 % from the donors and 6 % from the beneficiaries.

3.2 Sector Agencies

3.2.1 Institutional Arrangements in the Sector

The overall responsibility for the formulation and steering the implementation of policies and strategies in the water supply and sanitation sector lies with the Ministry of Housing and Physical Planning (MHPP). The lead Government Agency in the sector is the Department of Water and Sewerage of the MHPP. The other main Government Agencies directly involved in the sector are Nepal Water Supply Corporation (urban water supply and sewerage), Ministry of Local Development through the District Development Committees and Ministry of Health (health education and environmental sanitation). All of these agencies, except the Nepal Water Supply Corporation, are represented in Palpa District.

In addition to the governmental offices, national and foreign NGO's are participating in the water and sanitation development. Their functions are coordinated by the Social Welfare Council (SWC).

As the present Government policy directs, the communities are increasingly assuming responsibility over their water supply and the role of the other agencies is being changed from direct implementation and operation towards guidance, support and supervision.

3.2.2 Department of Water Supply and Sewerage (DWSS)

Department of Water Supply and Sewerage (DWSS) is the lead government agency in water supply and sanitation sector responsible for rural and small urban water supplies. It has also undertaken few projects for household latrine construction. In addition to the direct implementation and operation of the schemes, its role

extends to coordinate the sector activities of the other agencies, including NGO's, providing technical assistance to agencies and to communities when required, disseminating information on the sectoral plans and policies of HMGN in order to achieve some level of uniformity in implementation and to avoid duplication of effort.

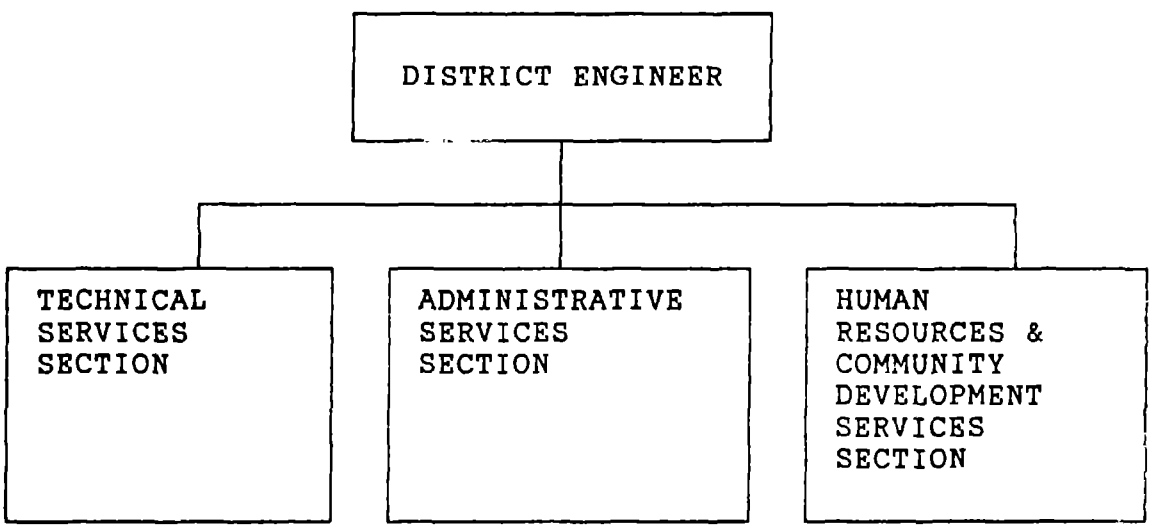
DWSS is functioning at central, regional and district levels.

In Palpa the DWSS is mainly involved in planning, designing and construction of piped gravity schemes for small market centers and rural villages. It also operates Tansen town water supply and 28 rural piped schemes at the moment and gives assistance to community managed water supply systems in case of major break-down or damage. The District Water Supply Office (DWSO) is also at the moment implementing 8 donor assisted projects i.e. FINNIDA aided Rural Water Supply and Sanitation Project.

The organizational structure of all the District Water Supply Offices and in fact the whole DWSS has been changed recently. New activities, e.g. sanitation promotion and training have been included in the work of the District Offices. The new organization has stipulated training, operation and maintenance units to be formed in each District Water Supply Office.

The new organizational chart is presented in Figure 5. Palpa District Office is presently (1993) in the process of forming the new sections and units.

Figure 5. Organization go the District Water Supply Office



The total number of staff posts is 26 and at present 28 people are employed, some being on deputation from other districts. In addition there are 29 people employed on a temporary basis. There

is therefore a total of 57 people working in the District Headquarters and in the ongoing and completed water supply systems. A staff of 56 is attached to the Tansen town water supply, bringing the grand total to 114. The number of personnel can be considered to be adequate.

The staff in various categories is presented below:

District Water Supply Office Staff

Technical staff	Posts filled at present (permanent)	Temporary employees
District Engineer, gazetted II	1	-
Assistant Engineer, gazetted III	3	-
Overseer, non-gazetted I	7	-
Water Supply and Sanitation Technician, non-gazetted II	2	6
Kalighad, non-gazetted II	2	4
Tracer, non-gazetted II	1	-
Supervisor, non-gazetted II	-	4
Plumber, non-gazetted III	2	3
Administrative staff		
Nayab Subba, non-gazetted I	1	-
Accountant, non-gazetted I	1	-
Assistant Accountant, non-gazetted II	1	-
Khardar, non-gazetted II	1	2
Typist, non-gazetted III	1	
Peon	4	10
Subtotal	29	29
Tansen town water supply		
Senior Pump Operator		4
Pump Operator		9
Mistri		2
Plumber		4
Assistant Pump Operator		18
Kalighad		2
Peon		17
Total Tansen water supply		56
TOTAL (all categories)	114	

The main office is located in Tansen, comprising an office building, a store and a yard, and a workshop. The office is located on its own plot on the outskirts of Tansen. DWSO has one pick-up vehicle and private contractors are used for major transport requirements. RWSS Project has two trucks and four tractors assisting the 6 districts of the Lumbini Zone in their material transportation needs.

There are some basic tools and equipment for cutting pipes and threads available at DWSO workshop. In general, the equipment and facilities for maintenance and repairs are inadequate.

The main problems faced by the DWSS office in Palpa are the following:

- inadequate facilities to operate, particularly stores and workshop;
- a financial and manpower burden of running the town water supply
- present organization and staffing which is geared to operating the existing large schemes rather than providing a service to communities in water supply implementation
- inadequate mechanism at the district level for coordinating water supply development activities;
- lack of medium and long terms plans, both in the overall district development as well as in the water and sanitation sector.

3.2.3 Other Sector Agencies

The following are the government line agencies and other agents involved in water supply and sanitation sector in Gulmi District:

Ministry of Health:

The District Health Office (DHO) manages the preventative health and sanitation activities in the district, particularly at the village level. Health education activities also fall under the management of the DHO.

Hygiene and health education are part of the preventive health programmes and is carried out mainly through the health posts. The Village Health Workers play and important role in this work.

The DHO has 133 technical staff in the district office and a total of 108 stationed in the health posts. Although subjects related to water supply and sanitation are included in the work of the most of the staff, none of them is engaged full-time in the water supply or sanitation activities.

There is no specific programme for the private sanitation (latrine) promotion. It falls under the general health education tasks of the Village Health Workers, but the time spared for hygiene education and sanitation promotion activities is limited due to the work load of the regular programmes.

Ministry of Local Development:

The District Development Committee (DDC) distributes Grant-In-Aid (a project of Ministry of Local Development) funds to the VDCs (formerly the village panchayat) for constructing water supply systems. The funds are generally used for purchasing pipe, cement and paying the skilled labour, all other material and labour costs being covered by the communities. These schemes are usually constructed with little or no technical supervision and designs. Their present condition is mostly poor.

It is estimated by the Local Development Officer that under the grant-in-aid programme 593 small water supply systems have been funded by the Palpa District Development Committee (formerly District Panchayat) during the last 11 years. In the field survey 165 systems with actual structures were found. This means, that the remaining 428 DDC systems most probably operate on a temporary water supply system basis, which means, that only HDPE pipe is visible in the field, but no tapstands, intake structures etc.

The DDC distributes annually a fixed amount to each VDC (15 000 Rs/VDC in 2049/50) to be used exclusively in water supply construction.

Communities:

As a result of the new government policies the role on the communities - the consumers - is getting more and more important in the water supply and sanitation sector. The input of the communities in the water supply development is realized partly through construction of small private water supply systems or within the framework of some government or donor assisted projects.

A group of households can sometimes join to construct a small gravity scheme, bearing all the investment and maintenance

costs themselves. These systems are similar to the private ones.

Private Sector:

Private contractors are used especially in the implementation of the DWSS construction works. Smaller contracts can be granted to the contractors from the district and larger to contractors from all over Nepal.

Small scale works are implemented by village level contractors/craftsmen.

Industries serving the water supply sector are not readily available in the district, and practically no materials or tools necessary to construct or maintain water supplies, except sand, gravel, timber and stones, are produced in the district. The closest manufacturers of materials and equipment are either in Butwal, Beirahawa or across the border in India. There are, however, a number of hardware stores in Tansen which are able to supply material needed for water supplies.

NGO's:

The NGO's active in the Water sector in Palpa are the following:

- Red Cross started its village water supply programme in Palpa in 1988. By now 17 projects have been completed and 5 are under implementation;

- Helvetas together with UNICEF has completed its Community Water Supply System Programme of 33 schemes but is continuing to support their maintenance up to the end of 1993;

- Redd Barna has a large community development programme in Palpa covering 9 VDCs. Water supply, sanitation and health education activities have been implemented in the programme VDCs and more than 130 water supply systems have been implemented covering some 20,000 population. Programme is ongoing and is planning to cover all 9 VDCs with water supply;

- United Mission of Nepal is implementing community health programme in 14 VDCs in Palpa and water supply, sanitation and health education are part of the programme. 35 water supply systems have been implemented so far covering some 10,000 population;

- Pension funds of both Indian Army and British Gorkha have been active in the water supply sector. British Gorkha pensioners have implemented 21 systems covering some

2,500 population and Pensioners of Indian Army 15 systems covering some 3,000 population.

Donors:

There are two donors active in Palpa district, i.e. FINNIDA and UNICEF through its CWSS programme.

UNICEF is supporting the materials of the CWSS as Helvetas is giving software support. The programme has been large in the past (34 completed systems, serving some 18 000 population) but is phasing out now, having only two ongoing schemes.

FINNIDA has implemented the first phase (1990 - 1994) of the RWSS Project and is planning to cover (partly) 9 VDCs in Palpa.

3.3 Sector Financing

During the Seventh Plan (1985-90) the nationwide budget allocations to investments in the water supply and sanitation sector have been 4.3 % of the total budget amounting to 2,302 mill.NRs, out of which 1,655 mill.NRs were for rural water supplies and 3.8 mill.NRs for rural sanitation. The operation and maintenance funds, which also provides for employment of staff for completed schemes, come through the regular budget and the Renewal and Extensions budget and were 48.5 mill.NRs during the Seventh Plan.

The DWSS expenditures in Palpa 1992/93 were 10.2 NRs mill. A more complete and detailed break-down of the expenditures and their sources is presented in Table 4.

Table 4. Capital and Recurrent Expenditure for Water Supplies in Gulmi District

Source	1990/91 NRs mill. (actual)	1991/92 NRs mill. (actual)	1992/93 NRs mill. (budget)
HMG through DWSS:			
-Water supply development	3.2	5.2	5.5
-Staff salaries + administ.	5.7	5.5	4.7
-Operation and Maintenance		0.7	
DDC programme	0.13	1.1	2.15
-Water supply development			
FINNIDA RWSS Programme			
-Water supply development	0.5	1.7	5.0
-Staff salaries + administ	0.3	0.4	0.54
-Sanitation	0.1	0.2	0.5
Red Cross			
-Water Supply Development		1.45	1.6
Redd Barna (information was not available)			
Small Farmers Development Pr.			0.22
Pensioner of the Indian Army		0.5	0.29
United Mission of Nepal, Community Health Programme			0.2
*Communities (estimated)			
-Water supply development	0.1	0.9	1.9
-Operation and maintenance	0.3	0.3	0.4
Total			
-Water supply development	4.0	10.8	16.9
-Staff salaries	6.0	5.9	5.2
-Operation and maintenance	0.3	1.0	0.4
-Sanitation	0.1	0.2	0.5
Total annual investment in the sector	10.4	18.0	22.9

* *The estimated water supply costs of the communities include the value of their contribution for the construction in cash, kind or labour of common water supply system. This is estimated to be about 20 % of all those programme investments, which include communities in their working procedures. Compensations to the Village Maintenance Workers are included in the communities' operation and maintenance costs.*

3.4 Ongoing Programmes

3.4.1 Implementation Programmes

The water supply development in Palpa District is implemented through various government channels and other programmes:

- DWSS own programme financed fully through the government budget;
- DDC programme financed by DDC from an government budget allocation through Ministry of Local Development. The projects are implemented directly by the villagers;
- the FINNIDA supported Rural Water Supply and Sanitation Project started in Lumbini Zone in 1990. The project has a programme to cover about 21,000 people in the district during the first phase 1990-1994. The funds are channelled partly through DWSS (government contribution) and partly through the Project Implementation Unit (FINNIDA contribution). The implementation is carried out by DWSS in cooperation with the benefitting communities. It has been preliminarily indicated that FINNIDA may be willing to support the second phase, although in a smaller scale.
- Red Cross continues its programme in 5 VDCs, having 5 systems under construction and Redd Barna continues to work in 6 VDCs having 6 systems under construction.
- of the smaller NGOs, Pensioners of the Indian Army and Small Farmers Development Project are also active in the District.

3.4.2 Water Supplies under Construction

There are several water supplies under construction by various agencies. The list of the main ones is presented in Table 5 below. More detailed information is included in Annex 3.

Table 5. Water Supply Schemes under Construction

Implementing Agency	No of schemes	Total base population	Average implementation time until present
DWSS	7	5,948	5
DWSS/FINNIDA	2	406	1
DDC	6	661	2.6
Redd Barna	6	1,573	1.2
Red Cross	5	212	1
PIA	1	304	1
SFDP	1	52	1
UMN	1	1,184	1
UNICEF	1	560	1
Villagers	1	78	1
Total	31	10 978	

Some of the schemes, particularly those fully financed and implemented by the government, have been started long time ago and are still in their early stages of completion. This is caused by the practice of including, often for political reasons, several new projects in the annual implementation programmes which results in very small annual budget allocations per scheme. This practice is uneconomical and frustrating for both the implementors and the beneficiaries.

3.5 Existing Water Supply Systems

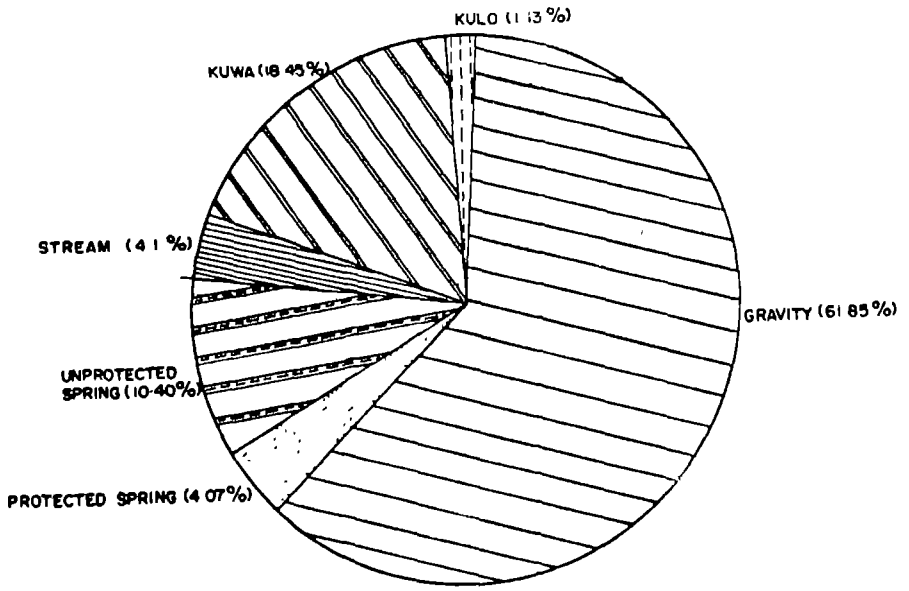
3.5.1 Present Status

The people in the district are getting their water for domestic use through improved water supplies: piped gravity schemes and protected springs or through unprotected sources: natural springs, rivers (khola), local wells (kuwa) or irrigation channels (kulo).

The biggest group of people in Palpa (62 %) are using gravity water supplies as their primary source.

The distribution of people as per their primary source is presented in the Figure 6 (based on the field survey 1993).

Figure 6. Present Water Use; Population's Primary Source of Water



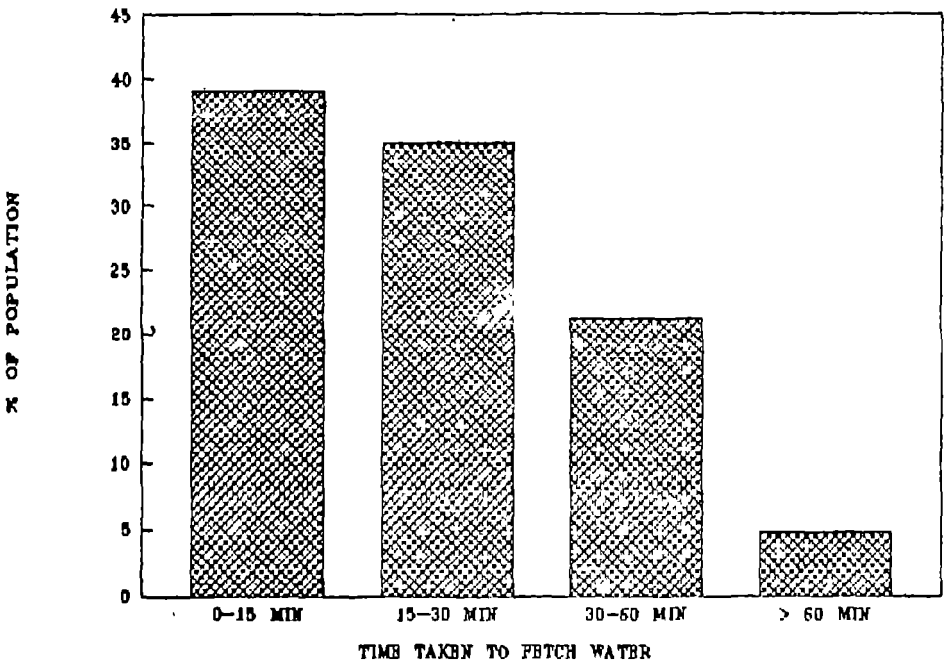
A common type of water supply in the district is a private household tapping a spring near by the household. This type of water supply rarely has any structures, only a pipeline from the source to the consumer. Simple tap stands are sometimes constructed. These pipelines fall under the category of temporary water supplies, as no permanent structures of this type of water supplies have been found during the village survey.

Most people in Palpa District have a perennial water source as their primary source of drinking water. Only 6 % of the (rural) population has at present a non-perennial source as their primary source, hence they have to try to find another source for the dry months.

Majority of people (74 %) can collect their water (go and come back) within 30 minutes.

Distribution of people in the district by the time needed to fetch water (go to the collection point and return) is presented in the Figure 7 (based on the field survey 1993).

Figure 7. Distribution of Population by the Time Needed to Fetch Water



Improved water supplies have been constructed by various public or non-government organizations, by communities or by private individuals. The different implementing/donor agencies are described under the chapter 3.2 "Sector Agencies". Table 6 below presents summary of the data of the improved water supplies in the district. This data is based on the results of the field survey 1993. A more detailed scheme data is in Annex 3.

Table 6. Existing Improved Water Supply Systems

Implementor or donor agency	No of schemes	Population presently served	Size of the schemes Min.	Aver.	Max
Piped gravity w/s and protected springs					
-British Gorkha Army	21	2,530	14	121	335
-DDC	165	34,015	11	207	954
-DWSS	43	15,568	4	362	5,013
-DWSS/FINNIDA	4	1,267	184	317	582
-Helvetas	29	5,622	23	194	569
-Pensioners of Indian Army	15	2,823	48	189	600
-Red Cross	14	3,046	41	218	494
-Redd Barna	131	20,571	-	157	
-Small farmers development project	2	122	54	61	68
-United Mission to Nepal	35	10,676	39	305	1,736
-UNICEF	34	18,055	13	531	2,687
-Women's Development Pr.	2	155	34	58	81
-villagers	11	835	..	76	185
-temporary water supplies*		64,000			
Total		179,800			

* *Water supplies with no structures like tapstands, reservoirs or intakes and permanently buried pipeline have been classified as temporary. These systems are mostly half inch pipes serving one or a few households, installed by private households.*

It can be seen from the above table that on average the schemes are relatively small, apart from one large government system, which has population over 5,000. The individual existing pipelines are shown in the 1:25,000 Water Supply Maps in the Volume II. Temporary pipelines are not shown on the maps.

Figure 8. below illustrates the share of. implementation between the various agencies. Palpa District has a noticeably high share of implementation by the NGOs, compared to other districts in the Lumbini Zone.

Figure 8. Implementation of water supplies by different agencies

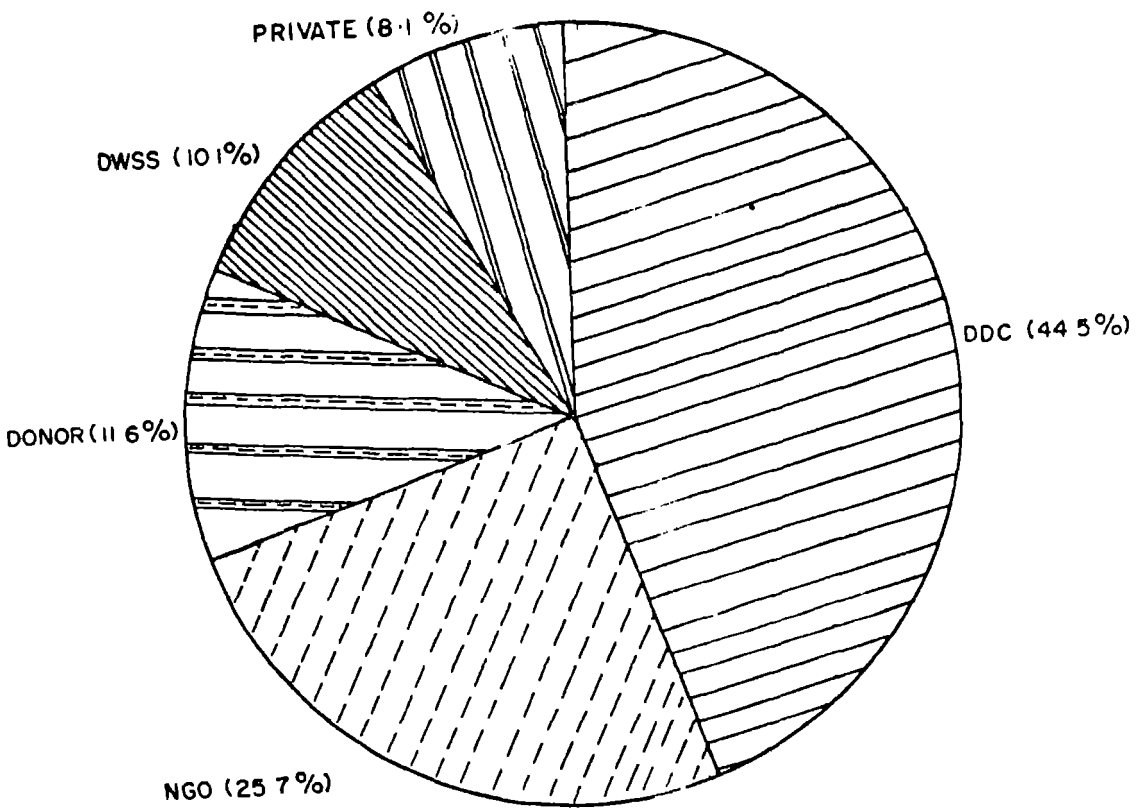


Table 7. below gives some indicators of the present status and construction quality and the present status of the existing water supply systems.

Table 7. Construction Quality and the Present Status of the Gravity Water Supply Schemes

Implementor or donor agency	% of tapstands in good condition	% of intakes with protection
Piped gravity w/s and protected springs		
-British Gorkha Army	65 %	81 %
-DDC	52 %	30 %
-DWSS	76 %	24 %
-DWSS/FINNIDA	100 %	100 %
-Helvetas	69 %	31 %
-Pensioners of Indian Army	67 %	27 %
-Red Cross	91 %	86 %
-Redd Barna	90 %	54 %
-Small farmers development project	0 %	0 %
-United Mission to Nepal	72 %	52 %
-UNICEF	81 %	36 %
-Women's Development Pr.	30 %	100 %
-villagers	67 %	19 %

The systems differ in age as well as in original construction quality. For example the FINNIDA systems surveyed under this study, have been completed during 1992, which explains their good constructional status.

In the above Table, the column "% of taps in good condition" indicates, that the rest of the tapstands need repair or rehabilitation. It also often happens, that after the implementing agency completes the system and leaves the area, the villagers add more tapstands, which constructional quality may be worse than that of the original system. But as old design drawings or as-built drawings are not available from any of the implementing organizations, the number of these "non-designed" taps added by the villagers is impossible to verify.

It is however clear from the above data, that rehabilitation and renewal investment has not been made on a regular basis in the District in the past and the present condition of many gravity systems is poor.

3.5.2 Operation, Maintenance and Management of the Water Supplies

Water supply systems are operated, maintained and managed either by DWSS or the communities. In all completed DWSS schemes DWSS staff (usually on temporary assignment with year to year extension) are maintaining the system and carrying out most of the repairs. This situation is reflected in the large number of staff employed by the Palpa DWSO. Normally, in the DWSS schemes the consumers do not take part in the maintenance and are also not contributing anything towards the O&M costs.

In the schemes managed by the communities a Users Committee has normally been established to be in charge of the scheme. The committee appoints a Village Maintenance Worker to carry out the routine maintenance of the system and to monitor the functioning of the system. The Committee collects funds from the consumers to cover the costs of operation and maintaining the scheme. In case of major break-down DWSO will assist by providing material and skilled manpower, free of charge, although the timely availability of this support is often a problem. The DWSO annual O & M budget is about 50 000 Rs, which is usually used in subsidizing the electricity bill of Tansen water supply.

In the UNICEF, Red Cross and FINNIDA funded schemes the village maintenance systems have been formalized and the village maintenance workers receive training. Spareparts have also so far been available in Pokhara through the CWSS project.

Many small village schemes, several of those funded by DDC or NGOs, are run by organizations created by the villagers themselves, including in most cases fund raising for operation and maintenance costs.

The operational status of the different systems has been given in Table 8 and in more detail in Annex 3.

Table 8. Operational Status of the Existing Improved Water Supplies.

Implementor or donor agency	% of taps operating well (good or acceptable flow)	Systems' average daily operational hours
Gravity systems and protected springs		
-British Gorkha Army	87 %	18
-DDC	83 %	16
-DWSS	62 %	18
-DWSS/FINNIDA	96 %	21
-Helvetas	91 %	16
-Pensioners of Indian Army	92 %	17
-Red Cross	91 %	20
-Redd Barna	95 %	22
-Small farmers development project	60 %	24
-United Mission to Nepal	82 %	14
-UNICEF	92 %	20
-Women's Development Pr.	50 %	24
-Villagers	78 %	19

The column "% of taps operating well" describes the villagers perception of the tap flow, as it was not possible to measure the exact flow of all the surveyed tapstands.

Daily operational hours in all types of systems are relatively good in Palpa. This may be due to the small average sizes of systems. Around 27 000 users' (16 %) of the gravity systems receive service less than 6 hours per day.

3.6 Consumers' Water Supply Situation

3.6.1 Field Survey of the Water Supply Situation

Information on the schemes is available for those constructed by DWSS, District Development Committees, Helvetas, Red Cross, Redd Barna and UNICEF funded schemes, thus covering only part of the water supplies. Even this information is limited and based on the design documents and often different from the actual situation in the field. In order to get a better and more comprehensive picture of the real present water supply situation and service levels, a

Table 9. Water Supply Service Levels

Category	Requirements to be met (the poorest characteristic decides the service level)				
	Quality	Quantity (l/c/day)	Accessibility (min)	Reliability (months/y)	Continuity (hr/day)
Service Level 1. Good	Protected source	≥ 45	≤ 15	12	≥ 6
Service Level 2. Acceptable	Spring or better	≥ 25	≤ 30	≥ 11	≥ 5
Service Level 3. Poor	Any source	≥ 15	≤ 60	≥ 10	≥ 4
Service Level 4. Very Poor	All other water supplies				

3.6.3 Service Levels and Coverage Indicators in Palpa District

The population of the Palpa District falls into various service categories as follows:

- Level 1. Good 14 %
- Level 2. Acceptable 33 %
- Level 3. Poor 41 %
- Level 4. Very Poor 12 %

Although about 66 % of the population has an improved water supply system - piped gravity scheme or a protected spring - as their primary source of domestic water, only 14 % of the population of Palpa district have improved water supply within 15 minutes reach, all year round, for minimum 6 h/day. The latter is comparable with the normal design criteria of DWSS. This means that 14% of the population of Palpa is covered by improved water supplies at present (1993).

survey has been carried out covering all villages, wards and clusters in the whole district. In addition to the water supply data, information were also collected on water resources, population, livestock, general economy and sanitation. A detailed description on the survey is presented in Annex 1.

The coverage of the various improved water supply systems does not give a true and whole picture of the actual water supply situation and the service levels. In the survey the present water supply situation was analyzed from the users point of view. The following factors affecting the service of the users' were determined:

- reliability of the water source, is the primary source perennial;
- accessibility; how much time is needed to fetch water (to go, fill the water container and come back);
- water quality in the source (protected or not protected);
- continuity of the supply (how many hours a day can the source give water).

3.6.2 Service Level Criteria

When analyzing the field survey data the consumers were categorized into 4 service levels as shown in Table 9. This means, that each cluster of households can be classified in one of the service levels. This came as a result of the field survey, where questions of "time taken to collect water", "daily service hours" etc. were asked in each cluster.

The average service level variations between the VDC's is further described by a simplified hardship classification, based on number of people falling into each service level in each VDC.

The overall hardship ranking of the individual VDC is calculated as follows:

H = (0xL1 + 1xL2 + 2xL3 + 3xL4) where

L1 = % of people falling into service level 1
L2 = % of people falling into service level 2
L3 = % of people falling into service level 3
L4 = % of people falling into service level 4

The VDC's have been classified into 4 hardship classes as follows:

HARDSHIP CLASS	H	Water supply situation on average in the VDC
I	0 - 100	Good
II	101 - 150	Average
III	151 - 200	Poor
IV	201 - 300	Very Poor

Figure 9 provides a rough guideline for comparing the water supply situation and service levels in each VDC. A more detailed presentation of the present water supply situation and service levels in the district and its various VDC's is presented in Annex 4.

A wardwise hardship map is also added to the map folder.

A list where the VDCs have been put in the order of descending hardship, is presented in the Appendix 4.

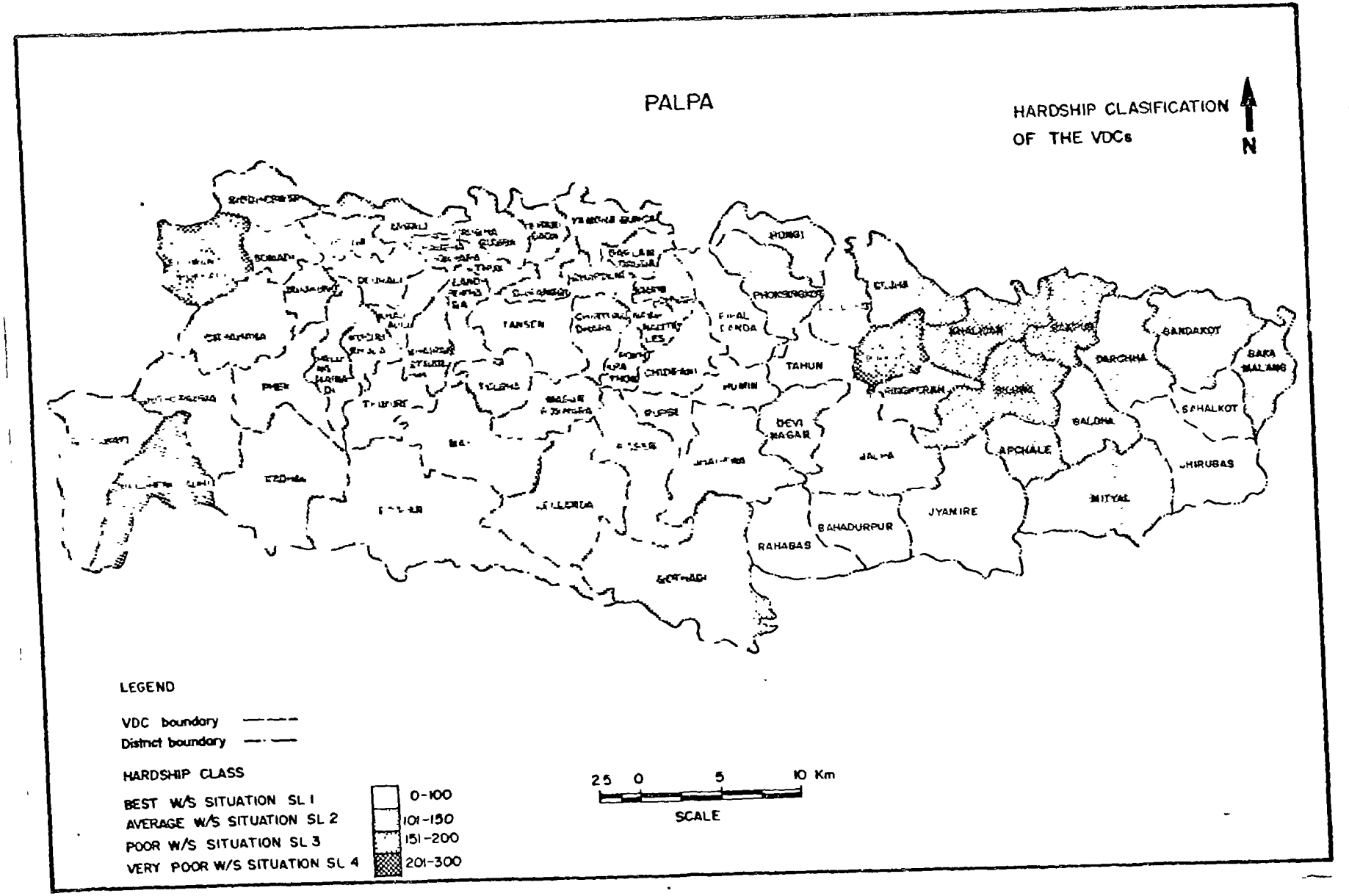


Figure 9. Hardship classification of the VDCs.

3.7 Urban Water Supply of Tansen Town

Tansen town is the district headquarters of Palpa, with about 16,105 inhabitants in 1992. The town is located in a hilly terrain at the elevation of about 1,000 m above the sea level. The town is supplied practically fully by piped water supply system.

The water supply consists of an intake with pumping station, rising main, booster pumping station, main reservoir and balancing reservoirs. It is operated and maintained by DWSO with a staff of 56. The consumers are charged for water according to the prevailing DWSS rates. In Tansen, where water has to be pumped, the water chargers cover only fraction of the operation and maintenance costs of the scheme. A more detailed description of the Tansen water supply and its operation is presented in Annex 5.

3.8 Sanitation Situation

The sanitation situation in Palpa District is poor. No piped sewerage systems exist and only very few households are reported to have a latrine. Only government offices and houses and some better residential buildings in Tansen have septic tanks or latrines. Outside Tansen, latrines are rare even in health posts, schools and other public places.

During the field survey 4226 private latrines and 332 septic tanks were recorded. The latrine coverage is hence 11 % in Palpa District. However, the coverage of improved sanitation is lower, because all the existing latrines do not meet the required standards.

4. WATER RESOURCES

4.1 Meteorology

Long term rainfall, temperature, relative humidity and wind speed data are available from two stations in Palpa District (see Table 10):

Table 10. Meteorological Stations in Palpa District

Station	Elevation	Established
Tansen	1,067	1971
Garakot	500	1979

The nearest station with evaporation and sunshine data is in Beirahawa.

The location of the stations is shown in Figure 10.

The mean annual rainfall for the Lumbini Zone is presented in Figure 10. The average annual rainfall in Palpa District varies between 1500 mm and 2000 mm. During the recording period of 1981-90 the highest recorded annual rainfall was 2257 mm in 1989 in Garakot and the lowest 1387 mm in 1987 in Tansen. About 80 % of the rainfall comes during the monsoon season (June to September). The annual rainfall pattern, i.e. the monthly average rainfall distribution in ~~Tamghas~~ Tansen is presented in Figure 11.

Figure 10. Mean annual rainfall in Lumbini Zone

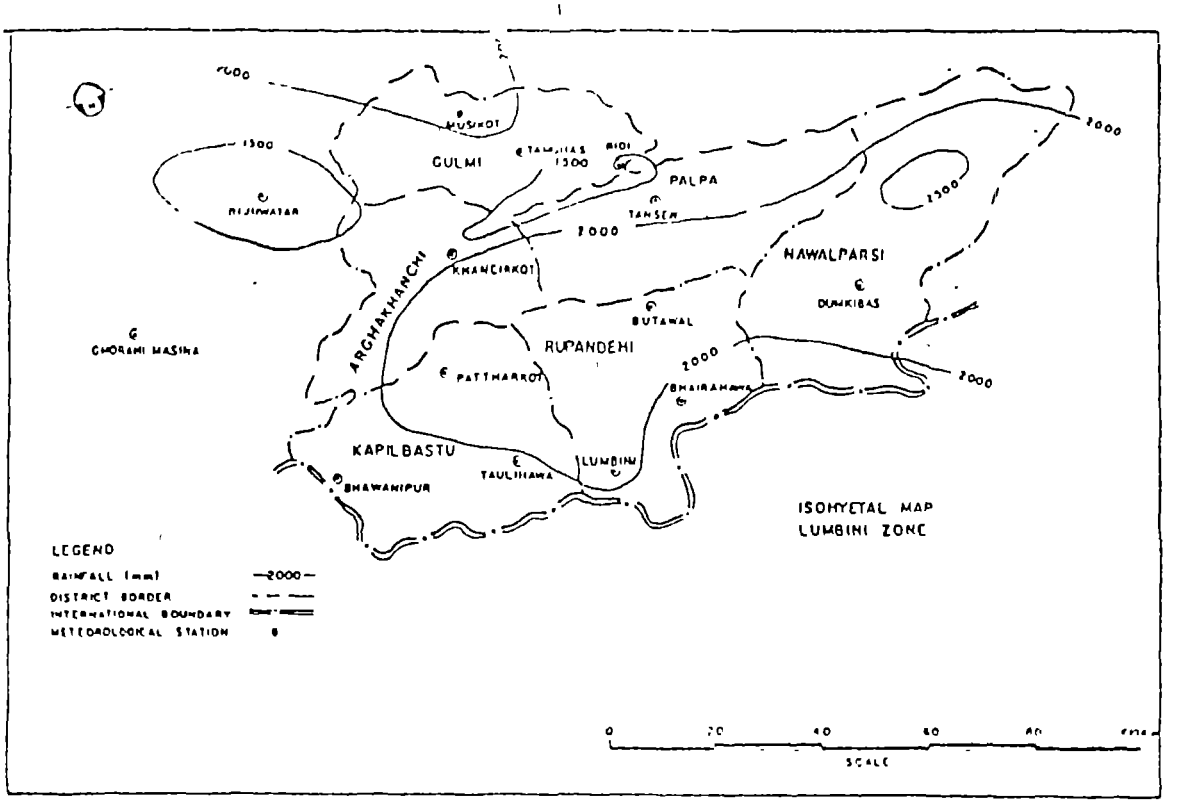
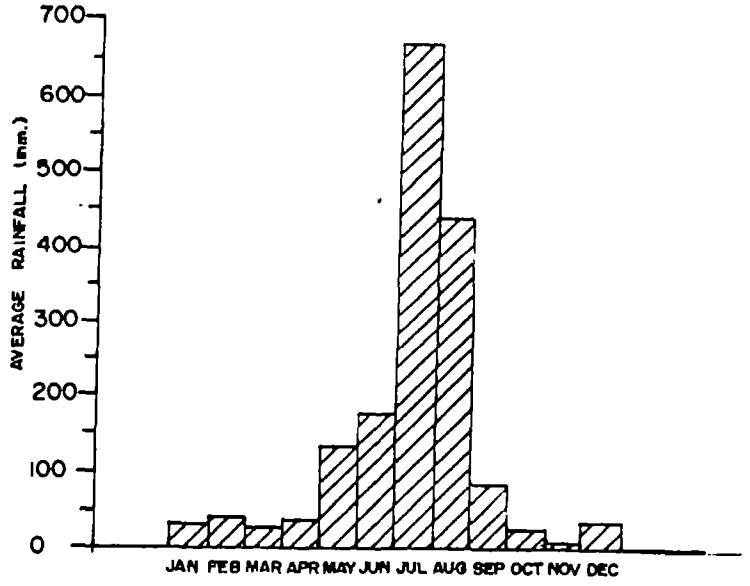


Figure 11. Annual Rainfall Pattern in Tansen Station.



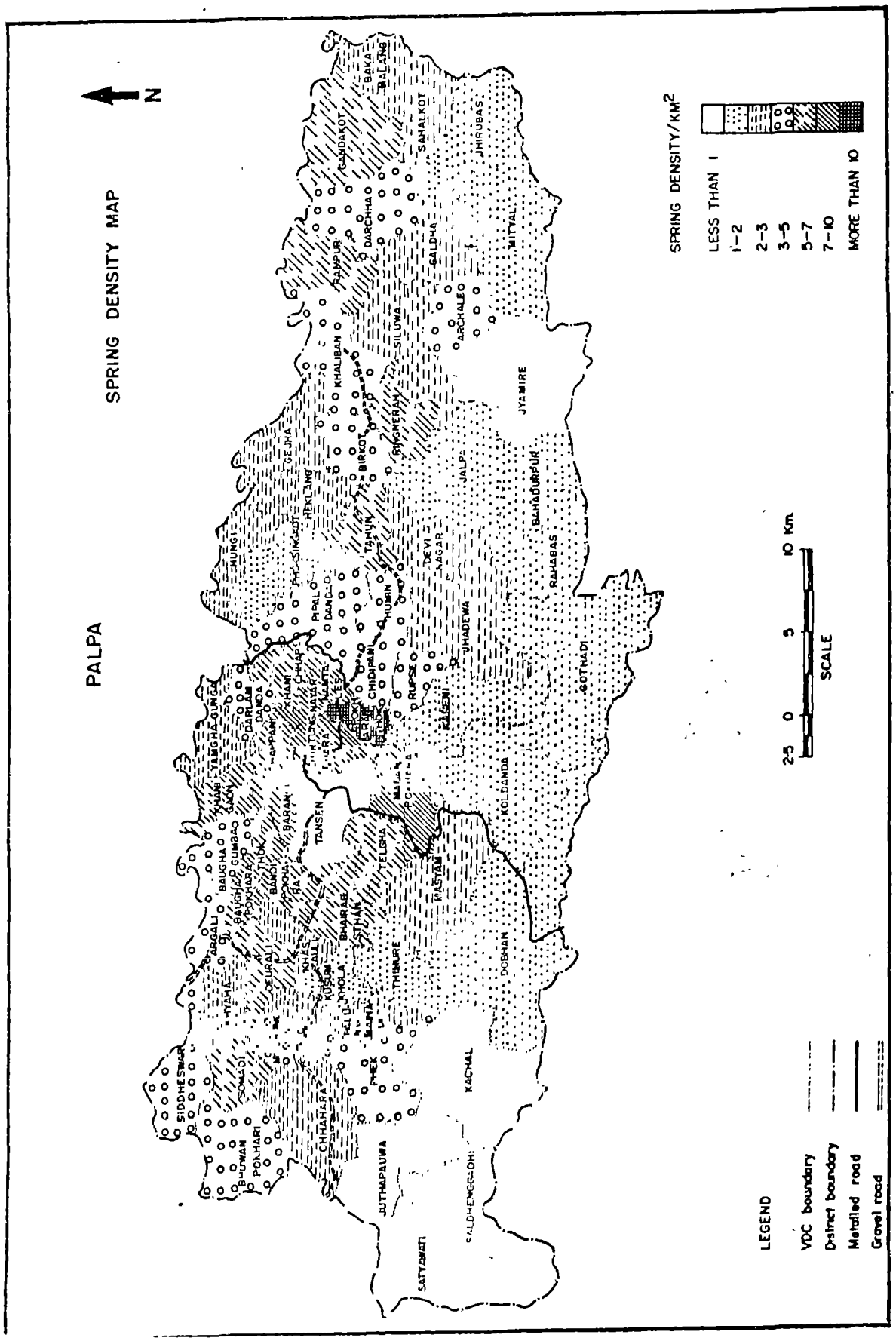
Average annual evaporation comes to 1690 mm measured from the Bhairahawa station. Bhairahawa, however is situated in a different type of climatical zone, and the evaporation data cannot directly be transferred to Palpa.

4.2 Ground Water Resources

Knowledge on ground water sources in Palpa is very limited. Based on the geology and its groundwater characteristics, it can be roughly estimated that on average about 5 % of the rainfall infiltrates into the ground and recharging the groundwater resources which, eventually, are discharged through springs. When the average rainfall in Palpa is about 1750 mm per annum and area of the district 1449 km2, it can be thus estimated that the total average groundwater yield is about 130 mill.m^3/a (350,000 m^3/d or 4 m^3/s). In dry years the yield can decrease considerably, maybe by 25 %.

During the field survey 1993 the perennial springs in the district were recorded. In total, 4021 springs were identified. The average spring density is 2.8 springs/km2 varying in the different areas from 1 spring/km to 14 springs/km. The spring density in the various VDC's in illustrated in Figure 12. The spring density in the District seems considerably high compared to the other districts surveyed by RWSSP.

Figure 12. Average Spring Density in the VDCs of Palpa.



Spring measurements or follow up has not been done in Palpa District systematically. Measurement data is readily available only from the RWSSP/FINNIDA constructed systems, but this is not quoted here as the springs are not chosen randomly.

Data is however availabe form Arghakhanchi and Gulmi Districts, where spring yield measurements are undertaken on regular basis and in random sampling. During the field work of this District Water Supply Development Plan, in 46 places V-notch dams have been established in the Arghakhanchi and Gulmi District in small streams and perennial springs. Systematic follow-up and record reading has been organized, to get a better picture of the hydrological conditions of the district. Dry period spot measurements at these stations and other potential sources, taken at the end of May 1992 and 93 are summarized in the Table 11. below.

A sample of hydrographs, prepared in the RWSS project during this spring follow up is presented in Annex 6.

Table 11. Summary of Low Flow Measurements in Springs and Small Stream in May 1992 and 93, in Arghakhanchi and Gulmi Districts.

Low flow, l/s	No of measurements
0 - 1	331
1 - 2	42
over 2 l/s	30

The preliminary results show, that most of the springs and small stream not yet taken into the use of water supply, have a very small low flow, i.e. below 1 l/s.

The physio-chemical and hygienic quality of water in the springs is, according to the sampling done in other hill districts of the Lumbini Zone, generally good. The most common problems are high calcium content, causing scaling in the water supply pipes and high iron/magnesium content making the water unpalatable.

The hygienic quality of the groundwater sources can be assumed to depend on the protection, the unprotected sources mostly being polluted by human activity, and the quality being good in protected sources.

The bacteriological quality in springs is generally good, but deteriorates somewhat during the rainy season if adequate protection is not there. Some hygienic water quality results of

the regular sampling programme of RWSSP are presented in Appendix 7.

4.3 Surface Water Resources

The main rivers in Palpa are Tinau Khola and Kaligandaki.

The river system of Palpa is presented in Figure 13 below. The flow in the rivers fluctuates greatly depending on the rains. The minimum flow originate entirely from the springs in the catchments. The water quality in the rivers changes with the flow and is fairly good during the dry season and very turbid during the rainy season. In general, the hygienic quality of the river waters is not satisfactory for drinking purposes without treatment. The features of the catchment (vegetation, human settlements) affect the water quality of the stream. Annex 7. gives some tentative data on the water quality of the rivers, data is abstracted from the regular sampling programme of th RWSSP.

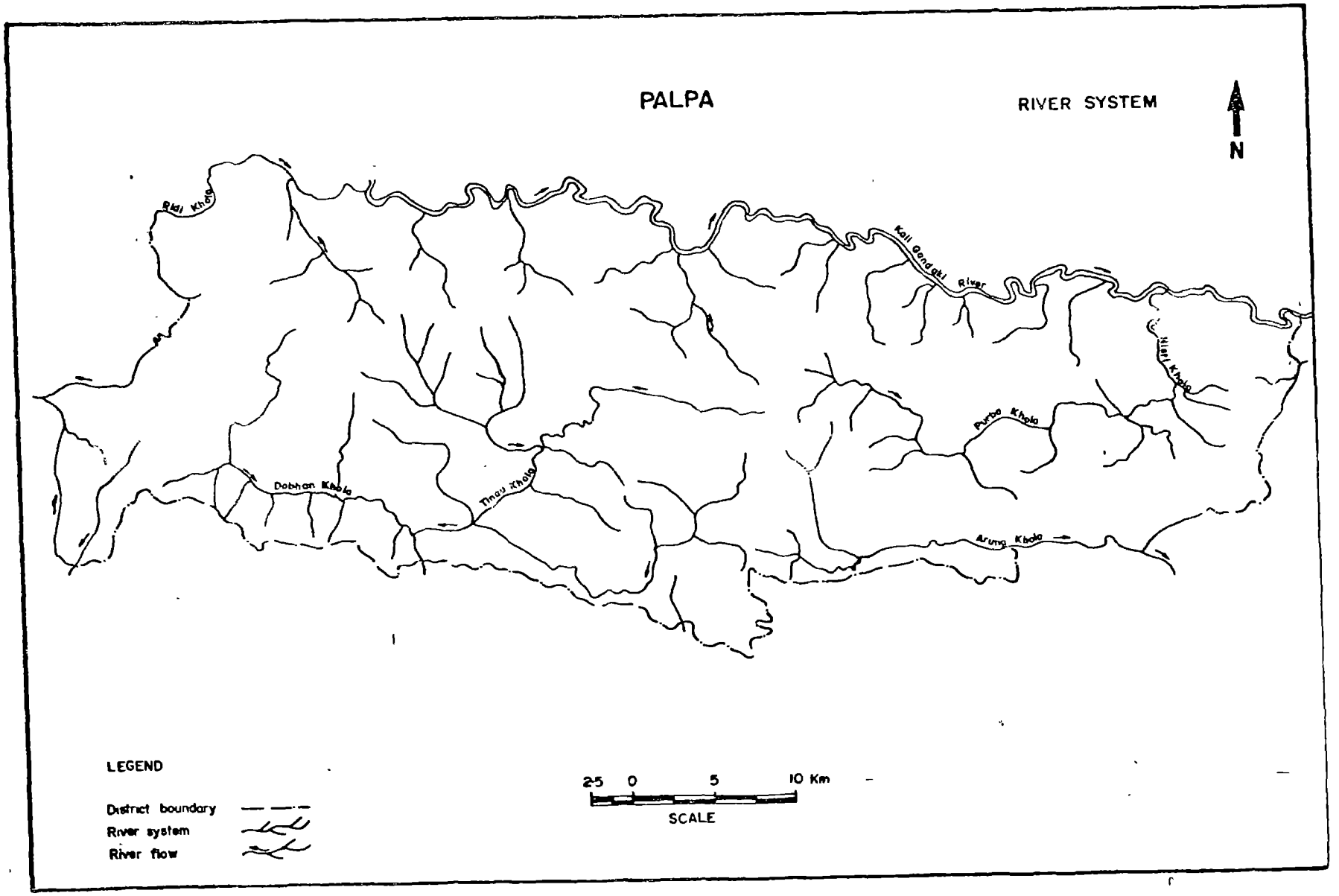


Figure 13. River System of Palpa.

5. WATER DEMAND

5.1 Population

The rural population of the Palpa District was, according to the field survey undertaken by the RWSSP, 272,724 in 1993 and the population of Tansen bazaar about 16,100. The annual growth between 1981 and 1991 was, as calculated from the national census figures for Palpa 1 % , which is below the national average of 2.07 % for rural areas and also below the 1.8 % estimated for the Midlands.

The future projections are presented in Table 12. below:

Table 12. Population Forecast

	1993	growth p.a.	1997	growth p.a.	2002
rural	272,700	0.9 %	282,700	0.9 %	295,600
bazaar, town	16,100	2.0 %	17,400	2.0 %	19,200
Total	288,829	1.0 %	300,100	1.0 %	314,900

The population projections in each of the 66 VDC's are presented in Annex 8.

5.2 Other Users

Most of the households in the district have domestic animals, cows, buffaloes, sheep, coats, poultry, etc.(see Chapter 2.6), and they use water, either from a water supply system or a natural water courses. The number of animals can be estimated to grow at the same rate as the population.

In addition to the domestic use of water other users which need to considered are schools, health posts, other institutions and commercial premises and workshops. Major industries do not exist in Palpa District.

The school enrolment already represents about 100 % of the school going age group at the primary school level. Therefore, it is estimated that the enrolment will grow at the same rate as the population. The health facilities as expected to double between 1993 and 2002. The estimated projections of the school enrolment and the number of outpatients are as follows:

	1993 (actual)	1997 (projection)	2002 (projection)
Primary schools, pupils	41,800	43,450	45,600
Middle level schools, students	13,300	13,800	14,500
High schools, students	21,200	22,000	23,100
Campus, students	2,600	2,700	2,800
Health posts,auyrvedic hospitals	16	25	32
Hospitals, beds	152	200	300

The school enrolment figures have been obtained through the field survey 1993.

5.3 Water Demand

The water demand forecasts have been made on the basis of the DWSS design criteria.

5.3.1 Domestic Water Demand

The domestic water demand for piped water supplies in the rural areas is estimated at 45 litres/capita/day (lcd). This consumption includes losses and wastage of 20 %.

In areas, where suitable sources for piped systems are not available and point source improvement with difficult access (water collection takes more than 15 min) is designed, the consumption rate of 25 lcd can be used.

In bazaars and town areas the unit water demand is estimated as 60 lcd.

5.3.2 Other Water Demand

The per capita consumption of the domestic animals are estimated at following rates.

- cow 45 l/day
- buffalo 45 l/day
- horse 45 l/day
- sheep, goat 5 l/day
- pig 5 l/day

In many cases the animals can be watered from natural sources but often, particularly in case of buffaloes, which are not well

adopted to moving up and down steep slopes, they have to be watered at the household using normally the same water as used for human consumption. Considering that a major part of the animal consumption can be satisfied from the natural sources, their average requirement is here estimated to be 20 % of the their calculated daily consumption.

The water demand of the schools is estimated at 6 l/pupil/day and in the campus 45 l/d. Health post are assumed to use water 1000 l/day when not equipped with latrines and 3000 l/d when latrine is available. In the hospitals the consumption is estimated at 3000 l/bed/day.

Other institutional water consumptions are included in the domestic consumption.

Commercial water demand is estimated at 10 % of the domestic consumption in bazaars and town areas.

5.4 Total Water Demand

The water demand forecasts have been made assuming that the specific consumption rates will stay the same throughout the planning period.

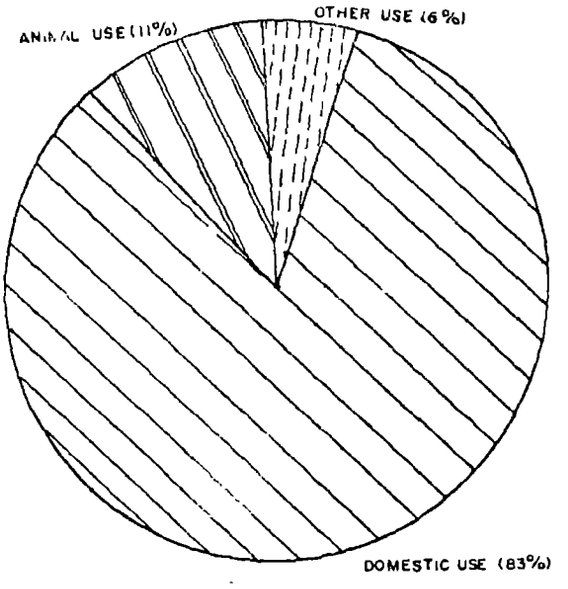
The total water demand projections for the district are presented in Table 13 below:

Table 13. Water Demand Forecast

Water Demand, m3/day	1993	1997	2002
Domestic			
- rural	12,300	12,700	13,300
- bazaars and towns	1,000	1,000	1,100
Domestic animals	1,700	1,800	1,900
Schools	470	490	520
Health posts and auyrvedic hosp.	16	25	32
Hospitals	450	600	900
Commercial and workshops	100	110	115
Total Water Demand, m3/day	16,000	16,800	17,900
" , mill.m3/year	5.9	6.1	6.5

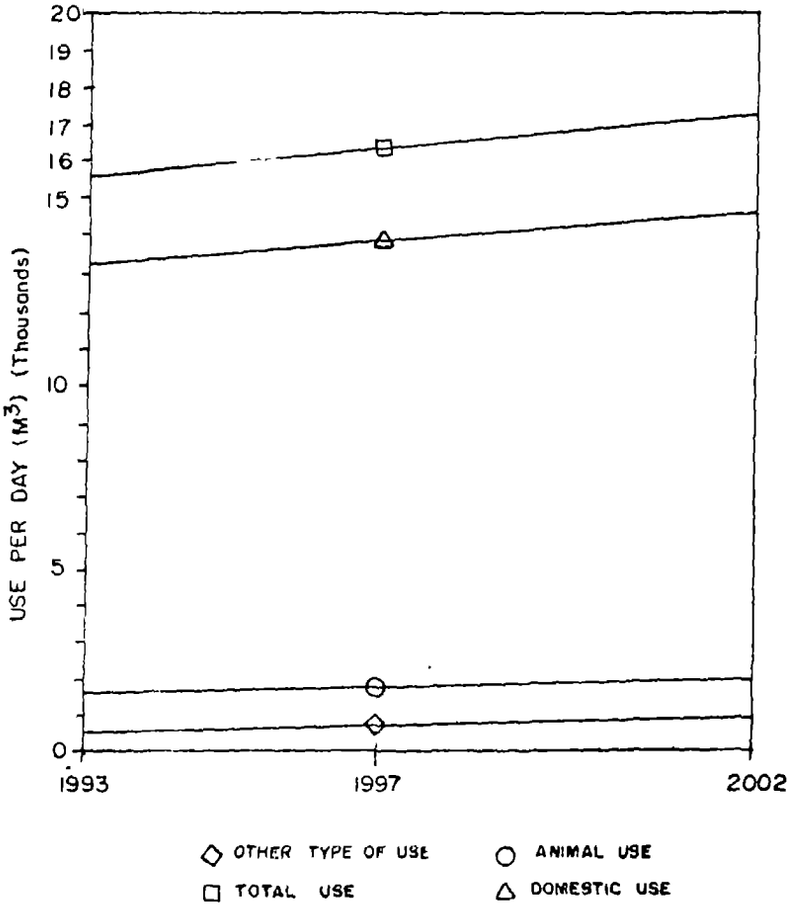
The distribution of the demand between the different users is illustrated in Figure 14.

Figure 14. Distribution of Water Consumption between Users.



The forecasted growth of the demand is graphically illustrated in Figure 15.

Figure 15. Water Demand Forecast



6. SOCIO-ECONOMIC, CULTURAL AND HEALTH ASPECTS RELATED TO WATER SUPPLY AND SANITATION

6.1 Social Aspects

The community participation approach in water supply implementation requires full commitment of the community in the implementation, operation and maintenance of the system. This commitment will not be achieved, if the community does not see water supply as it's development priority in the first place. The communities may want to invest their time and effort in school building, irrigation or road construction, not giving water supply a high priority.

There must be a felt need for improving the water supply situation. In areas, with relatively good existing service level and reliable and sufficient water supply, even if not good quality, the motivation for community participation projects can be difficult to achieve.

The request from the villagers to start the water supply project is therefore a necessary prerequisite for any future water supply development.

In the planning and implementation of the water supplies, it is important to guarantee the representation in the Users' Committee of all the different ethnic, social and caste groups of the supply area. The distribution of the tapstands and other supply points must be, although decided by the community, checked by the technical staff to avoid misuse of the communal water points. The points should serve all the population equally, not giving privilege to any groups or individual.

If the community is not informed about all their responsibilities and rights, and not involved in the planning and management of the work in every stage, disputes between the different groups of the project area sometimes occur. This may concern the type of water supply requested, location of supply points, timing of work, etc. In these situations the technical staff should try to clarify possible misunderstandings and get the Users' Committee to solve the dispute. However, they should also make sure, that there are no underprivileged groups in the village, suffering from the decisions made by the Users' Committee.

Source disputes, concerning the right of use of a spring for water supply of a certain community, regularly occur in the areas of scarce supply. Therefore, it is necessary to check other users and uses of the proposed sources. In the new legislation concerning the use of water resources, it has however, been clearly stated, that the use of a source for drinking water supply has the first priority. Other uses only follow, when the requirement for the drinking water supply is satisfied.

It is recommended that in case of large water supply systems they are broken down into small sub-systems mainly following the social and cultural boundaries in the supply area. The maintenance responsibility of a sub-system can be given to small, preferably homogenous, groups who will form their own Users' Committees.

6.2 Cultural Aspects

Different ethnic and caste groups do have different practices as regard to the water supply and sanitation. The groups using less water in their households should be provided more (within the design guidelines and technical possibilities) and encouraged by health education to use more water. Health behavior studies, using the rapid assessment methods, provide quick, cheap but reliable information about the basic hygiene and water use practices. These should then be used as the basis for all health education and sanitation programmes.

6.3 Home Economy and Affordability

The operation and maintenance costs of the scheme must be estimated before construction and the community given clear understanding about the financial burden the scheme will represent to the community members. This should be calculated on a household basis e.g. NRs 100/hh/a and clearly informed to all the community members.

Some indication of the affordability of the scheme for the community can be obtained, if the Users' Committee is asked to raise e.g. two years maintenance costs before the construction starts. This also gives an indication of the community's ability of fee collection, accounting, trust between the community and the leaders to handle the community money.

6.4 Health Aspects

The health improvement of a particular community can not be achieved with an improved water supply system only. Hygiene and sanitation habits must be improved, only then the improved drinking water has some impact.

The government has, through its primary health programme and educational system, all the channels and infrastructure necessary for health education in the village level. These systems, are however, somewhat hampered by lack of motivated and trained manpower and teaching aids. Health and hygiene education is also difficult if the water supply situation is poor. The schools (and health posts) with no water supply and no latrines can not act as an example of a hygienic environment, and hence as a habit creating surroundings for the children (or patients).

The water supplies should be carefully designed not to create any drainage or water logging problems in the villagers. Spill and overflow water should be carefully drained away to the fields. Watering facilities for domestic animals should be arranged so that they can be drained and cleaned so as not to form breeding places of mosquitoes.

7. WATER SUPPLY DEVELOPMENT PLAN

7.1 Water Supply Options

7.1.1 The Sufficiency of the Water Resources

The estimated annual water demand in 1993 is 5.9 million m3. The annual groundwater recharge rate has been estimated to be 130 million m3. Therefore, it can be assumed, that the groundwater resources, i.e spring sources, can supply the future demand. However, water requirements for irrigation is already considerably bigger than the domestic water use and can be assumed to grow further in future. Therefore, there will be areas in future where the total water requirement exceeds the available sources. In those cases, domestic water supply should always have preference over other uses of the same water resources.

As this plan does not recommend the construction of pumping systems or treatment of water, the potential sources for (untreated) gravity water supply may in some areas be less than the total groundwater yield.

The spring density map shows some areas with spring density of 1 - 2 springs/km2 only, so some areas may face problems locating a feasible source for the water supply. But generally, in the majority of the district, the spring density seems to be quite high. It can also be assumed, as shown in the first field surveys, that most of the springs fall into the category of "low flow below 1 l/s", which means, that large distribution networks can not be built. However, with some relaxation of the accessibility criteria ("collection point within 15 min to go, fill the container and come back"), the area seems to be well coverable with small gravity systems and protected springs. This conclusion can also be drawn looking at the 1:25 000 maps, which show the settlements as well as the potential sources discovered during the field survey.

7.1.2 Source Options

In absence of usable groundwater aquifers, spring and stream sources are the only options for water supplies in Palpa District. In special cases rainwater collection may be prove to be a feasible alternative.

Numerous springs in the area (see Chapter 4.2) are at the moment the most common source of water supplies in the district. The advantages of the springs over surface water sources are:

- The yield is normally more stable
- The quality of the spring water is normally good and they are easier to protect against pollution, so treatment is not needed
- Springs are usually located at higher elevations and gravity flow to the supply area is feasible.

The disadvantages are low yield and difficulty of collecting water from the often scattered seepage of a spring. Spring sources sometimes have high concentrations of calcium and magnesium, causing scaling of the pipelines and appliances.

Streams are also widely used as sources for piped gravity systems. Since the dry season flow of the streams originates from the springs, they can be considered as accumulation of flows of springs in their catchment area. The advantages of the streams as source are the greater yield and the many options for selection of the point of abstraction. The disadvantages of the streams are the great fluctuations in the flow and quality, torrent floods, and the difficulties in preventing the contamination. Stream sources flowing at the lowest point in a valley require the intake located far away from the consumptions points in order to gain the necessary difference in elevation for gravity flow.

Small springs and open shallow seepage wells/pits (kuwas) located near the settlements, can be protected and improved as point sources.

7.1.3 Technology Options

The most common water supply technology presently used in the district is piped gravity system with public taps as collection points. In limited cases, mainly in bazaar areas, some individual houses have private connections. Gravity piped schemes will continue to be the main technology also in the foreseeable future. With regard to the size of the schemes, the operational records of the existing schemes (Chapter 3.5.2) show clearly that small systems covering one or few clusters only are more reliable than the larger schemes.

Springs with low yields can be protected, improved and used as point sources for water supplies. Also non-flowing point sources (kuwas) can be protected as point sources.

When gravity systems are not possible due to the high elevation of the consumption areas pumping would be required. In the present situation, where the economic potential of the

community to pay for high operation costs is poor and problems on the regular supply of fuel and spares exist, pumping schemes should be constructed only in very special circumstances. In such situations sustainable operation and maintenance system must be assured. In some limited cases, where a reasonable size, perennial river exist nearby, hydrams could be used for fuel-free pumping. Where possible, pumping of water supplies should be connected with the small scale hydro-power projects. Rainwater collections systems should be considered on pilot basis in hilltop areas.

7.1.4 Costs

For the planning purposes the following unit costs for construction and O&M and economic life times are used:

	Capital cost NRs/capita	O&M cost NRs/capita/yr	lifetime years
Gravity piped W/S (small schemes)	1600	20	20
Protected springs	400	10	10
Rehabilitations of piped W/S	1000	20	20
Completion of schemes under construction	800	20	20

Completion of an ongoing water supply scheme is estimated to cost on average 50 % of the cost of a corresponding new scheme.

7.2 Planning Criteria

7.2.1 Planning Horizon

The plan covers the period of 1992 - 1997 (the period of the 8th Five Year Plan) and gives the outline for 1998 - 2002 (the period of the 9th Five Year Plan).

7.2.2 Consumers to be Served

The Plan focuses on the human consumption, thus covering domestic, institutional, commercial and small scale industries' demand in rural areas and commercial centres. A moderate provision (20 %) of the water demand for domestic animals is made but major industries and irrigation are excluded.

7.2.3 Service Levels

The water supply coverage targets have been set according to the recently published 8th Five Year Plan. The definition of the coverage has been done according to the design guidelines of the Department of Water Supply and Sewerage and falls hence in to the Service Level 1 (good) defined in the chapter 3.6.3 of this report.

The Plan aims at improved water supply service for increased number of people. People receiving a good service level (see Chapter 3.6.3) are expected to increase from the present (1993) 14 % to 72 % in 1997 and 100 % in 2002. The target is to provide good quality water at 45 lcd within a walking distance of not more than 15 minutes (150-200 meters) and supplied round the year for more than 6 hrs a day.

In the difficult hilly environment of the Palpa District these requirements, particularly the walking distance and the time, might have to be relaxed when suitable sources for gravity water supply do not exist. This means that when a scheme is designed for a community where part of the population lives at unserviceable elevations, consideration should be given to locate the water collection point (taps/point sources) as near to the community as technically feasible. This can also be defined by saying that part of the population will remain in Service Level 2. This has also been taken into consideration in the cost calculations of the Annex 8, where those people, presently receiving Service Level 2 by improved water supply (gravity or protected spring), will not be taken into the investment programme.

Water will be distributed mainly through public taps and point sources. Individual connections are planned for rural health posts, for institutions and administrative premises and for a limited number of commercial and private consumers in the urban areas (Tansen). One public tap should not serve more that 120 people (design population).

7.2.4 Water Quality

Water supplied to the consumers should in principle meet the guideline standards set by WHO. However, since treatment of water is practically unfeasible in most of the schemes, the Plan emphasizes the selection of a good quality source and its protection in order to secure good quality water even without treatment. This means that springs are preferred over other types of water sources e.g. streams, open wells and alike.

7.2.5 Technology

For the reason of sustained operation and maintenance, only gravity systems or point source water supplies are included in the Plan. Cost and design data as well as operational experience from rainwater collection systems is too limited at this stage, to allow for any reliable planning.

The technology used must take into account the socio-cultural aspects as described in chapter 6. Based on them and on the poor operational records of the large schemes the Plan recommends small systems of maximum 10 taps outside urban areas. Larger systems should be broken into smaller sub-systems with independent tanks and distribution networks. The locations of wells and, in case of piped water supplies, the boundaries of the distribution network, tap locations, siting and number of the tanks should be decided in cooperation with the consumers.

Health aspects have been included in the planning criteria by introducing enough water (45 l/c/d) to increase the present water use. The Plan also recommends collection points with platforms large enough for washing, proper drainage systems and properly protected sources.

7.2.6 Environmental Aspects

Construction and use of predominantly small gravity systems is not expected to cause any major negative environmental effects. Nevertheless, such works as tree cutting and trench digging, clearing the tank and intake sites, access roads, etc. can cause erosion if correct measures are not taken during the preparation of the work and during construction. Environmental guidelines to be used in the scheme construction are presented in the Annex 9.

Consumer education in questions of watershed protection and drainage of the spill water are extremely important and require joined efforts of different organizations, including the forestry, officials.

7.2.7 Institutional Aspects

The development of the water supply sector requires better coordination, standardization and exchange of information than at present. Different implementing/financing agencies - the government, donors, NGOs - must agree over policies, division of responsibilities and annual implementation programmes. Better mutual coordination and planning would result in economical use of scarce resources and less overlapping.

Water supply planning should become an integral part of the overall district planning and should, therefore, be guided by the District Development Council and coordinated by the LDO. The annual development programmes in water supply sector will be approved by the DDC.

The DWSO will remain as the lead agency in the water supply sector in the district but will shift its emphasis from the direct implementation and operation more towards monitoring and evaluation.

The role of the communities in planning and implementing of water supply systems will become stronger and they will assume full responsibility for the operation and maintenance. For this purpose Users' Committees will be formed in all water supply schemes.

7.2.8 Financial Aspects

The Plan is based on a water supply development spelled out by the 8th Five Year Plan. The financial considerations are as follows:

- The Government development funding will continue at present (92/93) level, on average NRs 10 million annually;
- The donor funding must increase about 50 % from the present (92/93) level, 6 million NRs to about 10 million NRs annually
- If funds can not be made available from the Government or donor agencies, the private households and NGOs must be encouraged towards financing the sector
- The consumers will meet all direct operation and maintenance costs of the water supplies, and will provide the necessary local materials unskilled manpower during the construction (about 20 % of the total cost).
- A considerable shift of financing must take place from construction of new water supplies towards annual renewal and rehabilitation of old schemes.
- The consumers must also meet the costs of Tansen water supply, which at the moment represents a financial burden to the DWSO.

7.2.9 Priority Criteria

As the community participation and management of water supplies is the general approach of the Plan, no water supply

development should be started or implemented without the request of the benefitting community and its full consent and participation.

When such a request and commitment exist, the Plan gives priority to the following types of water supply development:

- schemes which serve low service level areas (hardship areas);
- schemes having low per capita investment and O&M costs;
- rehabilitation of existing schemes if otherwise feasibly;
- completion of schemes under construction;
- small schemes serving one or few communities (clusters) only;
- schemes which provide for the needs of the poorer fraction of the community, which does not have their own means to improve their water supply situation.

7.3 Development Scenarios

During the preparation of this Plan different water supply development scenarios were considered representing different service coverage level and different technologies.

A scenario based on the continuation of the present level of financing would result in the availability of investment costs only, but renewal and operation and maintenance costs would not be covered. The requirement for renewal and operation & maintenance is however high, and there costs must be recovered, mostly from the users.

The technology based on large schemes, river intakes, or pumping systems would be more expensive to construct and uneconomical to operate.

Lower targets (e.g. 70 % in the year 2000) in the service coverage are possible and would be easier to achieve, but are not in line with the national targets.

7.4 Water Supply Development Plan 1993-2002

7.4.1 General Approach

The water supply development in the Palpa District will be based on the community involvement and community management, thus the emphasis will on small gravity schemes or point sources

whenever possible and feasible. Target is to provide good (& acceptable) service level of water supply for 72 % of the population (203,200 people) by year 1997. The aim is to fulfill the criteria spelled out in Chapter 7.2.3, but their flexible application is emphasized in the sometimes difficult situations in the district - improvement of water supply service is more important than a strict adherence to fixed criteria.

The development of new water supplies will be directed to the areas where the present service levels are the lowest (i.e areas of high hardship rating). For practical reasons it would be useful if one VDC is considered as a unit where water supply development is completed once a programme is started there (to the extent possible taking into account the water resources).

In the Plan the communities role is emphasized: water supply development should not be forced on the people, instead, the implementation of improved water supplies should only take place when the benefitting communities request it and are ready to assume their part in the implementation and operation and maintenance. Since it is not possible to predict communities' attitude at this stage, it also not possible to precisely define which clusters, wards and VDCs are covered in any given year. Therefore, the Plan can only give indications of priorities and possible options and set financial and capacity frames for the development. A guideline hardship figures and the listing of the VDCs in the Hardship order is given in the Annex 4.

The following procedure is suggested for the use of the Plan in the preparation of annual implementation plans:

1) The requests from the communities are filed/collected in the DWSO.

2) Preliminary costings of the requests up to the coverage suggested in the Plan is made using the Plan data (Annex 4).

3) The DWSO puts the requests into the priority order using the hardship rating presented in the Plan (Annex 8) and the preliminary costings.

4) This list is then discussed in the District Water Supply and Sanitation Coordination Committee (see Chapter "7.4.3 Institutional Development") and preliminary financing plan is drawn up, including HMG, donors and NGOs.

5) These costed, prioritized lists of requested VDC programmes with possible financing options are then forwarded to the DDC for their consideration and approval.

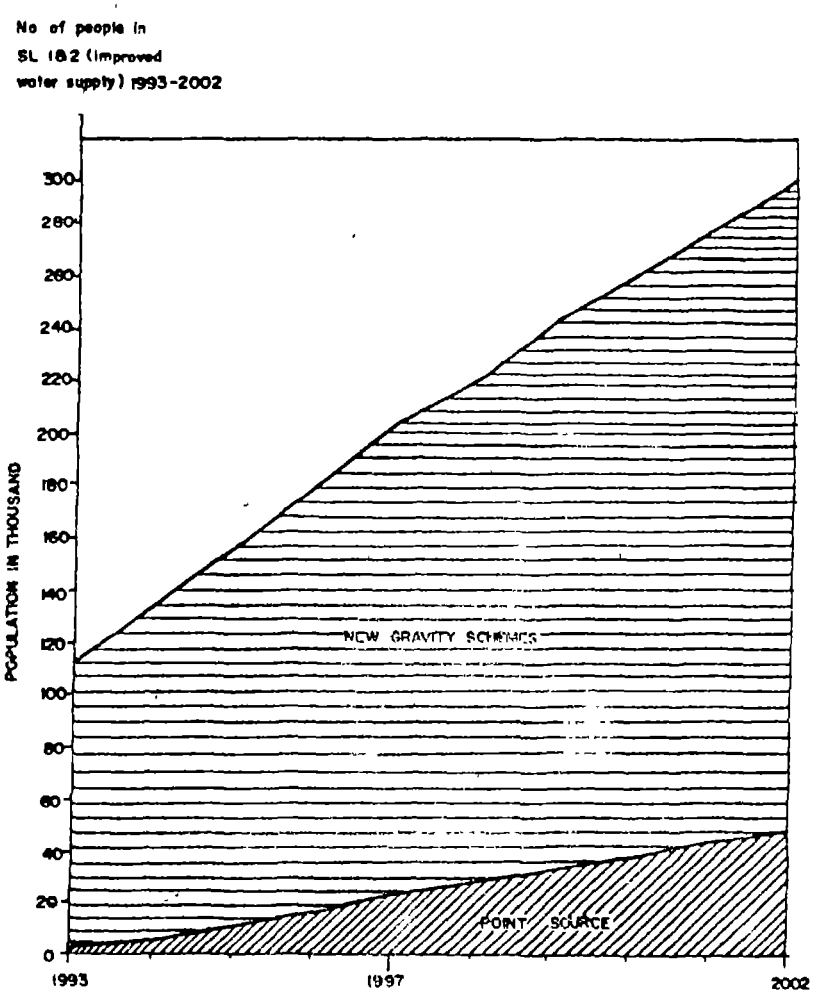
The approved annual water supply development programme is binding for all implementing agencies - the DWSO, the donors and the NGO's.

7.4.2 Water Supply Coverage

People receiving good and acceptable service level (1 & 2) of improved water supply is expected to increase from the present (1993) 41 % to 72 % in 1992 and 100 % in 2002. The estimated development of the water supply coverage in VDC's is presented in Figure 16.

The coverage target of 72 % in the year 1997 is an average figure for the district and the individual VDCs have variable coverage figures, some are higher some lower than 72 %. This somehow reflects the availability of water sources and hence the costs of implementation. The VDCs with abundant potential sources would be covered quicker and with less cost, than those having scarce sources and long pipelines.

Figure 16. Water Supply Coverage 1993-2002.



7.4.2 Water Supply Development

The water supply development in Palpa District during 1993-2002 takes place in three categories:

1. Completing the present water supply construction projects;
2. Rehabilitation of existing water supplies;
3. Construction of new water supplies.

Table 14. below shows the summary to the implementation programme. A more detailed description (VDC wise) of the water supply development is presented in Annex 8.

Table 14. Water Supply Implementation Programme

Item	1994-1997			1998-2002		
	No of systems	Popul. served	Cost, mill. NRs	No of systems	Popul. served	Cost, mill. NRs.
Completion of ongoing projects	22	10,234	8.2	-	-	-
Rehabilitation of existing system	90	20,300	20.3	-	-	-
Construction of new gravity systems	150*	33,600	53.7	270*	59,300	94.9
Construction of new point sources (protected springs)	220	22,000	8.8	250	24,400	10.2
Renewal of facilities, 5 % annually			51.0			97.4
TOTAL	482	86,134	142.0	520	84,700	198.5

* *Average scheme size same as at present, i e. 220 pers./scheme.*

The projects to be completed and rehabilitated are shown in the set of District Maps, 1:25,000 in Volume 2.

7.4.3 Institutional Development

Sector Coordination in the District Level

The district office of the Department of Water Supply and Sewerage will remain a lead agency in the water supply sector in Palpa District. Its role will change from the present implementation oriented more towards monitoring and evaluation.

The coordination of the water supply and sanitation activities in the district needs to be improved considerably. To facilitate this a District Water and Sanitation Coordination Committee shall be established under the chairmanship of the LDO and meeting regularly 3-4 times a year to discuss and review the progress of ongoing programmes and projects and the future plans. The District Engineer, who will be the secretary of the Committee, will prepare the necessary progress reports, plans and other documents for the Committee's consideration.

The Committee will recommend the annual implementation programme as outlined in the chapter "7.4.1 General approach" to the DDC. It should also prepare annual financing plans, recommending which VDC/water supply scheme should be taken by which implementing agency. This would minimize parallel planning and implementation activities. It is economical for one implementing agency to work in a limited area and take new areas in the proximity of old ones.

The Committee should facilitate for coordination between water supply, health education and sanitation programmes. An attitude change towards good health, hygiene and sanitation practices can be achieved among the population when the community is already working for improvement of their water supply. Sanitation campaigns are also better received by the communities simultaneously with the water supply improvement.

Common operation and maintenance policies and division of responsibilities should be agreed upon in the Committee. The questions like "Will the DWSO give pipes and fittings to the broken British Gorkha constructed schemes?" must be discussed. The revitalization of the O & M systems of the old existing schemes (formation of the Users' Committees, training of the village maintenance workers etc.) should be discussed and actions agreed upon.

The Committee should comprise at least the following members:

- LDO, Chairman
- District Engineer, DWSS, Secretary
- District Public Health Officer
- Representative of each donor programme having a water supply and/or sanitation component
- Representative of each NGO Programme with water supply and/or sanitation component

Manpower Development of the DWSO and Other Agencies

The implementation level, required for the achievement of the coverage target of 72 % in the year 1997, is about 21,000 population covered (rehabilitation included) annually. This puts a considerable pressure on the existing institutions and manpower resources. The output of the present implementing agencies can be estimated from the ongoing schemes (Table 5.). Water supply systems for 11,000 population was found to be under construction during the field survey. If a three year period for completing all schemes under design and construction is allowed, the annual output would be something in the region of
5,500 people. To achieve the targets set by the 8th Plan the institutions' output must be increased considerably from the present level.

Table 15. gives some estimates of the manpower requirement.

It is noticeable, that the present manpower structure of the DWSO is geared and burdened by running the completed systems, especially Tansen water supply. Alternative management systems must be created for these water supplies, hence freeing the government from the excess burden of employing so many people.

The annual implementation of about 21,00 people consists of on average 95 small projects (220 population on average) to be completed every year. As for a small project, the completion time (actual construction work) is maximum 2 years, 190 systems are under construction at any one year. For efficient implementation these small systems should be located near to each other, preferably several systems under implementation in one VDC. If on average 5 systems are assumed in one VDC and 2 technicians (one senior, one junior) to work in one VDC, a total of 38 senior and another 38 junior technicians are required. One overseer is required to supervise 3 technicians. These assumptions are used as the basis of the manpower plan in the Table 15.

The changing responsibilities of DWSS will be reflected in the organization structure and personnel development - more inputs are required in planning and design, coordination and community promotion. The present set up is also not able to cope with all the implementation requirement. The actual implementation and

construction will be more spread out - to other agencies and the private sector.

The manpower within the DWSO will also be upgraded, so that peon's posts would be upgraded to technician posts. New posts of engineer, community promotion officer, overseers and technicians must be created and respective training programmes to upgrade the present staff to be implemented.

Table 15. Manpower requirement

Staff Group	1992 (Present)	1997 - 2002 (Proposal)	
	DWSO (including Tansen w/s)	DWSO	Other Agencies
Senior technical staff (Engineers)	4	2	1
Overseers	7	15	9
Senior Technicians (WSST)	8	23	15
Junior technicians	56	23	1 5
Peons and other staff	31	-	-
Community promotion officer	-	1	1
Administrative staff	7	7	-
Total staff	112	71	41

The Logistics

The facilities of DWSS need to be improve which means that the present plot reserved for DWSS use have to be expanded. The priorities are:

- Permanent office, stores and workshop
- Survey equipment
- Workshop equipment
- Office equipment
- One vehicle, 4-wheel drive
- One tractor with trailer

7.4.4 Operation and Maintenance of Water Supplies

The operation and maintenance of gravity piped schemes and point source water supplies should be the responsibility of the communities through the Users Committees and the Village Maintenance Workers employed by the UC's.

As planned by the HMG, the schemes presently operated by DWSS should be gradually handed over to the users. The handing over requires in most cases the following activities:

- rehabilitation of the scheme, so that it is technically fully functional and can be handed over;
- formation of the Users' Committee;
- training of the Users' Committee in the management of the water supply schemes - mobilization of people for the maintenance activities, fund collection, accounting, etc.;
- training of the village maintenance worker(s);
- signing of the official handing over documents (Owner's Red Card) as specified in the MHPP Directives of the year 2047.

In case of large schemes, where the forming and functioning of a Users Committee may by difficult, other alternatives should be considered. Tansen water supply should be handed over to the National Water Supply Corporation or the municipality, so that reasonable users' charges could be introduced.

A specific unit or section - Operation and Maintenance Section, as stipulated in the new organogram of the DWSS - should be established in the District Water Supply Office for supporting the Users Committees. Every gravity scheme and point source (except the private ones) should be visited at least once a year and a maintenance report should be prepared on it. The unit should support the users' committees by:

- Training the users' committees and village maintenance staff in questions of operation and maintenance, both technical and non-technical;
- Training and motivating the users' committees in questions of fund raising for the maintenance work;
- Providing necessary technical support, i.e. surveys, designs and cost estimates for the repair activities;
- Providing on-site manpower support (technician) to the communities undertaking complicated repair activities;
- Through regular monitoring and keeping up district level data-bases of the condition of the water supply systems;

7.4.5 Costs

The total capital costs of the water supply sector in Palpa District are presented in Table 16. below. These costs relate to the development plan presented in Table 14 and VDC wise in Annex 4.

Table 16. Water Supply Capital Costs

	Costs, NRs mill.	
	1994-1997	1998-2002
Water Supply Development	142.0	198.5
DWSS Institutions Costs		
- Facilities	5.0	5.0
- Equipment	5.0	5.0
Total	152.0	208.5

The total recurrent costs of the water supply sector, excluding the maintenance costs of private facilities, are in Table 17. below:

Table 17. Water Supply Recurrent Costs

Costs, NRs mill.	1993-1997	1998-2002
O&M of Water Supplies	13.0	24.3
DWSS staff and operations	10.0	10.0
Total	23.0	34.3

The total cost are presented in Table 18.

Table 18. Total Water Supply Costs

Costs, NRs mill.	1993-1997		1998-2002	
	Total	Annual	Total	Annual
Water Supply				
-Capital Costs	152.0	38.0	208.5	41.7
-Recurrent Cost	23.0	5.8	34.3	6.9
Total	175.0	43.8	242.8	48.6

7.4.6 Financing

The financing of the capital and recurrent cost will be shared between the government, donors, NGO's and the beneficiaries. The beneficiaries contribution is the value of the labour and material provided during the implementation. The direct O&M cost of water supplies are expected to be fully met by the beneficiaries, although some provision for government contribution is made to meet the cost of the follow-up ant technical support.

Table 19. Financing of Water Supply Costs

	1993 - 1997 NRs mill.			1998-2002 NRs mill.		
	Total	Annual	%	Total	Annual	%
CAPITAL COSTS						
-Government	40.0	10.0	26%	50.0	10.0	24%
-Donors	49.6	9.9	33%	76.8	15.4	37%
-NGO's	32.0	8.0	21%	40.0	8.0	19%
-Beneficiaries	30.4	7.6	20%	41.7	8.3	20%
Subtotal	152.0	38.0	100%	208.5	41.7	100%
RECURRENT COSTS						
-Government	10.0	2.5	43%	10.0	2.0	29%
-Beneficiaries	13.0	3.3	57%	24.3	4.9	71%
Subtotal	23.0	5.8	100%	34.3	6.9	100%

When compared with last few years expenditure and the present - 1992/93 - budget, the above financing plan for 1993 - 2002 means considerable increment in the annual capital expenditure. It also requires transfer of funds from only new construction towards rehabilitation, renewal and operation and maintenance. The beneficiaries share will obviously increase due to the increased implementation volume and, particularly due to the rapidly increasing number of community managed water supply systems.

There is a big increase to be expected in the operation and maintenance costs, most of which is, however to be financed by the beneficiaries. The present operation and maintenance budget of the Government represents only 25 % of the estimated operation and maintenance costs. As the operation and maintenance policies of the government are yet to be detailed and implemented on the national level, it is difficult to say, what is the Government's share of the operation and maintenance costs. It is however clear, that considerable funds have to be generated in the local level to cover the considerable annual operation and maintenance costs of the growing number of the water supply systems.

7.4.7 Risks

There are several factors which may hinder achieving the targets set out in the Plan:

1. Sufficient funds are not made available, either from the government side of from the donors. The most crucial is the donor contribution, which is 33% of the capital costs. As the future of the presently running donor programmes (FINNIDA) is not clear, this risk factor may turn out to be grave;

2. The available manpower for the implementation may create a serious bottleneck for the water supply implementation, operation and maintenance. The development of the manpower base is relatively slow and it has not happened simultaneously and in relation to the increase of available funds. The implementation capacity and the present output of the institutions is also not sufficient to undertake such a big increase in the implementation requirement;

3. The water resource for individual villages and clusters may not always be easily available and much higher costs are resulted than generally estimated in the Plan. It is also most obvious that some of the settlements located on the top of high ridges can not be supplied if the principle of not constructing pumping schemes is followed;

4. The operation and maintenance does not function properly, therefore, the completed water supplies do not provide the expected service. This can be avoided through strong O&M support system and careful planning, design and construction of the schemes;

All the above risks are real but mostly manageable. If they can not be avoided the result will be a slower pace in the implementation or a poorer than expected service level due to the inadequate operation, maintenance and renewal of the water supply systems.

8. SANITATION DEVELOPMENT PLAN

8.1 General Approach

As shown in Chapter 3.8 the sanitation situation in Palpa District is poor (11 % of households in the rural areas having a latrine) and very little is being done for its improvement.

In this Plan it is recommended, that the hygiene education and sanitation promotion programmes are incorporated as essential components into the existing health education programmes. At the same time, there should be good coordination and co-operation with water supply development programmes.

This plan recommends simple pit latrines and VIP (Ventilated Improved Pit) latrines to be promoted in the district. Many of the past programmes of promoting pour-flush latrines, often with a considerable subsidy, now face serious maintenance problems. The pour-flush latrine requires a considerable amount of water for proper operation and is not feasible in households with no house or yard water connection. In schools, health posts and semi-urban areas, pucca type VIP latrines, including an emptiable alternative, are recommended.

The main objective of the sanitation programme is not latrine construction, but a formation of hygienic sanitary habits. The plan therefore recommends hygiene education programmes and sanitation promotion **without subsidy**. Best results are achieved, when people are motivated to build their own latrines, after they have understood the necessity of the latrines for improved health.

Subsidy is only needed for school latrine and health post latrine programme, which concentrates on providing a sanitary environment for these institutions, as an addition to the hygiene education work. The subsidy rate for these latrines is same as for the water supply systems.

Apart from sanitation promotion, the work in the villages would include improvement of the environment by introducing waste disposal and drainage.

In the sanitation promotion programmes, the qualified motivational manpower is the key issue. If each VDC would have a sanitation promotion person, a village health worker and in each cluster, a community health volunteer , a viable hygiene education and sanitation promotion programme could be implemented. This requires an additional manpower (compared to the present government set up) input of village hygiene promoters (village based), one per VDC.

8.2 Sanitation Development

The sanitation development in Palpa District emphasizes health and hygiene education and sanitation promotion and comprises the following components:

1. Manpower development and training
2. School and health post latrine programme
3. Hygiene education and latrine promotion programme in the VDC's
4. Hygiene education programme in the schools

Manpower development and training

The magnitude of the sanitation development can be directly estimated by the manpower input into the programme. The following inputs are proposed:

- Community Health Volunteer programme to cover all the VDCs in the District by the year 1995. Training programme to produce on average 2 CHV per ward means that about 1200 CHV will be trained altogether. They are in the process of being trained, most wards have already been covered with at least one CHV.
- Training programme for all VHWs and health post personnel to manage the hygiene education and sanitation programme, the supervision and follow-up of the CHVs' work.
- Training programme for school teachers to implement hygiene education in schools.
- Appointment of one hygiene and sanitation training officer in DHO's office.

Palpa District has 9 Ilaka health posts and 4 ordinary health posts. These would provide a viable infrastructure for a community sanitation and hygiene education programme, implemented through village health workers, community health volunteers and schools.

At the moment many of the remote health posts are undermanned, suffering from the lack of equipment and not properly managed. The posts for the necessary manpower are, however, there. The personnel is only not motivated to stay at these remote outposts.

These problems could be best solved by choosing local personnel for e.g. village health worker training and posting professional staff in the health post near their home area.

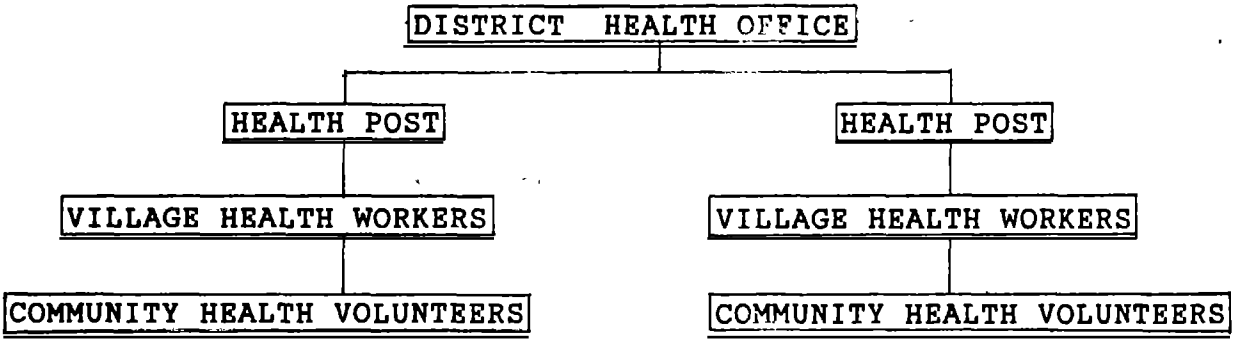
Starting sanitation and hygiene education programme needs a lot of institutional support, especially in terms of training and motivation of the existing staff. As the infrastructure (buildings etc.) is however already there, this will not require major investments. The main task will be manpower development by retraining, motivating and when necessary, screening the existing manpower.

Follow-up systems of the personnel working at the field level must be created. Personnel posted in the villages, must be regularly visited by the supervisory staff. Community health volunteers must be visited in their villages and invited for mutual gatherings to discuss their progress and programmes.

Extensive training programmes are required to create the hygiene education and sanitation promotion skills for the existing manpower. Training programmes for community health volunteers must be initiated. These training costs will also form the main part of the costs required for starting the hygiene education and sanitation programme.

A proposed organizational structure of the hygiene education and sanitation programme within the MOH is shown in Fig 17.

Figure 17. Institutional arrangement of Hygiene Education and Sanitation Promotion.



School and health post latrine programme

There are 13 health posts, 429 primary schools, 47 middle schools, 40 high schools and 3 campuses in the district and practically none of them has any sanitation facilities.

The programme will aim at constructing sufficient number of VIP latrines in all health posts and schools by the year 1997. This means that about 500 latrine units will be constructed. Construction of the latrines will be done by the DWSO with the financing coming from HMG or from a donor programme.

The latrine construction programme will include a training and follow-up component to ensure that the facilities are well maintained after completion.

The programme will be closely coordinated with the water supply development to ensure that no latrines are built in the schools or health posts where there is no water supply.

Hygiene education and latrine promotion programme in the VDC's

The programme will be part of the MOH's health education programme and will contain the following components:

1. General health education campaigns by the DHO's staff;

2. Hygiene education and latrine construction promotion by the CHV's in their respective clusters

3. Provision of promotion material for hygiene education and latrine construction

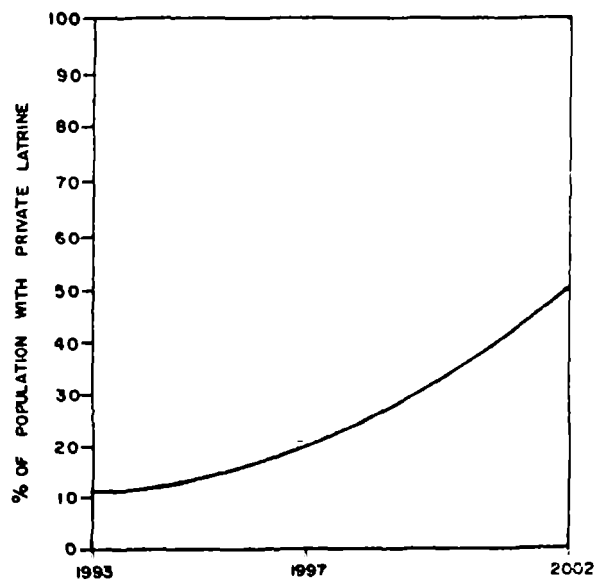
4. Technical assistance by DWSO in latrine construction

Hygiene education programme in the schools

This programme will linked with the school latrine construction programme and the teacher's training programme. It will include general hygiene education in the schools and practical training in the proper use and maintenance of latrines.

The construction of the latrines in the households depends on the promoters' ability to change the prevailing attitudes towards improved hygiene and to create a need for improved sanitation. Therefore, it is difficult to project the development of the coverage of the improved sanitation. It is obvious that at the beginning the progress will be slow but will eventually speed up when the campaigns gain momentum. The following targets for the sanitation coverage can be set:

Figure 18. Target for Sanitation Coverage



8.3 Institutional Development

The lead agency in sanitation promotion should be the Ministry of Health. Ministry of Education and Culture would be responsible for sanitation and hygiene education in schools.

The Department of Water Supply and Sanitation is responsible for all the technical support needed for the sanitation programmes.

This mainly means, that the DWSS would produce the necessary designs and cost estimates for different type of latrines. The DWSO would also organize the sanitation in schools and health posts, connected with the water supply programmes.

The above organizations are already in place and functioning in Palpa.

8.5 Costs and Financing

The total cost of the sanitation programme include the following costs:

- training and follow-up cost of the community health volunteers
- training and follow-up cost of the village health workers
- training and follow-up cost of the school teachers
- investment cost of the school latrines

Table 20. Sanitation Development Costs

Annual costs	1994	NRs. Mill. 1997	2002
CHV, VHW and school teachers' basic training programme	0.6	0.3	-
School latrine investment	3.1	3.1	-
Hygiene education and latrine promotion (follow-up costs)	0.5	1.2	1.2
Total annual	4.2	4.6	1.2

Total cost for the sanitation development in 1994-2002 would be NRs 48 mill., in the 1994 cost level.

9. FOLLOW-UP OF THE PLAN

9.1 Use of the Plan

The Palpa District Water Supply and Sanitation Plan should be used as guideline when selecting priorities for and implementing water supply and sanitation development, making institutional arrangements, setting annual development targets and preparing budget estimates and when considering the use of a specific water supply source. The Plan can be used as a source of base information when commencing feasibility studies of individual schemes. The Plan also gives other development agencies information about present water supply and sanitation situation in the district and the future sector development. The Plan is the main tool in coordinating the water and sanitation sector activities in the district.

9.2 Updating of the Plan

The actual development hardly ever follows precisely any plan and the same will be the case with this Plan also. Regular updating should therefore be an inseparable part of the planning process. The key information - the water supply and sanitation situation and the service levels and coverages - should be updated annually as well as the targets and estimates. This should be carried out by the District Engineer and his regular staff. A major updating and revision should take place at least every 5 years when the Plan report and the attached maps are revised. This should be carried out by the District Engineer and his staff with some assistance from the Regional or Central offices of the DWSS.

9.3 Collection of Planning Data

Accurate and comprehensive data is essential in both preparation and updating of the Plan. In order to improve the quality of data and to avoid the major data and information collection exercises included in the preparation of this report, it is essential that regular data collection, processing and storing is arranged in the District.

ANNEX 1

FIELD SURVEY

FIELD SURVEY FOR THE DISTRICT WATER SUPPLY DEVELOPMENT PLAN

General

The main objective of the Field Survey of the District Water Supply Development Plan (DDP) is to find out the existing water supply situation in district with respect to hardship, reliability, quantity and quality. This goal could be achieved only by extensive field work, visiting all the clusters in the district.

Private households and many agencies have implemented the water supply schemes in the district but records were not readily available. As this was the first time to embark on this kind of work, a seminar was organized to discuss planning and strategies. Hence 2 days seminar was took place in fourth week of September in 1991 and was participated by Deputy Director General (DDG), Regional Director (RD), Project Manager of RWSSP, 6 District Engineer (DE) and all responsible Consultant staff.

Working procedure

Field questionnaires were developed in 5 sets, 2 for technical evaluation and 3 for general data collection.

Considering the existing manpower situation of HMG, it was agreed to hire temporary high school level enumerators and overseers to supervise them. Overseer's task was to supervise the enumerators' work and technically evaluate all the gravity schemes in the district.

In total 9 overseers and 45 enumerators were hired for the Palpa field survey.

Questionnaires were field tested and modified after testing. Computer specialist then modified the questionnaire to facilitate the computer entry and developed the data base programmes. One computer person was hired to enter the data.

Field survey in Palpa started in December 1992 and was completed in February 1993 hence the total time of the field survey was 10 weeks.

Data collection for maps

Readymade maps showing VDC and ward boundaries were not available, land survey department of Palpa was approached to prepare1:25000 map from 1:2500 land use maps.

This job took considerable time but gave reliable VDC and ward boundaries.

The overseers plotted relevant information on to these maps and draftsmen transferred these information on to the final maps.

Procedures in the field level

Each group consisted of 1 overseer and 5 enumerators surveying one VDC. Total 9 groups were working in adjoining VDCs to enabel easy communication and sharing of information. The whole District was covered in the same manner.

After completing the data collection work in entire district, sample rechecking was conducted in 30 wards of 15 VDC in different location by exchanging the enumerator who were completely unknown to the new VDC.

The out put was compared with previous work and was found satisfactory. The difference in total number house holds & total population was 2 % in both, which can considered to be reasonable. This difference is due to isolated dwellings in remote areas. Over all result of rechecking was satisfactory.

Time and manpower requirement

The field survey was undertaken by 9 overseers and 45 enumerators in 10 weeks, 2 1/2 months.

Two types of manpower were involved in the Palpa District Development Plan as follows:

a) Field staff (9 overseers & 45 enumerators)

b) Office staff; Apart from logistic support from office following manpower was involved in the preparation of the DDP:

1. Full time Senior Engineer	1 No.
2. Full time Draft-persons	5 Nos.
3. Full time computer person	1 No.
4. Part time computer specialist	1 No.
5. Part time expatriate	2 Nos.

Total man months used is given below :

1. Senior Engineer	3 mm
2. Overseer (9 x 2.5)	22.5 mm
3. Draftpersons (5 x 9)	45 mm
4. Computer person (1 x 5)	5 mm
5. Computer specialist (1 x 4)	4 mm
6. Expatriate (2 x 1)	6 mm

Mapping Exercise

This is most sophisticated and time consuming task in the preparation of the DDP.

Old (1961) Survey of India topographic maps (1:50,000) are available, but were outdated in terms of settlements, place names and roads. Those maps do not have any administrative boundaries presented on them. It was decided to update and amend these maps. These maps together with the aerial photographs (1:25 000) were used for preparation of the water supply maps. To cover the whole Kapilbastu district 18 numbers of A1 size sheets are required. As each finished map consists of 5 different "layers", total of 90 sheets need to be drafted. The "layers" of one sheet of the map are the following:

1. Contour map : This sheet contains at on 100 feet interval.

2. River map : This sheet contains the rivers streams and their names.

3. Boundary map: This Contains all the boundaries from ward to international boundaries.

4. Road map : This contains roads, public building, number of households and settlement reference.

5. Water Supply map : This contains all the water supply components, water sources and scheme names.

ANNEX 2

NATIONAL WATER SUPPLY AND SANITATION STRATEGIES

SUMMARY OF THE 8th PLAN

Annex 2

Drinking Water and Sanitation

Ref: Eight Plan (1992-1997) Summary
(Unofficial Translation)

His Majesty's Government
National Planning Commission
Nepal, July 1992.

Objectives

The basic objectives will be to :

1. Provide drinking water facilities to 72 percent of the population by the end of the Eight Plan period, consistent with the long term objective of providing drinking water facilities to the entire population within the next 10 years.

2. Extend knowledge and services related to personal and domestic hygiene and environmental sanitation to the maximum number of people.

Policies

1. Priority will be given to small scale and cost effective projects.

2. Drinking water facilities will be extended in the Terai region through shallow tubewells, deepset tubewells and maintenance and repair of the existing water sources.

3. Rural drinking water and sanitation programmes will be integrated and implemented with women's involvement.

4. Existing irrigation systems will be improved and arrangements will be made to utilize them for the supply of drinking water as well.

5. The involvement of local communities will be made mandatory in all phases of the project, i.e., identification, formulation, implementation and operation and maintenance.

6. NGOs, local bodies and the private sector will be involved in

the rural areas of the Terai for the installation of shallow and deep tubewells, the construction of wells, operation and maintenance. Piped water supply projects with the maximum coverage of 500 people will also be carried out in similar manner without the involvement of the government. His Majesty's Government will make matching grants available for the execution of such projects, the rest being borne by the consumers.

7. Sewer lines will be constructed and extended in major towns.

8. Public awareness on sanitation will be raised through training programmes, health education and promotional campaigns.

9. The support of users will be mobilized to reduce leakage in water supply.

10. The formation of companies to execute water supply projects will be encouraged. Loans will be made available through banks and His Majesty's Government will provide certain grants.

11. Municipalities and District Development Committees will be involved in urban area drinking water programmes. Repair and maintenance works will be carried out on existing systems to increase water supply. Improvements will be made in the supply of water even during dry seasons, by developing alternative sources of water in feasible areas.

Targets and Programmes

During the Eighth Plan period, drinking water facilities will be extended to and additional 7,199,000 people, including 6,756.000 people in rural areas and 443,000 people in urban areas. By the end of th eighth Plan period, 15 million people or 72 % of the total population, including 13,455,000 people (72%) in rural areas and 1,615,000 people (77%) in urban areas, will benefit from drinking water facilities.

During the Eighth Plan period, sanitation facilities will be extended to an additional 1,573,00 people, including 1,159,000 in rural areas and 414,000 in urban areas. By the end of Eighth Plan period, 2,658.000 or 13% of the total population, including 1,672,000 (9%) in rural areas and 1,013,000 (48%) in urban areas will benefit from sanitation facilities.

The following programmes will be carried out in order to meet the targets :

1. Drinking Water Supply Programme

Tubewell Programme

About 60,559 new shallow tubewells (including artesian), deep set tubewells and wells will be installed in rural areas of the Terai. This will benefit 4,057,000 people.

Spring Protection

An additional 268,000 people will benefit from the protection and improvement of some 8,000 sources.

On Going Projects

An additional 1,404,000 people will benefit from the completion of about 500 on-going piped water supply schemes.

New Projects

New pipe system projects will be initiated and completed during this plan period which will benefit an additional 1,027,000 people.

Kathmandu Drinking Water Supply

An additional 83,000 people in Kathmandu Valley will be provided drinking water facilities during plan period. The leakage of water supply will be reduced from the present 40 % to 30% by the end of the plan period.

Urban Area Drinking Water Supply Projects

During the Eighth Plan period, 28 urban area drinking water supply projects will be renovated and extended for the benefit of an additional 360,000 people.

2. Sanitation Programme

During the Plan period 2,000 model latrines will be constructed at various schools, health posts and drinking water projects, for the benefit of 20,000 people. Another 50,000 private latrines will be constructed by

motivating people which will benefit an additional 300,000 people. About 100,000 people will benefit from the construction of Sewer lines in urban areas outside the Valley. The construction of new sewer lines within the valley will benefit about 245,000 people. 9,000 latrines will be constructed outside the valley to benefit 54,000 people. Programmes implemented by national and international nongovernment organizations will benefit and additional 695,000 people. Some 15,000 latrines will be constructed, combined with bio-gas plants. An additional 90,000 people will benefit from this scheme, to be undertaken by bio-gas company. Another 69,000 people will benefit from the construction of private latrines in urban areas.

Implementation Arrangement

Of the total physical targets in the drinking water and sanitation sector during the Eighth Plan period, about 60 % of the target in the drinking water sector and 54 % of the target in the sanitation sector will be achieved through the execution of programmes by NGOs, private sector entrepreneurs, companies and local bodies.

Financial Provisions

A total of Rs.6,273 million has been allocated for drinking water and sanitation programmes during the Eighth Plan Period.

ANNEX 3

PRESENT WATER SUPPLIES: LIST OF GRAVITY SYSTEMS

S.N.	SCHEME NAME	SUB SCHEME NAME	IMP. BY	POP	HH	COVERED VDC	SOURGE PROT.	TAP NO. OF TAP	ST GOOD	ST BAD	SUPP. HOURS	FLOW OF TAP GOOD	FLOW OF TAP BAD
1	GEHJA W/S SCHEME		BGN	117	20	4	YES	7	7	0	24	7	0
2	BAGHA POKHARATHOK W/S P.	BERUWA CHIDIYAR W/S PRO.	BGN	48	5	12	YES	10	0	10	4	10	0
3	MATHILLO BHUTUKE W/S SCH.		BGN	120	21	15	YES	2	0	2	24	2	0
4	MATHILLO JAUPOKHARA W/S S		BGN	335	43	15	YES	8	8	0	4	5	3
5	GAPJUNG W/S PROJECT		BGN	81	13	16	YES	4	4	0	24	4	0
6	GAPTUNG W/S PROJECT		BGN	27	4	16	YES	9	5	4	3	8	1
7	GHYNGSING W/S PROJECT		BGN	43	9	16	YES	5	5	0	24	5	0
8	CHHAHAR DANDA W/S SCHEME		BGN	25	3	27	YES	2	2	0	24	2	0
9	RAMAI DANDA W/S SCHEME		BGN	166	26	27	YES	1	1	0	24	1	0
10	MARSI DANDA W/S SCHEME		BGN	248	37	27	YES	7	0	7	5	5	2
11	RAIYA W/S SCHEME		BGN	120	13	27	YES	5	2	3	4	2	3
12	LOHARENG PRIM.SCH.W/S S.		BGN	44	8	27	YES	3	0	3	24	2	1
13	LOHARENG W/S SCHEME		BGN	245	35	27	YES	4	3	1	24	3	1
14	TALLO MATHI. MALANG W/S S		BGN	326	65	62	YES	6	6	0	24	4	2
15	GAU MUKHI W/S SCHEME		BGN	16	2	62	YES	2	0	2	24	2	0
16	MATHILLO MALANG W/S SC.		BGN	80	15	62	YES	1	0	1	1	1	0
17	TANSEN NAGAR PALIKA W/S	PKUNSARE W/S PROJECT	BGN	211	30	63	NO	5	5	0	24	5	0
18	GUNDRATUNG W/S SCHEME	TATO PANI W/S SCHEME	BGN	128	13	65	NO	6	6	0	24	6	0
19	ICAHR DANDA W/S SCHEME	KHARI GAIRA W/S SCHEME	BGN	112	14	65	YES	5	5	0	24	5	0
20	LEK CHIRI W/S SCHEME	LEK CHIDI W/S SCHEME	BGN	24	2	65	NO	2	2	0	24	2	0
21	BAPTUN SCHOOL W/S PROJECT		BGN	14	2	16	NO	3	2	1	24	3	0
				2530	380			97	63	34	18.1	84	13
1	ARCHALE-7 W/S SCHEME	ADAMARA W/S SCHEME	DDC	196	26	1	NO	3	0	3	24	1	2
2	ARCHALE -5 W/S SCHEME	SIMAL DANDA W/S SCHEME	DDC	180	26	1	NO	5	0	5	24	5	0
3	ARCHALE -9 W/S SCHEME	RANGUWA W/S SCHEME	DDC	129	12	1	NO	1	0	1	24	1	0
4	BANDI POKHARA W/ PROJECT	BANJHA W.NO.5,9 W/S PRO.	DDC	194	28	6	NO	6	6	0	7	3	3
5	BANDI POKHARA W/S PROJECT	BHUTENI KHOLSA W/S PRO.	DDC	145	23	6	NO	4	2	2	24	4	0
6	BANDI POKHARA W/S PROJECT	THULO DUNGA W/S W.N.1	DDC	375	55	6	NO	12	7	5	4	9	3
7	BANDI POKHARA W/S PROJECT	SANTI W/S PROJECT W.N.2	DDC	108	16	6	NO	14	0	14	4	14	0
8	BANDI POKHARA W/S PROJECT	CHHIERO W.N.6 W/S PROJECT	DDC	144	22	6	NO	6	6	0	24	6	0
9	BANDI POKHARA W/S PROJECT	THULO POKHARA W/S PROJECT	DDC	255	43	6	NO	1	0	1	6	0	1
10	BANDI POKHARA W/S PROJECT	SAPANGDI RANA TOLE W/S P.	DDC	73	11	6	NO	6	0	6	24	6	0
11	BARANDI W/ PROJECT	DALAL RIP KHOLA PROJECT	DDC	52	8	7	YES	4	0	4	2	4	0
12	BARANDI W/S PROJECT	TIMURE SHATAL WN.2 W/S P.	DDC	125	12	7	NO	9	4	5	3	9	0
13	BARANDI WN.3 W/S PROJECT	ARCHALE WNO.3 W/S PROJECT	DDC	269	44	7	NO	5	5	0	4	5	0
14	BARANDI W.NO.5 W/S PRO.	BARANDI W.N.5 W/S PROJECT	DDC	72	8	7	NO	7	0	7	24	7	0
15	CHAPANI W/S PROJECT	SIRINGA W/S PROJECT	DDC	62	12	7	NO	1	1	0	3	1	0
16	BHAIRASTHAN W/S PROJECT	KALIKA W/S PROJECT	DDC	391	68	8	NO	36	1	35	5	36	0
17	BHAISTHAN W/S PROJECT	HATTIYA BAZAR W/S PROJECT	DDC	110	12	8	YES	1	0	1	2	0	1
18	BHAIRABSTHAN WNO.1 W/S P.	DHARI GAIRA WN.1 W/S P.	DDC	135	27	8	NO	9	1	8	1	0	9
19	BHJAIRABSTHAN W/S PROJECT	PALPALI DHARA WN.2 W/S P.	DDC	123	15	8	NO	6	0	6	5	6	0
20	CHHERDI W/S PROJECT	CHHERDI WN.7 W/S SCHEME	DDC	69	13	9	NO	2	1	1	24	2	0
21	BOKENI GAIRA MAIDAN W/S P	BHUWAN POKHARI W/S P.	DDC	96	17	9	YES	1	1	0	24	1	0
22	KHIDIM DEULCHAUR W/S PRO.	BHUWANPOKHARI WN.1 W/S S.	DDC	623	97	9	YES	2	1	1	24	2	0
23	BAUGHA GUMBA W/S PROJECT	WNO.1,2 W/S PROJECT	DDC	954	148	11	NO	0	0	0	0	0	0
24	BAUGHA GUMBA W/S PROJECT	DHARADI BAUGHA GUMBA W/S	PDDC	257	36	11	NO	14	2	12	6	14	0
25	BAUGHA GUMBA W/S PROJECT	ARCHALE TOLE WN.2 W/S P.	DDC	78	12	11	NO	10	10	0	4	0	10
26	BAUGHA GUMBA W/S PROJECT	CHARLUNG WN.3 W/S PROJECT	DDC	602	77	11	NO	1	0	1	24	1	0

S.N.	SCHEME NAME	SUB SCHEME NAME	IMP. BY	POP	HH	COVERED VDC	SOURCE PROT.	TAP NO. OF TAP	ST GOOD	ST BAD	SUPP. HOURS	FLOW OF TAP GOOD	FLOW OF TAP BAD
27	BAUGHA POKHARATHOK W/S P.	BANKASETOL WN.9 W/S P.	DDC	51	9	12,7	NO	2	2	0	24	2	0
28	BAUGHA POKHARATHOK W/S P.	BERUWA CHIDAYAR W/S P.	DDC	389	39	12	NO	2	1	1	24	2	0
29	BAUGHA POKHARTHOK W/S P.	DHARADI WN.4 W/S P.	DDC	132	21	12	NO	4	4	0	4	4	0
30	BHUGHA POKHARA W/S PRO.	KHIR GHAT WN.5 W/S P.	DDC	318	48	12	NO	2	2	0	3	2	0
31	BAUGHA POKHARA W/S PRO.	JARUWAPANI W/S PORJECT	DDC	617	80	12	NO	3	2	1	24	2	1
32	BOJHADI W/S PROJECT		DDC	305	44	13	NO	2	2	0	24	2	0
33	KEWARACHIDI W/S PROJECT		DDC	61	11	13,7	YES	8	2	6	4	7	1
34	CHAP PANI W/S PROJECT		DDC	225	29	13	NO	2	1	1	2	1	1
35	SIKHRE W/S PROJECT		DDC	67	11	13	NO	6	5	1	4	6	0
36	PHUKTUNG W/S PROJECT		DDC	96	14	13	NO	6	0	6	3	5	1
37	DEURALI DANDA W/S PROJECT		DDC	88	13	13	YES	6	0	6	2	4	2
38	RANA TOLE W/S PROJECT		DDC	38	4	13	NO	4	4	0	5	2	2
39	GAUNDI W/S PROJECT		DDC	126	14	13	YES	2	2	0	24	2	0
40	AHIRAN DANDA W/S PROJECT		DDC	139	25	13	NO	2	1	1	24	1	1
41	KEWARACHIDI W/S PROJECT		DDC	45	6	13	NO	6	6	0	3	5	1
42	LIDHIN DANDA WS PROJECT		DDC	124	12	13	YES	2	2	0	24	2	0
43	CHUNDRE DANDA W/S PROJECT		DDC	84	12	13	NO	4	4	0	24	4	0
44	JHIRBHANJYANG W/S PROJECT		DDC	587	99	13,7	NO	3	3	0	5	[illegible]	1
45	BADWARI W/S SCHEME		DDC	168	28	15	YES	17	17	0	5	[illegible]	4
46	YAMKUNA W/S SCHEME		DDC	241	30	15	YES	7	0	7	5	[illegible]	1
47	MAJH BHUTUKE W/S SCHEME		DDC	88	9	15	NO	9	4	5	24	9	0
48	GAYANODAYA W/S SCHEME		DDC	90	14	15	YES	1	1	0	24	1	0
49	BEHADI W/S SCHEME		DDC	173	[illegible]	15	YES	8	0	8	24	8	0
50	DARHINGBATTE W/S SCHEME		DDC	150	23	15	NO	4	4	0	6	[illegible]	2
51	LAMA CHAUR W/S SCHEME		DDC	68	12	15,27	YES	7	5	2	12	5	2
52	MATHILLO BHANJYANG W/S		DDC	325	57	15	NO	6	0	6	24	[illegible]	0
53	RAI DANDA W/S PROJECT		DDC	185	31	16	NO	2	2	0	24	1	1
54	GHORBANDA W/S PROJECT		DDC	485	83	16	NO	7	1	6	5	6	1
55	KHARBARI DARLAMI W/S PRO.		DDC	134	20	16	YES	9	8	1	24	4	5
56	SHIKHAR W/S PROJECT		DDC	149	19	16	NO	4	4	0	24	4	0
57	SHANDHAP W/S PROJECT		DDC	212	34	16	NO	5	1	4	24	5	0
58	CHILAUDI W/S PROJECT		DDC	468	65	16	NO	3	2	1	24	2	1
59	N/A	SIRAN DANDA W/S SCHEME	DDC	98	12	23	NO	13	13	0	24	13	0
60	N/A	SANKARDI W/S SCHEME	DDC	111	18	23	NO	4	3	1	24	4	0
61	N/A	SANKHARDI W/S SCHEME	DDC	75	10	23	NO	6	0	6	24	6	0
62	DHANSARBARI W/S SCHEME		DDC	76	11	23	NO	2	2	0	24	2	0
63	GEJHA -2	CHIDUYAR W/S SCHEME	DDC	263	37	24	NO	2	0	2	24	2	0
64	GEJHA-4	ADAMBARA W/S	DDC	173	23	24	NO	2	0	2	24	2	0
65	GEJHA -5 W/S	TOKSE W/S	DDC	74	7	24	YES	10	6	4	24	10	0
66	GEJHA-3 W/S	CHISA PANI W/S	DDC	185	29	24	NO	24	19	5	24	13	11
67	KHUM DANDA W/S SCHEME		DDC	258	35	26	YES	6	3	3	4	6	0
68	NARUWA W/S SCHEME		DDC	106	12	26	YES	6	6	0	4	6	0
69	LAKURI BHANDARI W/S SCHE.		DDC	146	25	26	YES	2	0	2	24	2	0
70	POKHARA DANDA W/S SCHEME		DDC	69	10	26	YES	4	0	4	24	0	4
71	LANPAL W/S SCHEME		DDC	97	14	26	YES	3	1	2	24	3	0
72	MATHILLO JHERMRANG W/S S.		DDC	221	33	26	YES	5	1	4	24	3	2
73	CHAKBUNG W/S SCHEME		DDC	179	32	26	YES	6	5	1	4	5	1
74	PANEYARDI W/S SCHEME		DDC	435	60	26	YES	2	2	0	24	2	0
75	DHAN MAJHA TOLE W/S SC.		DDC	246	34	27	YES	8	3	5	24	8	0
76	MARSI DANDA W/S SCHEME S		DDC	212	29	27	YES	6	0	6	6	4	2
77	BAGCHAUR W/S SCHEME		DDC	180	29	27	NO	9	6	3	24	8	1

S.N.	SCHEME NAME	SUB SCHEME NAME	IMP. BY	POP	HH	COVERED VDC	SOURCE PROT.	TAP NO. OF	ST GOOD	ST BAD	SUPP. HOURS	FLOW OF TAP GOOD	FLOW OF TAP BAD
78	DEWANPAUWA TILHAR W/S SC.		DDC	83	9	27	YES	5	1	4	24	3	2
79	KUWARI KUN W/S SCHEME		DDC	65	9	27	YES	2	2	0	24	2	0
80	SANG KHOLA W/S		DDC	160	30	28	YES	14	14	0	24	14	0
81	SILENGDI W/S SCHEME		DDC	258	42	28	YES	12	5	7	12	12	0
82	DABRA W/S SCHEME		DDC	139	16	31	NO	1	1	0	24	1	0
83	KHUNDHARA W/S SCHEME	LIT KHOLA W/S SCHEME	DDC	112	16	32	NO	5	4	1	24	5	0
84	BHALEBAS W/S PROJECT		DDC	333	50	37	YES	3	2	1	24	3	0
85	PITLUNG CHHAP W/S PROJECT		DDC	259	31	37	NO	3	3	0	4	3	0
86	KHANI CHHAP BHANJY.W/S P.		DDC	278	41	37	YES	2	1	1	24	1	1
87	KHANI CHHAP MALYANG W/S P		DDC	228	39	37	NO	3	0	3	24	3	0
88	TIKHUM W/S PROJECT		DDC	149	24	37	NO	5	1	4	2	4	1
89	KHANI GAON W/S PROJECT	CHAP KHOLA LAM DANDA W/SP	DDC	140	24	38	NO	5	3	2	6	0	5
90	KHANI GAON W/S PROJECT	JUKEAPANI W/S PROJECT	DDC	132	24	38	NO	5	4	1	2	0	5
91	KHANI GAON W/S PROJECT	URLENI W/S PROJECT	DDC	98	16	38	NO	1	0	1	24	1	0
92	KHAN GAON W/S PORJECT	TAKI CHAUR W/S PROJECT	DDC	140	17	38	NO	6	6	0	24	6	0
93	KHANI GAON W/S PROJECT	BHATTARAI KO KHET W/S P.	DDC	80	13	38	NO	3	0	3	2	0	3
94	KHANI GAON W/S PROJECT	CHIDAYAR KALLABARI W/S P.	DDC	103	15	38	NO	2	2	0	8	2	0
95	WARD NO.9 W/S SCHEME	WARD NO.9 W/S SCHEME	DDC	452	63	40	NO	5	2	3	5	5	0
96	KOLDABNDA W/S SCHEME		DDC	148	18	41	NO	7	4	3	24	7	0
97	NAITOLA W/S SCHEME	WARDNO.4,5 W/S SCHEME	DDC	378	54	42	NO	9	4	5	24	7	2
98	DHIKICHAUR W/S SCHEME	DHIKICHAUR WN.7,8 W/S S.	DDC	200	39	42	NO	10	7	3	7	9	1
99	RUKSE BHANJYANG W/S		DDC	37	2	45	NO	2	2	0	24	2	0
100	AAM DANDA W/S		DDC	86	13	45	NO	8	8	0	24	8	0
101	MANLADO W/S SCHEME	MUJHUNG WN.1,3,8, W/S S.	DDC	187	26	46	NO	5	0	5	5	3	2
102	SISNEPANI W/S PORJECT	MUJHUNG WN. 6,9 W/S SC.	DDC	262	39	46	YES	7	0	7	2	4	3
103	BHALUKHAN W/S SCHEME	BHALUKHAN W/S SCHEME	DDC	233	42	46	NO	1	0	1	24	1	0
104	KARANGA W/S PROJECT		DDC	127	20	47	NO	2	1	1	4	1	1
105	SYALIKOT W/S PROJECT		DDC	78	10	47	NO	3	1	2	4	2	1
106	AARYA BHANJYANG W/S PRO.		DDC	436	68	47	NO	7	3	4	6	7	0
107	CHAUPARI WS RPOEJCT		DDC	291	38	47	NO	2	0	2	12	2	0
108	AAPHAR W/S PROJECT		DDC	309	41	47	NO	9	6	3	4	8	1
109	LUMBAS W/S SCHEME	BOLADI W/S SCHEME	DDC	173	23	49	NO	4	0	4	24	0	4
110	SIR KHOLA W/S SCHEME	SIRKHOLA W/S SCHEME	DDC	65	9	49	NO	0	0	0	24	0	0
111	N/A	N/A	DDC	22	3	49	YES	0	0	0	24	0	0
112	THUMKA W/S SCHEME		DDC	217	26	50	YES	7	0	7	24	5	2
113	RAMTARA W/S SCHEME		DDC	669	76	50	YES	6	3	3	24	6	0
114	PHERA W/S SCHEME		DDC	216	32	50	YES	6	1	5	4	6	0
115	SURAM DANDA W/S SCHEME		DDC	237	29	50	YES	6	4	2	24	6	0
116	PIPARDI W/S SCHEME		DDC	225	31	50	YES	7	4	3	4	7	0
117	JHARLENG W/S SCHEME		DDC	265	41	50	YES	4	4	0	24	4	0
118	RANA TOLE W/S SCHEME		DDC	113	10	50	YES	2	2	0	24	2	0
119	SIKHAR DANDA W/S		DDC	118	17	51	NO	5	1	4	24	3	2
120	AAMARAHI W/S		DDC	225	37	51	NO	2	1	1	24	2	0
121	UPALLO KUWADI W/S		DDC	31	3	51	NO	3	3	0	24	3	0
122	PANAYARGHAT W/S		DDC	400	60	51	YES	9	9	0	24	9	0
123	AALAICHIGHAT W/S		DDC	11	16	51	NO	3	3	0	24	3	0
124	TALLO GHUNSING W/S		DDC	523	78	51	NO	11	6	5	24	8	3
125	LUNGKURE W/S		DDC	203	31	51	NO	8	8	0	24	8	0
126	CHHISDI W/S		DDC	400	48	51	NO	7	7	0	24	7	0
127	AAMRAI W/S PROJECT		DDC	62	8	52	NO	8	4	4	24	6	2
128	POKHATHOK W/S PROJECT		DDC	517	77	52,16	NO	17	3	14	6	15	2

S.N.	SCHEME NAME	SUB SCHEME NAME	IMP. BY	POP	HH	COVERED VDC	SOURCE PROT.	TAP NO. OF TAP	ST GOOD	ST BAD	SUPP. HOURS	FLOW OF TAP GOOD	FLOW OF TAP BAD
129	BELDANDA W/S PROJECT		DDC	111	19	52	NO	8	0	8	3	2	6
130	CHISA PANI W/S SCHEME		DDC	729	146	54	NO	10	6	4	6	4	6
131	BHOTANI W/S PROJECT	SIDDHESWAR W/S SCHEME	DDC	352	46	59,61	NO	7	5	2	7	5	2
132	BUDATHOKO W/S SCHEME		DDC	156	22	60	NO	4	3	1	24	4	0
133	BHALEM W/S SCHEME		DDC	124	17	60	NO	1	0	1	24	1	0
134	DHOBADI W/S SCHEME		DDC	140	17	62	YES	2	2	0	24	2	0
135	GHORPAL CHHAP W/S SCHEME		DDC	272	40	62	NO	3	2	1	6	3	0
136	TEMANE W/S SCHEME		DDC	120	20	62	NO	4	2	2	4	3	1
137	PHAT TOLE W/S SCHEME		DDC	195	25	62	NO	4	4	0	24	4	0
138	CHHAP DANDA W/S SCHEME		DDC	148	24	62	YES	3	0	3	24	3	0
139	SAGARMATHA PRI. SC. W/S S		DDC	49	7	62	NO	1	1	0	24	1	0
140	TANSEN NAGAR PALIKA W/S	PMADANPOKHARA W/S P.	DDC	511	70	63	NO	7	6	1	24	0	7
141	TANSEN NAGAR PALIKA W/S	PBANSTARARI W/S PROJECT	DDC	161	31	63	NO	4	4	0	24	4	0
142	JHALJHALE W/S SCHEME		DDC	299	49	64	NO	7	6	1	5	7	0
143	SUN DANDA W/S SCHEME		DDC	340	42	64	YES	8	6	2	2	8	0
144	TELGHA W/S SCHEME		DDC	117	20	64	YES	4	4	0	24	4	0
145	THIMURE W/S SCHEME	CHILE GAIRA W/S SCHEME	DDC	392	57	65	NO	4	2	2	7	4	0
146	SIDHESHWAR W/S SCHEME	ALLEKHOLA W/S SCHEME	DDC	347	42	65	NO	7	0	7	24	2	5
147	BHUTUK DANDA W/S SCHEME	MULA PANI W/S SCHEME	DDC	347	28	65	NO	9	0	9	7	9	0
148	YAMGHA W/S PROJECT		DDC	546	79	66	NO	3	2	1	24	3	0
149	GUNA BACHANDI W/S PRO.		DDC	84	10	66	NO	1	1	0	24	1	0
150	TAREE W/S PROJECT		DDC	225	34	66,38	YES	7	7	0	24	7	0
151	YAMGHA GUNGA W/S PROJECT	CHISAKHOLA W/S PROJECT	DDC	91	14	38	NO	4	4	0	24	4	0
152	LAMA CHAUR W/S SCHEME		DDC	48	7	27,15	YES	6	0	6	24	6	0
153	DUN DANDA W/S SCHEME		DDC	113	19	31	NO	4	3	1	24	4	0
154	KHUNDHARA W/S SCHEME	LIT KHOLA W/S SCHEME	DDC	112	16	32	NO	4	4	0	24	4	0
155	SIRUNGA W/S PROJECT		DDC	99	14	13	NO	3	0	3	24	1	2
156	PAHARE AAREBHANJYANG W/S		DDC	42	8	15,47	NO	0	0	0	0	0	0
157	AAREBHANJYANG W/S SCHEME		DDC	155	19	15,47	NO	0	0	0	0	0	0
158	BARANDI W/S PROJECT	CHANDITHAN W/S PROJECT	DDC	76	12	7	NO	6	5	1	2	6	0
159	BARANDI W/S PROJECT	BARANDI SCHOOL W/S PRO.	DDC	72	14	7	NO	4	1	3	24	4	0
160	BHUTUK DANDA W/S PROJECT		DDC	24	3	18	NO	2	1	1	24	2	0
161	KOLDANDA W/S PROJECT		DDC	196	26	18	YES	3	3	0	24	3	0
162	GARAN DANDA W/S PROJECT		DDC	462	74	18	NO	6	6	0	5	6	0
163	POKHARA THAR W/S		DDC	239	27	22	YES	6	0	6	24	6	0
164	KATHAI DANDA W/S SCHEME		DDC	264	38	22	NO	8	0	8	24	7	1
165	BELAUNJI W/S		DDC	135	20	22	NO	6	0	6	24	6	0
				34015	4967			880	450	430	16.1	729	151
1	BANSPANI W/S		DWSS	175	26	4	NO	6	5	1	24	6	0
2	BANDI POKHARA W/S PROJECT	MAULANDHARA SAMAKOTW/S P.	DWSS	269	37	6	NO	6	5	1	2	0	6
3	BHAIRABSTHAN W/S PROJECT	PALPALI DHARA WNO.1	DWSS	267	43	8	NO	6	5	1	2	0	6
4	BITKOT W/S	TALLOTHAR KARME DANDA	DWSS	64	10	10	NO	4	4	0	24	0	4
5	BIRKOT-9 W/S SCHEME	THUMBAS W/S SCHEME	DWSS	366	57	10	NO	8	2	6	24	2	6
6	BIRKOT-2 W/S	JHAKRE THAN W/S	DWSS	39	7	10	NO	1	1	0	24	1	0
7	BIRKOT-2 W/S	SHIKHAR DANDA	DWSS	63	9	10	NO	2	2	0	24	2	0
8	BIRKOT-1	KEURADI	DWSS	56	7	10	NO	3	3	0	24	0	3
9	GANDAKOT W/S PROJECT	3,4,5,7,8,	DWSS	1043	169	23	YES	14	14	0	4	14	0
10	GANDAKOT W/S SCHEME	BHALAYA WNO.4 W/S SCHEME	DWSS	300	44	23	NO	13	13	0	24	13	0
11	GANDAKOT W/S SCHEME	PHUKUL DANDA	DWSS	297	55	23	NO	7	5	2	24	7	0

S.N.	SCHEME NAME	SUB SCHEME NAME	IMP. BY	POP	HH	COVERED VDC	SOURCE PROT.	TAP ST NO. OF TAP	GOOD	BAD	SUPP. HOURS	FLOW OF GOOD	TAP BAD
12	GANDAKOT W/S SCHEME	KAGATI DANDA W/S SCHEME	DWSS.	437	54	23	NO	0	0	0	0	0	0
13	GANDAKOT W/S SCHEME	THULBESI W/S SCHEME	DWSS	348	50	23	NO	4	3	1	24	4	0
14	PHAJUWA W/S		DWSS	57	8	23	NO	7	0	7	0	0	7
15	JALPA W/S PROJECT	JALPA W/S PROJECT	DWSS	424	59	29	YES	1	1	0	24	1	0
16	JALPA W/S PROJECT		DWSS	59	10	29	YES	9	9	0	24	5	4
17	DEURALI W/S SCHEME	RANGBANG W/S SCHEME	DWSS	67	9	34	NO	7	7	0	24	7	0
18	THANTHARE W/S SCHEME	THANTHARE W/S SCHEME	DWSS	49	6	34	NO	0	0	0	24	0	0
19	LAMI DANDA W/S SCHEME	CHOWAR W/S SCHEME	DWSS	25	4	34	NO	0	0	0	24	0	0
20	KAUDE LEKH W/S PROJECT	SYSTEM-2	DWSS	21	2	35	NO	1	0	1	24	1	0
21	KAUDE LEKH W/S PROJECT	SYSTEM-3	DWSS	4	1	35	NO	1	1	0	24	1	0
22	KAUDE LEKH W/S PROJECT	SYSTEM-1	DWSS	261	32	35	NO	17	17	0	4	17	0
23	BHAIRABSTHAN RIDIKOT WS	PCHDIYA DHARA	DWSS	56	10	39	NO	3	3	0	24	3	0
24	RIBDIKOT W/S PROJECT	RIBDIKOT W/S PROJECT	DWSS	5013	741	39,8,194042	NO	68	64	4	10	68	0
25	JOGITHUM W/S SCHEME	JOGITHUM W/S SCHEME	DWSS	425	74	40	YES	7	3	4	24	3	4
26	RIBDIKOT W/S SCHEME NO.2	RIBDIKOT W/S SCHEMENO.2	DWSS	874	147	42	NO	28	18	10	8	26	2
27	MADANPOKHARA W/S P.		DWSS	50	9	43	NO	4	4	0	24	3	1
28	TUTUNG MAHACHHAP W/S PRO.		DWSS	319	45	47,37	YES	2	2	0	24	2	0
29	SATYAWATI W/S SCHEME	CHAP PANI W/S SCHEME	DWSS	426	64	58	NO	11	11	0	24	0	11
30	KHURSANI W/S SCHEME	JHIRUBAS W/S SCHEME	DWSS	213	31	58	NO	0	0	0	24	0	0
31	SARDEWA W/S PROJECT	SOMADI W/S SCHEME	DWSS	415	61	61	NO	10	9	1	5	9	1
32	SARDEWA W/S PORJECT	SOMADI W/S SCHEME	DWSS	146	20	61	NO	3	2	1	24	2	1
33	TANSEN W/S PROJECT	BARTUNG W/S PROJECT	DWSS	1371	201	63	NO	82	63	19	3	0	82
34	TANSEN W/S PROJECT	BHUCHCHE DHARA W/S P.	DWSS	402	63	63	NO	18	3	15	3	12	6
35	TANSEN W/S PROJECT	KAJI DAUWA W/S PROJECT	DWSS	291	51	63	NO	3	2	1	24	3	0
36	RAMDI W/S PROJECT		DWSS	184	42	18	YES	6	6	0	24	6	0
37	LAMPATA GAIR W/S PROJECT	LAMPATE WARD NO 5 W/S	DWSS	127	18	19	YES	3	0	3	24	3	0
38	DOBHAN RWS PROJECT	SYSTEM 2	DWSS	62	11	21	YES	2	2	0	24	2	0
39	PATAN W/S PROJECT		DWSS	117	11	21	NO	2	2	0	5	2	0
40	BHAKARLIUNG W/S PROJECT		DWSS	32	4	21	YES	1	1	0	24	1	0
41	PATAN W/S PROJECT	SYSTEM 1	DWSS	127	18	21	YES	4	3	1	5	4	0
42	DOBHAN BADAHARE W/S P.		DWSS	182	28	21	NO	4	4	0	24	4	0
43	ALKI DAMAR W/S PROJECT		DWSS	45	10	21	YES	1	1	0	24	1	0
				15568	2358			379	300	79	17.9	235	144
1	ARGALI W/S PROJECT	W.NO.4 KUSENI W/S SCHEME	FINNIDA	582	85	2	YES	10	10	0	24	10	0
2	MONTHALA W/S SCHEME	HEKULA TONI SCHEME	FINNIDA	274	46	14	YES	3	3	0	24	3	0
3	TALLO GABU DANDA W/S SCH.		FINNIDA	184	28	50	YES	5	5	0	24	5	0
4	MATHILLO GABU DHADA W/S S		FINNIDA	227	32	50	YES	6	6	0	12	5	1
				1267	191			24	24	0	21	23	1
1	BHAIRASTHAN W/S PROJECT	MUSURE WNO.4 W/S PROJECT	HELVITAS	251	34	8	NO	31	13	18	4	31	0
2	BHAIRASTHAN W/S PROJECT	MUSURE TALLO TOLE W/S P.	HELVITAS	65	10	8	NO	8	2	6	4	8	0
3	DHAAIRENI W/S SCHEME		HELVITAS	529	67	15	NO	9	4	5	4	8	1
4	GHORBANDA RAIDANDA W/S P.		HELVITAS	543	101	16	NO	7	7	0	6	6	1
5	DHARD SIRKHOLA W/S PRO.		HELVITAS	152	24	16	YES	10	6	4	0	0	10
6	GABUDANDA W/S SCHEME		HELVITAS	137	21	27	NO	3	3	0	24	3	0
7	PUGDI WS PROJECT		HELVITAS	86	14	30	NO	4	4	0	24	4	0
8	JHORKE W/S SCHEME	JHORKE W/S SCHEME	HELVITAS	135	23	32	NO	4	4	0	24	4	0
9	OLESH W/S PROJECT		HELVITAS	424	51	35	YES	12	5	7	24	12	0

S.N.	SCHEME NAME	SUB SCHEME NAME	IMP. BY	POP	HH	COVERED VDC	SOURCE PROT.	TAP NO. OF	ST GOOD	BAD	SUPP. HOURS	FLOW OF TAP GOOD	BAD
11	PARGATI TOLE W/S SCHEME		RED CROSS	107	20	62	YES	4	4	0	24	4	0
12	DHAV DANDA W/S SCHEME		RED CROSS	159	19	62	YES	5	5	0	24	5	0
13	TAHUN RANAGAUON W/S SC.		RED CROSS	111	21	62	YES	1	1	0	24	1	0
14	TAHUN BAZAR W/S SCHEME		RED CROSS	428	75	62	YES	10	9	1	3	8	2
				3046	494			67	61	6	20.2	61	6
1	TOKLADI W/S SCHEME	CHUSANDI W/S SCHEME	REDD BARNA	107	12	3	YES	2	2	0	24	2	0
2	CHARANGE W/S PROJECT		REDD BARNA	70	12	3	YES	4	4	0	24	4	0
3	BAGMARA W/S PROJECT		REDD BARNA	114	15	3,29	YES	6	6	0	24	6	0
4	BAHADURPUR W/S P.(1,7,8,9	BAHADURPUR W/S PROJECT	REDD BARNA	516	65	3	YES	19	19	0	24	19	0
5	BAHADURPUR W/S PROJECT		REDD BARNA	466	53	3	NO	16	16	0	24	16	0
6	BAKAMALANG W/S SCHEME	POKHARATHAR W/S WNO.1	REDD BARNA	101	20	4	NO	5	5	0	24	5	0
7	PURBA MALANG W/S SCHEME		REDD BARNA	242	38	4	YES	8	8	0	2	8	0
8	ARMALANG W/ SCHEME WN.7,8		REDD BARNA	89	14	4	NO	5	5	0	24	5	0
9	BOHORE W/ SCHEME W.NO.8		REDD BARNA	28	5	4	YES	4	4	0	24	4	0
10	DAMARA BHOTANA W/S SCHEME		REDD BARNA	265	63	4	NO	15	15	0	6	15	0
11	RAHU BAN W/S SCHEME		REDD BARNA	189	31	4	YES	15	13	2	24	15	0
12	LEKH MALANG W/S PROJECT		REDD BARNA	390	38	4	NO	12	12	0	5	12	0
13	BAKA W/S		REDD BARNA	223	33	4	NO	8	8	0	8	8	0
14	BADAHARE W/S SCHEME		REDD BARNA	69	13	4	YES	5	5	0	24	5	0
15	BAKAGAN W/S		REDD BARNA	139	15	4	YES	4	4	0	24	4	0
16	GANDAKI DHIK SCHEME		REDD BARNA	748	114	17	YES	4	0	4	24	4	0
17	PHULBARI W/S SCHEME		REDD BARNA	365	62	17	YES	22	22	0	24	22	0
18	DARBA W/S SCHEME		REDD BARNA	126	19	17	NO	8	8	0	24	8	0
19	ULTEKHARKA W/S PROJECT		REDD BARNA	68	9	17	YES	12	10	2	24	12	0
20	LAMTANG W/S SCHEME		REDD BARNA	258	41	17	NO	4	4	0	24	4	0
21	SINHA W/S SCHEME		REDD BARNA	159	21	17	NO	15	11	4	4	15	0
22	BAHARAPANTHI W/S SCHEME		REDD BARNA	65	9	17	YES	6	6	0	8	6	0
23	BAGAHA W/S SCHEME		REDD BARNA	453	77	17	NO	3	3	0	24	3	0
24	CHADANPUR W/S SCHEME		REDD BARNA	122	19	17	NO	38	38	0	4	38	0
25	DARCHHA SCHEME		REDD BARNA	1229	215	17	NO	14	0	14	14	14	0
26	N/A	KHAIRBOT W/S SCHEME WN.3	REDD BARNA	225	37	23	NO	28	25	3	24	28	0
27	N/A	BATRA W/S SCHEME	REDD BARNA	57	10	23	YES	9	7	2	24	9	0
28	N/A	DEURALI W/S SCHEME WN.3	REDD BARNA	62	10	23	YES	8	8	0	24	8	0
29	N/A	MELSE DANDA W/S SCHEME	REDD BARNA	26	5	23	YES	5	5	0	24	1	4
30	BHALAYATAR W/S SCHEME	WNO.4	REDD BARNA	104	12	23	YES	3	0	3	24	3	0
31	N/A	CHHAPAUNDI W/S SCHEME	REDD BARNA	29	6	23	NO	9	9	0	24	9	0
32	N/A	CHHAP W/S SCHEME WN.9	REDD BARNA	153	26	23	YES	3	3	0	24	3	0
33	N/A	KHATANG W/S SCHEME	REDD BARNA	20	3	23	NO	8	8	0	24	0	8
34	GAJBANDI W/S SCHEME		REDD BARNA	67	16	23	YES	3	3	0	24	3	0
35	KATHAI DANDA W/S SCHEME		REDD BARNA	43	7	23	NO	10	6	4	0	0	10
36	N/A	CHANUTE W/S SCHEME	REDD BARNA	42	7	23	YES	2	0	2	24	1	1
37	CHHAP DANDA W/S PROJECT		REDD BARNA	102	13	25,53	YES	3	3	0	24	3	0
38	TALLO DHANDKOR W/S SCHEME		REDD BARNA	33	5	25	YES	6	6	0	24	6	0
39	DHADKOR W/S SCHEME		REDD BARNA	50	7	25	YES	3	3	0	24	3	0
40	DHAP BARI W/S SCHEME		REDD BARNA	5	1	25	YES	5	5	0	24	5	0
41	BONGSHI DANDA		REDD BARNA	191	29	25	NO	1	1	0	24	1	0
42	MATHAGADI SCHOOL W/S SC.		REDD BARNA	0	0	25	YES	7	7	0	24	7	0
43	MAIDAN W/S PROJECT		REDD BARNA	426	60	29	YES	4	3	1	24	4	0
44	SATHIKOL W/S PROJECT		REDD BARNA	414	51	29	YES	5	5	0	2	5	0

S.N.	SCHEME NAME	SUB SCHEME NAME	IMP. BY	POP	HH	COVERED VDC	SOURCE PROT.	TAP NO. OF	ST GOOD	ST BAD	SUPP. HOURS	FLOW OF TAP GOOD	FLOW OF TAP BAD
45	RAKSE W/S PROJECT	RAKSE DANDA W/S SCHEME	REDD BARNA	578	79	29	YES	9	9	0	24	9	0
46	N/A	CHHAPDI W/S SCHEME	REDD BARNA	0	0	29	NO	22	22	0	24	22	0
47	N/A	RAKSE DANDA W/S SCHEME	REDD BARNA	0	0	29	NO	5	5	0	24	5	0
48	N/A	RAKSE SCHOOL W/S SCHEME	REDD BARNA	0	0	29	NO	3	3	0	24	3	0
49	SIKLIS DHUSENI W/S PRO.		REDD BARNA	79	12	29	NO	5	5	0	24	5	0
50	LAKHANDI W/S PROJECT		REDD BARNA	52	7	30	NO	3	3	0	24	3	0
51	LINDI W/S PROJECT		REDD BARNA	148	18	30	NO	6	6	0	24	6	0
52	KHALDUGHAT W/S PROJECT		REDD BARNA	190	30	30	NO	5	5	0	24	5	0
53	REDI W/S PROJECT		REDD BARNA	144	24	30	YES	5	5	0	24	5	0
54	REDI W/S PROJECT		REDD BARNA	30	6	30	NO	8	8	0	24	8	0
55	REDI W/S PROJECT		REDD BARNA	46	9	30	YES	3	3	0	24	3	0
56	REDI W/S PROJECT		REDD BARNA	7	1	30	YES	5	4	1	24	5	0
57	BHAKWA W/S		REDD BARNA	215	25	31	NO	24	20	4	24	22	2
58	MUL DANDA WH.6 W/S		REDD BARNA	28	3	31	NO	7	7	0	24	7	0
59	SARKI DANDAW/S SCHEME		REDD BARNA	137	15	31	NO	3	3	0	24	3	0
60	SORA DANDA W/S		REDD BARNA	18	3	31	NO	7	7	0	24	7	0
61	DHARKESING W/S PROJECT		REDD BARNA	67	8	31	YES	2	2	0	24	2	0
62	JARE KHOLA W/S	LABED W/S	REDD BARNA	123	11	31	YES	3	3	0	24	3	0
63	KHADAK W/S PROJECT		REDD BARNA	364	63	31	YES	8	6	2	24	8	0
64	CHAUPARI DANDA W/S		REDD BARNA	70	10	31	NO	6	6	0	24	6	0
65	GUMRING W/S SCHEME		REDD BARNA	70	7	31	YES	4	0	4	24	4	0
66	DUMRI W/S		REDD BARNA	208	15	31	NO	3	3	0	24	3	0
67	DHAKREBAS W\S SCHEME		REDD BARNA	68	10	31	NO	4	4	0	24	4	0
68	JHARLYANGDI W/S W/S SC.		REDD BARNA	69	9	33	YES	4	0	4	24	4	0
69	LAMEDI W/S SCHEME		REDD BARNA	86	11	33	YES	2	2	0	24	2	0
70	CHHETRI KHARKA W/S SC.		REDD BARNA	75	10	33	NO	3	3	0	24	3	0
71	ROLABAS W/S SCHME		REDD BARNA	167	23	33	YES	3	3	0	24	3	0
72	PASING W/S SCHEME		REDD BARNA	34	4	33	YES	1	1	0	2	1	0
73	ADHAMARA W/S PROJECT		REDD BARNA	160	20	33	NO	2	2	0	24	2	0
74	GHORUM KHARKA W/S SCHEME		REDD BARNA	121	20	33	YES	6	6	0	24	6	0
75	PIPENDI W/S SCHEME		REDD BARNA	79	11	33	YES	5	5	0	24	5	0
76	TALLO HUBAS W/S SCHEME		REDD BARNA	95	17	33	YES	4	4	0	24	4	0
77	DARSING BAS W/S SCHEME		REDD BARNA	127	12	33	NO	3	3	0	24	3	0
78	POKHARI CHHAP W/S SCHEME		REDD BARNA	323	35	33	YES	3	3	0	24	3	0
79	JYAMIRE W/S SCHEME	DADWA W/S SCHEME	REDD BARNA	263	37	33	NO	7	7	0	24	7	0
80	DADWA W/S SCHEME		REDD BARNA	0	0	33	NO	3	3	0	24	3	0
81	SIDURE W/S SCHEME		REDD BARNA	186	27	33	NO	3	3	0	24	3	0
82	MATHILLO CHARGHARE W/S S.		REDD BARNA	133	19	33	NO	1	1	0	24	1	0
83	BESAR DANDA W/S SCHEME		REDD BARNA	26	3	33	NO	3	3	0	24	3	0
84	CHARGHARE W/S SCHEME		REDD BARNA	152	23	33	YES	1	1	0	24	0	1
85	KHOPLEK W/S SCHEME		REDD BARNA	418	51	45	YES	15	15	0	24	15	0
86	BHORMA W/S SCHEME		REDD BARNA	187	28	45	YES	6	6	0	24	6	0
87	RUKSE BHANJYANG W/S		REDD BARNA	44	7	45	NO	2	2	0	24	2	0
88	RIPAH THAR W/S		REDD BARNA	57	8	45	NO	4	4	0	24	3	1
89	MUDHABAS W/S		REDD BARNA	198	29	45	NO	15	15	0	24	15	0
90	DAKAR W/S SCHEME		REDD BARNA	162	43	45	NO	17	17	0	24	17	0
91	KAPHAL DANDA W/S		REDD BARNA	29	5	45	NO	3	3	0	24	3	0
92	KAPHAL DANDA W/S SCHEME		REDD BARNA	132	19	45	NO	11	11	0	24	11	0
93	SIRBOOK W/S PROJECT		REDD BARNA	55	8	45	NO	5	5	0	24	5	0
94	MAULA THAR W/S SCHEME		REDD BARNA	259	39	45	YES	4	4	0	24	4	0
95	MAULATHAR W/S SCHEME		REDD BARNA	339	47	45	NO	6	6	0	24	3	3

N.	SCHEME NAME	SUB SCHEME NAME	IMP. BY	POP	HH	COVERED VDC	SOURCE PROT.	NO. OF TAP	TAP ST GOOD	TAP ST BAD	SUPP. HOURS	FLOW OF TAP GOOD	FLOW OF TAP BAD
96	PANIGHAT W/S SCHEME		REDD BARNA	59	10	45	YES	5	1	4	24	5	0
97	THOKSINGBAS W/S SCHEME		REDD BARNA	178	24	45	NO	11	3	8	24	11	0
98	GHENSING DANDA W/S		REDD BARNA	91	14	45	NO	7	7	0	24	7	0
99	BHIRPANI W/S		REDD BARNA	213	34	45	NO	2	1	1	24	1	1
100	TOKAL DANDAW/S SCHEME		REDD BARNA	34	5	45	NO	2	2	0	24	2	0
101	RIPTHAR W/S		REDD BARNA	98	19	45	NO	4	4	0	0	0	4
102	CHHAP DANDA W/S PROJECT		REDD BARNA	45	7	53	YES	6	6	0	24	6	0
103	KHOPERLUNG W/S PROJECT	DIGAIRA W/S SCHEME	REDD BARNA	67	11	53	YES	4	4	0	24	4	0
104	RITHABAS W/S PROJECT		REDD BARNA	42	5	53	YES	2	2	0	24	2	0
105	MATERI W/S PROJECT		REDD BARNA	175	23	53	YES	12	12	0	24	12	0
106	MATHILLO MATERI W/S PRO.		REDD BARNA	178	26	53	YES	7	7	0	24	7	0
107	SER DANDA W/S SCHEME		REDD BARNA	106	14	57	YES	4	4	0	24	4	0
108	KOTH THAR W/S		REDD BARNA	421	52	57	YES	8	8	0	17	8	0
109	LINDI W/S SCHEME		REDD BARNA	359	34	57	YES	15	15	0	24	15	0
110	TALLO BHANGBARI W/S		REDD BARNA	216	25	57	NO	7	5	2	24	7	0
111	MATHILLO BHANGBARI W/S		REDD BARNA	150	21	57	NO	4	4	0	24	4	0
112	KOL GAIRA W/S		REDD BARNA	427	57	57,31	NO	13	13	0	24	13	0
113	JURE PANDHERO (THAM) W/S		REDD BARNA	208	35	57	NO	4	4	0	24	4	0
114	BAGMARE W/S PROJECT		REDD BARNA	114	15	29	YES	6	6	0	24	6	0
115	LAGHUWA W/S SCHEME	LAGHUWA WARD NO 8 W/S	REDD BARNA	306	48	40	YES	10	0	10	24	10	0
116	BESARGHA W/S PROJECT		REDD BARNA	118	16	20	YES	5	5	0	24	5	0
117	KHURSANIDANDA W/S PROJECT		REDD BARNA	48	8	20	YES	4	4	0	6	4	0
118	BALIPOKHARI W/S PROEJCT		REDD BARNA	138	23	20	YES	5	5	0	24	5	0
119	BAHUNKHARKA W/S PROJECT		REDD BARNA	62	9	20	YES	5	5	0	24	0	5
120	PHANT W/S PROJECT		REDD BARNA	86	9	20	YES	6	6	0	24	6	0
121	KHARTUNGKHOLA W/S PROJECT		REDD BARNA	40	3	20	YES	1	1	0	24	1	0
122	PATAKSAR W/S SCHEME		REDD BARNA	123	18	22	NO	6	6	0	24	6	0
123	BANGLANG W/S SCHEME		REDD BARNA	111	18	22	NO	6	0	6	24	6	0
124	DHANUBANS DHUNMADI W/S SC		REDD BARNA	288	37	22	YES	10	10	0	24	10	0
125	GHACHUR W/S SCHEME		REDD BARNA	104	16	22	YES	10	9	1	24	10	0
126	TALLO BAHAPUR W/S		REDD BARNA	35	565	22	YES	3	3	0	24	3	0
127	RAMCHE BAHAPUR W/S SCHEME		REDD BARNA	114	15	22	YES	13	11	2	24	13	0
128	GEJHA W/S SCHEME		REDD BARNA	293	41	22	NO	14	10	4	24	14	0
129	TIRAL DANDA W/S		REDD BARNA	45	4	22	NO	4	4	0	24	4	0
130	BEL DANDA W/S		REDD BARNA	138	22	22	YES	9	9	0	24	0	9
131	BANG KHARKA W/S		REDD BARNA	73	11	22	YES	7	7	0	24	7	0
				20571	3533			909	815	94	22.0	860	49
1	RUMAL DANDA W/S SCHEME		SFDP	54	8	15	NO	9	0	9	24	5	4
2	GYANGDIS KHOLA W/S SCHEME		SFDP	68	7	15	NO	1	0	1	24	1	0
				122	15			10	0	10	24	6	4
1	BAUGHA GUMBA W/S PROJECT	W.NO.4,5,7, W/S P.	UMN	1059	148	11,12	YES	1	1	0	2	0	1
2	BAUGHA POKHARATHOK W/S P.	BUDO PANDHERA WN.4 W/S P.	UMN	160	24	12	NO	5	0	5	2	0	5
3	BAUGHA POKHARATHOK W/S P.	KUWADI DHAP W/S PROJECT	UMN	376	56	12	NO	3	0	3	4	3	0
4	PIPLE THULA CHAR W/S PRO		UMN	278	49	16	YES	3	0	3	24	3	0
5	GORSAT W/S PROJEC-9		UMN	188	33	16	YES	8	0	8	4	0	8
6	GAPTUNG KHORBADI W/S PRO.		UMN	409	58	16	YES	8	8	0	3	0	0
7	PHOKSIYAR W/S PROJECT		UMN	179	27	16	YES	10	10	0	24	10	0

S.N.	SCHEME NAME	SUB SCHEME NAME	IMP. BY	POP	HH	COVERED VDC	SOURCE PROT.	TAP NO. OF	ST GOOD	BAD	SUPP. HOURS	FLOW OF TAP GOOD	BAD
8	ASERDI W/S SCHEME		UMN	915	142	28	YES	4	4	0	24	4	0
9	SILINGI W/S PROJECT		UMN	360	45	35	NO	5	5	0	6	5	0
10	AGAHANI W/S PROJECT		UMN	274	38	35	YES	3	3	0	7	0	3
11	TALLO AARUKHARAK W/S PRO.		UMN	39	3	43	YES	3	3	0	24	3	0
12	JHIRBAS W/S PROJECT		UMN	56	10	44	YES	3	2	1	24	3	0
13	JUKEPANI,BHAISKATTA W/S P		UMN	89	15	44	YES	4	3	1	8	3	1
14	BEL DANDA W/S PROJECT		UMN	150	19	44	NO	5	5	0	14	5	0
15	CHARCHARE W/S PROJECT		UMN	197	23	44	YES	3	3	0	24	3	0
16	ASLANI TOLE W/S PROJECT		UMN	182	27	44	NO	5	5	0	7	5	0
17	BHIRKATTA W/S PROJECT		UMN	42	6	44	YES	1	1	0	24	1	0
18	DAIN DANDA W/S PROJECT		UMN	73	11	44	YES	2	2	0	24	2	0
19	KUSINDA BHANJYANG W/S P.		UMN	42	7	44	YES	2	2	0	24	2	0
20	KOLANG SARU TOLE W/S PRO.		UMN	110	14	44	YES	3	3	0	24	-	0
21	CHIDIS W/S PROJECT		UMN	136	22	44	YES	4	4	0	7	4	0
22	CHHATIWAN W/S PROJECT		UMN	260	42	52	NO	10	0	10	3	10	0
23	DHOBADI W/S PROJECT		UMN	228	34	52,61	NO	7	7	0	2	6	1
24	THATIYA W/S PROJECT		UMN	225	34	52	YES	5	5	0	5	5	0
25	MATHILLO GOPHEK W/S PRO.		UMN	48	10	52	YES	2	2	0	24	2	0
26	RINGNE RAHA-3 WS SCHEME	BAHUN DANDA W/S SCHEME	UMN	50	9	55	NO	1	1	0	24	1	0
27	RINGE RAHA-7 W/S SCHEME	SAND GAIRA W/S SCHEME	UMN	360	48	55	NO	5	5	0	24	5	0
28	RINGNE-7 W/S SCHEME	BOJ DANDA W/S SCHEME	UMN	52	5	55	NO	1	1	0	24	1	0
29	RINGNE-7 W/S SCHEME	KOL DANDA W/S SCHEME	UMN	40	5	55	NO	1	1	0	24	1	0
30	RINGNE RAHA-4 W/S SCHEME	BHALUKUN W/S SCHEME	UMN	207	30	55	NO	5	5	0	24	5	0
31	RINGNE RAHA-8 W/S SCHEME	ARKHAL DANDA W/S SCHEME	UMN	359	56	55	NO	10	10	0	4	10	0
32	CHALEDI W/S PROJECT		UMN	45	8	56	NO	1	1	0	24	1	0
33	YANGHA DARLAM DANDA W/S P		UMN	1736	272	66,18,13	NO	20	15	5	2	14	6
34	HUMIN W/S SCHEME		UMN	806	97	27,20	NO	9	3	6	6	6	3
35	HUMIN W/S PROJECT		UMN	946	119	20,27	NO	9	3	6	6	6	3
				10676	1546			171	123	48	14.2	140	31
1	BARANDI W/S PROJECT	BARANDIW.NO.1,7,9, W/S P.	UNICEF	1096	168	7,38	NO	15	15	0	4	15	0
2	BARANDI WNO.6 W/S PROJECT	PURNADI DANDA WN.6 PRO.	UNICEF	110	18	7	NO	2	2	0	24	2	0
3	GANDAKOT W/S SCHEME	BARDAKOT W/S WNO. 1	UNICEF	423	65	23	NO	28	28	0	3	29	0
4	GANDAKOT W/S SCHEME		UNICEF	439	66	23,57	NO	8	8	0	24	8	0
5	GANDAKOT W/S SCHEME	PHOSINGKOT	UNICEF	435	73	23	NO	2	2	0	24	2	0
6	DHARAMPANI W/S	GEJHA-4,9 W/S	UNICEF	735	82	24	NO	3	3	0	24	3	0
7	LAMPAL KHOLA W/S	GEJHA-7,8 W/S	UNICEF	1436	242	24	NO	2	2	0	24	2	0
8	SORLEK W/S SCHEME		UNICEF	178	25	28	YES	5	5	0	24	5	0
9	PHOKSING KHOLA W/S SCHEME		UNICEF	712	119	28	YES	3	2	1	24	0	3
10	BAIRADI W/S SCHEME		UNICEF	250	40	28	NO	10	0	10	24	10	0
11	BOJHA CHHAP W/S SCHEME		UNICEF	613	113	28	YES	7	3	4	4	7	0
12	BAJHA BARI W/S SCHEME		UNICEF	13	3	28	YES	9	9	0	24	7	2
13	BAJHABARI W/S SCHEME		UNICEF	51	8	28	YES	2	2	0	24	2	0
14	KAPUR DANDA W/S SCHEME		UNICEF	195	25	28	YES	2	2	0	24	1	1
15	TALLO BAIRADI W/S SCHEME		UNICEF	110	18	28	YES	6	6	0	24	6	0
16	COT DANDA W/S PROJECT		UNICEF	99	16	30	NO	5	5	0	24	5	0
17	HARDANDA W/S RPOJECT		UNICEF	328	47	30	NO	1	1	0	24	1	0
18	JHIRUBAS W/S PROJECT		UNICEF	1296	160	31	NO	16	16	0	24	16	0
19	KHASEULI W/S PROJECT	ASELU DHARA W/S PROJECT	UNICEF	151	25	39	NO	6	6	0	24	6	0
20	KOLDANDA W/S PROJECT		UNICEF	1096	123	41	YES	29	16	13	24	27	2

S.N.	SCHEME NAME	SUB SCHEME NAME	IMP. BY	POP	HH	COVERED VDC	SOURCE PROT.	TAP NO. OF TAP	GOOD	BAD	ST HOURS	SUPP. FLOW OF TAP GOOD	BAD
21	JHESKANG PIPALDANDA DWSS		UNICEF	2687	387	51	NO	16	16	0	8	16	0
22	TALLO KUWADI W/S		UNICEF	313	42	51	YES	9	9	0	24	9	0
23	DHARADI W/S		UNICEF	183	25	51	NO	6	6	0	4	6	0
24	AUSE W/S SCHEME	N/A	UNICEF	2176	373	54	NO	18	7	11	24	4	14
25	RUPSE- PIPAL DANDA W/S P.	SYSTEM-B	UNICEF	344	48	56	NO	8	8	0	24	8	0
26	RUPSE- PIPAL DANDA W/S P.	SYSTEM-A	UNICEF	271	37	56	NO	10	9	1	24	10	0
27	RUPSE- PIPAL DANDA W/S P.	SYSTEM-C	UNICEF	88	7	56	NO	4	4	0	24	4	0
28	JURE PANDHERO W/S		UNICEF	272	36	57	YES	5	5	0	24	5	0
29	BANDHA W/S PROJECT	SOMADI W/S SCHEME	UNICEF	72	15	61	YES	2	2	0	24	2	0
30	NIMDI W/S PROJECT	SOMADI W/S SCHEME	UNICEF	689	105	61	YES	9	8	1	24	9	0
31	TANSEN MUNICIPALITY W/S P	MATHILLO DHARAPANI W/S P.	UNICEF	72	11	63	NO	1	1	0	24	1	0
32	BANDI POKHARA TELGHA W/SP	BANDI POKHARA TELGH W/S P	UNICEF	695	105	63,64	NO	20	18	2	6	20	0
33	TANSEN MUNICIPALITY W/S P	DHUNA GHAT W/S P.	UNICEF	302	45	63	NO	24	9	15	7	21	3
34	BARANDI W/S PROJECT	BARANDI W/S PROJECT	UNICEF	125	18	7	NO	3	3	0	24	3	0
				18055	2690			296	238	58	20.1	271	25
1	BAUGHA GUMBA W/S PROJECT	RAJO BHANJANG W/S PROJECT	VILLAGERS	185	20	11	NO	4	4	0	2	0	4
2	BAUGHA POKHARA THOK	ABAL TOLE WN.9 W/S PRO.	VILLAGERS	47	8	12	NO	7	6	1	24	7	0
3	TALLO JHARLENG KUNA W/S S		VILLAGERS	1	1	15	NO	4	0	4	5	0	4
4	TALLO JHEMRANG W/S SCHEME		VILLAGERS	75	13	26	NO	1	1	0	24	1	0
5	PRIVATE SCHEME		VILLAGERS	96	11	43	NO	10	9	1	24	10	0
6	PRIVATE SCHEME		VILLAGERS	28	4	47	NO	1	0	1	24	1	0
7	PRIVATE W/S SCHEME		VILLAGERS	167	33	47	YES	3	2	1	6	3	0
8	PAKHANDI W/S PROJECT		VILLAGERS	63	9	47	NO	1	0	1	24	1	0
9	NAGKO THAN UTAPATTI W/S S		VILLAGERS	5	1	62	NO	1	1	0	24	1	0
10	JHAKRI DANDA W/S SCHEME		VILLAGERS	81	12	62	YES	3	0	3	24	.	0
11	KUDAHAR W/S SCHEME	KUDHAR WARD NO:8 W/S SCHE	VILLAGERS	87	11	19	NO	1	1	0	24	1	0
				835	123			36	24	12	18.6	28	8
1	SATAHA KHAIRGHARI W/S S.		WDP	81	15	28	YES	5	3	2	24	5	0
2	PIPALTARI W/S		WDP	34	6	51	YES	5	0	5	24	0	5
				115	21			10	3	7	24	5	5

ANNEX 4

HARDSHIP LISTING OF THE VDCs

VDC NAME	HOUSE HOLD	POPULATION	HARDSHIP
BIRKOT	672	4555	228
BHUWAN POKHARI	1038	6446	226
BALDENGGADI	355	2246	201
CHAPPANI	484	3357	200
SILUWA	831	5234	199
BARANGDI	474	3050	192
BAUGHA GUMBA	551	3905	192
RAMPUR	1263	7228	191
KHALIBAN	978	5934	190
YAMGHA GUNGA	764	5121	190
BAUGHA POKHARATHOK	563	3855	189
SIDDHESWAR	504	3139	189
KUSUMKHOLA	394	2462	185
DOBHAN	996	6320	177
KHANIGAON	427	2610	176
MUJHUNG	479	3070	175
GOTHADI	640	4652	174
KASENI	696	5280	172
BHAIRABSTHAN	478	3199	169
DARLAMDANDA	489	3117	169
TANSEN MULICIPALITY	1117	7252	169
JUTHAPAUWA	574	3544	167
KOLDANDA	464	4059	167
TELGHA	578	3606	167
CHIRTUNGDHARA	786	5038	164
KHYAHA	501	3348	164
BANDI POKHARA	618	4036	162
CHHAHARA	963	5925	162
KACHAL	506	3477	161
SATYAWATI	478	3352	161
KHANICHHAP	407	2684	158
ARGALI	708	4776	157
GEJHA	874	5905	151
MADAN POKHARA	975	6276	151
PALING MAINADI	537	3500	150
PHEK	553	3829	150
ARCHALE	377	2706	149
POKHARATHOK	429	2851	149
DARCHHA	1001	6245	148
KHASAULI	466	3054	148
SOMADI	532	3430	148
DEURALI	562	3721	147
RUPSE	299	2160	147
NAYAR NAMTALES	503	3535	144
RINGNERAH	380	2613	143
MASYAM	743	5219	133
CHIDIPANI	836	5630	130
JALPA	505	3755	130
JHADEWA	786	5259	129
THIMURE	485	3671	129
GALDHA	565	3824	118
PHOKSINGKOT	806	5679	116
HEKLANG	572	3859	110
DEVI NAGAR	549	3763	107

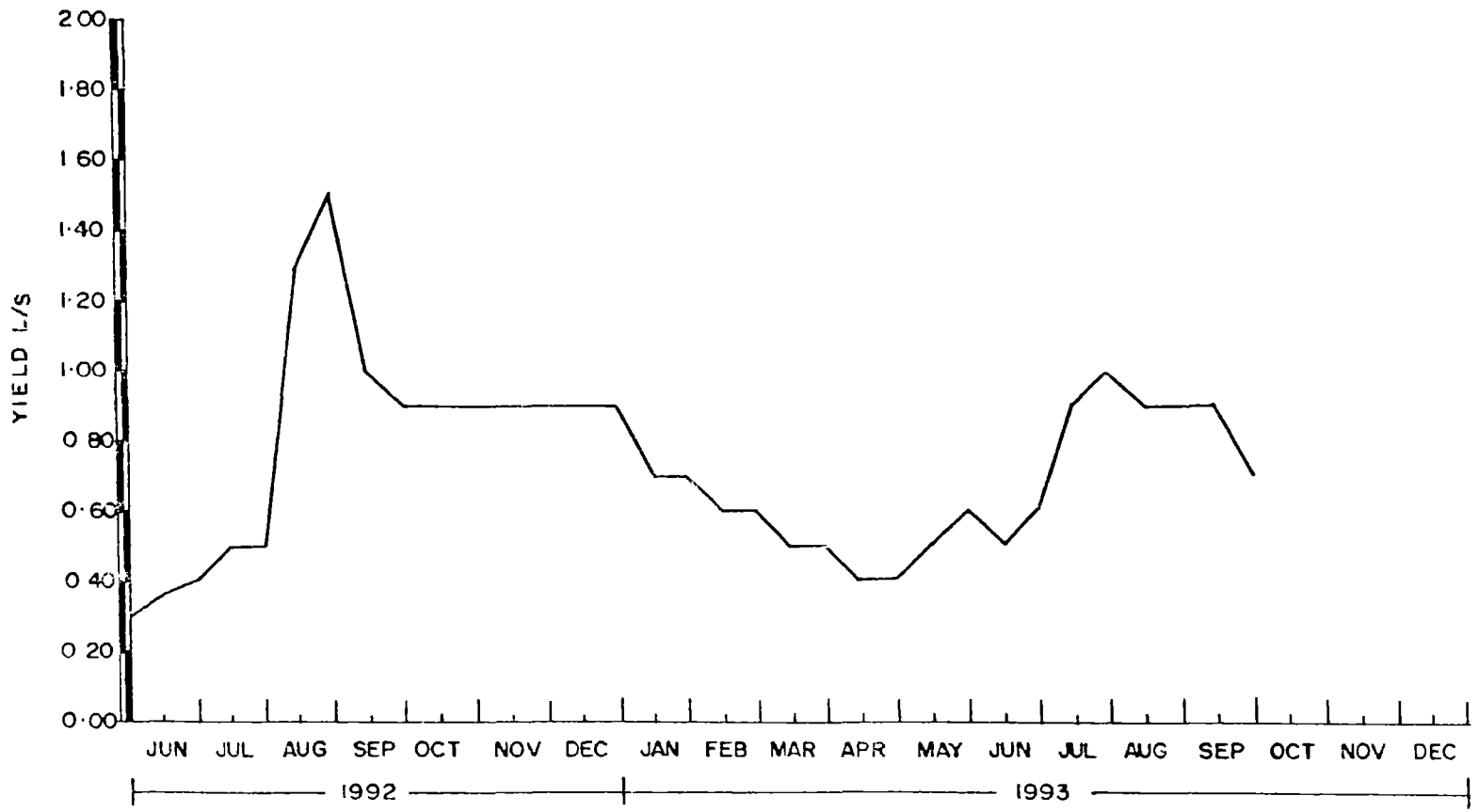
VDC NAME	HOUSE HOLD	POPULATION	HARDSHIP
GANDAKOT	892	5677	107
HUNGI	861	5324	107
MITYAL	608	4295	107
BAKAMALANG	509	3278	101
RAHABAS	320	2344	99
JHIRUBAS	406	3074	98
JYAMIRE	447	3286	96
PIPAL DANDA	1007	6760	92
TAHUN	683	4386	87
HUMIN	537	3980	73
BAHADURPUR	252	1810	64
SAHALKOT	274	2149	56

ANNEX 5

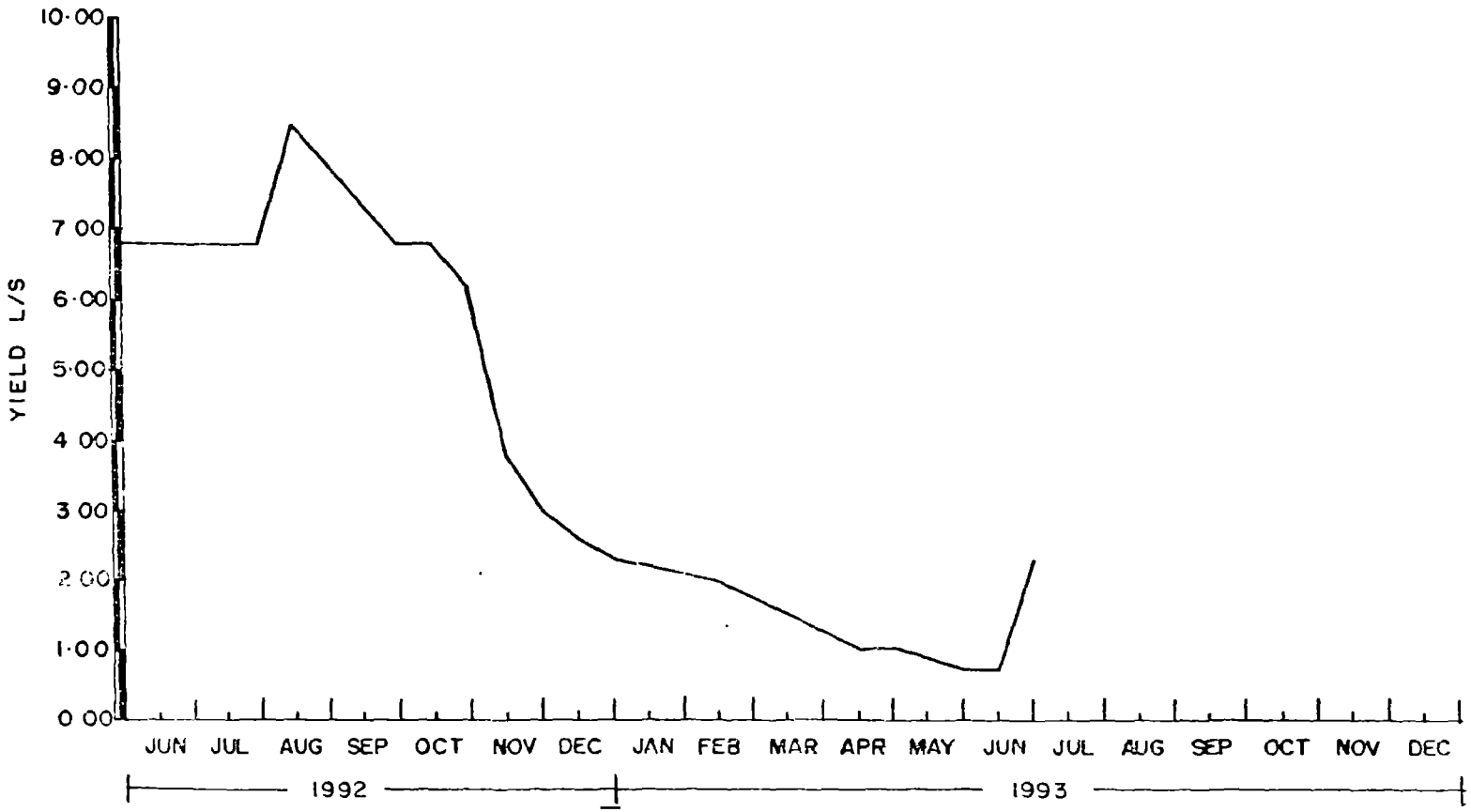
TANSEN TOWN WATER SUPPLY

ANNEX 6

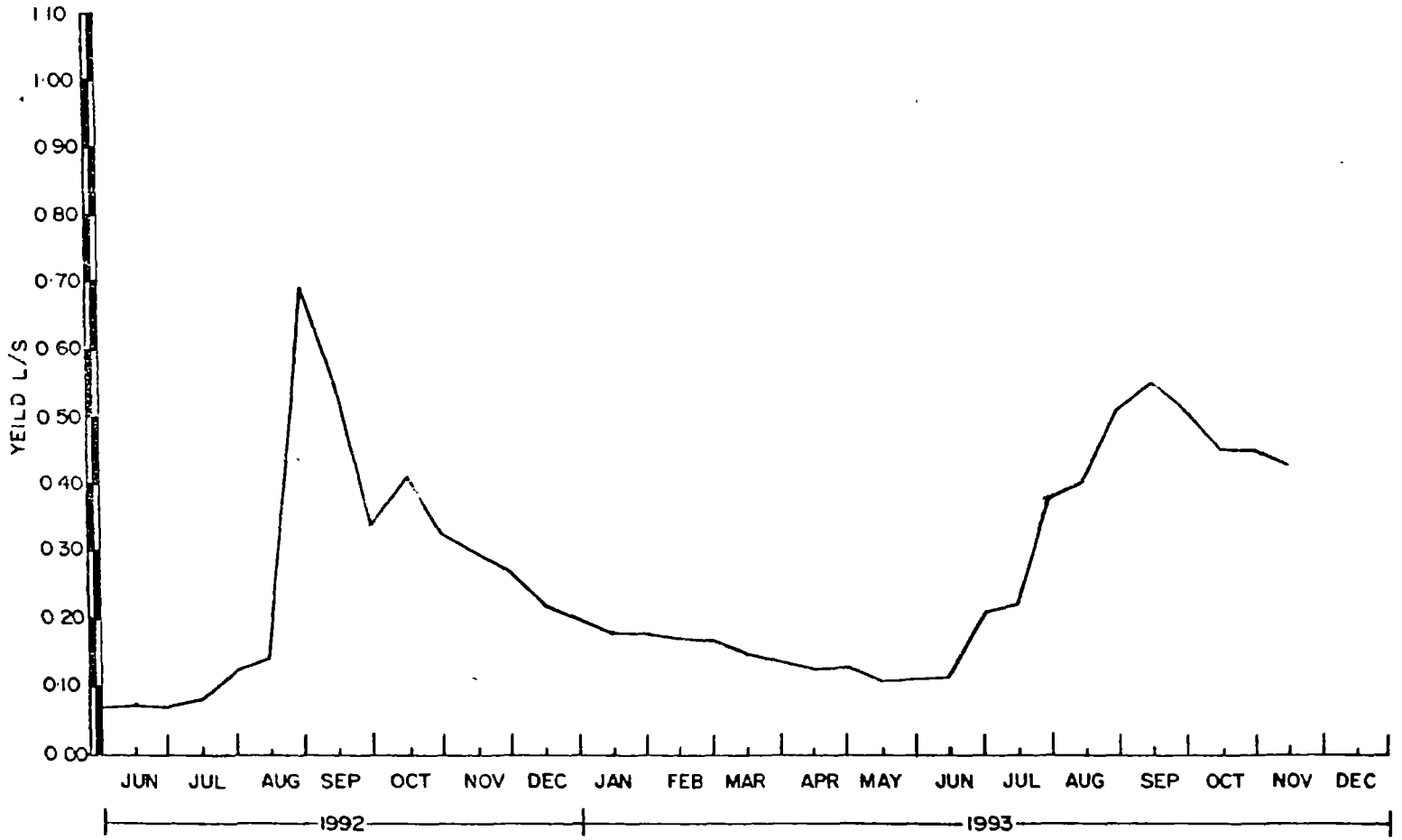
EXAMPLES OF THE SPRING FLOW VARIATION, HYDROGRAPHS



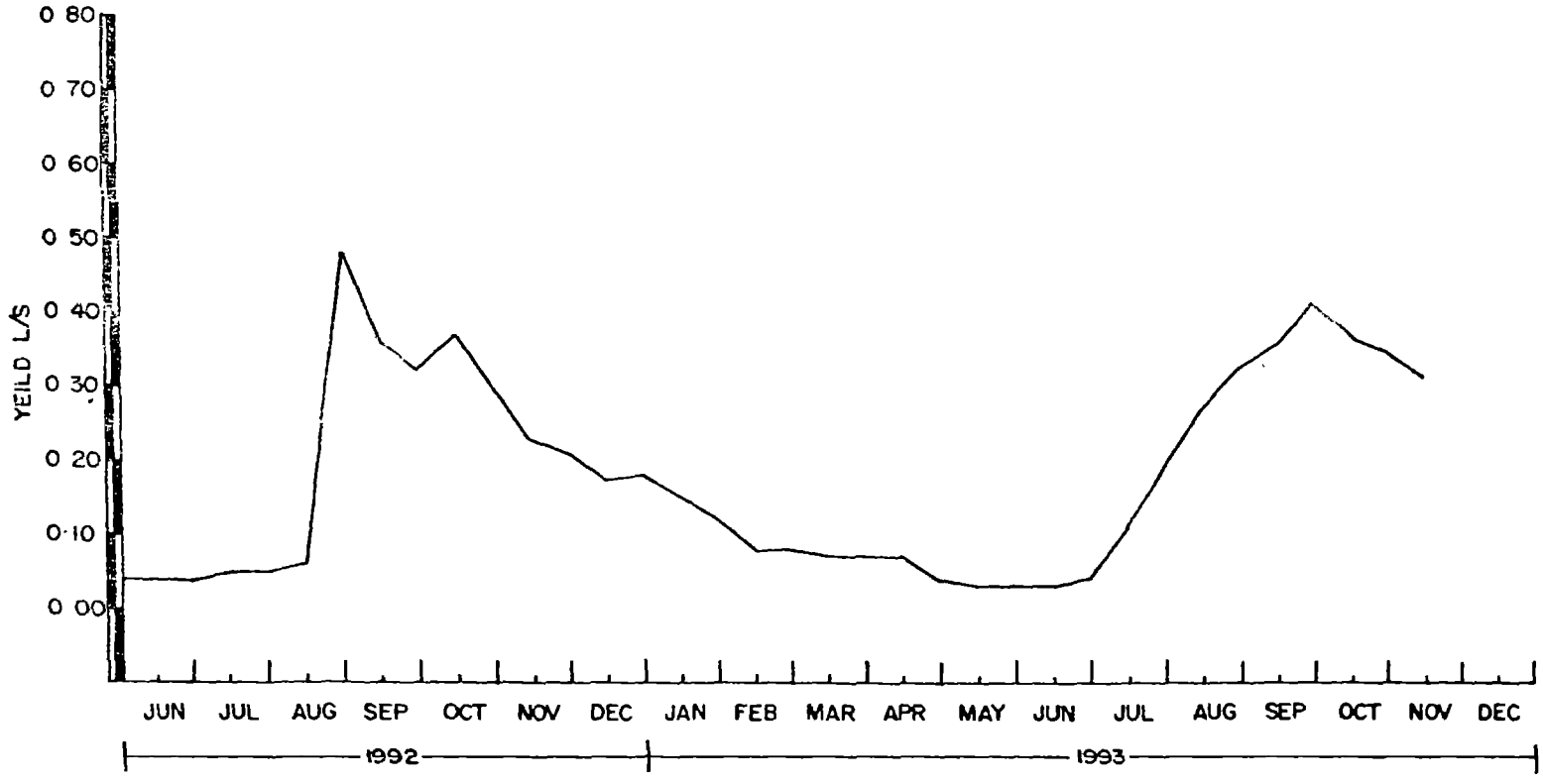
KAULE MUL
DHAKABANG V.D.C.
ARGHAKHANCHI



DHARAPANI MUL
SUBARNAKHAL V.D.C.
ARGHAKHANCHI



BANJADE KO PANDHERO MUL
MARENG VDC, ARGHAKHANCHI



LUMCHHA KHOLA KO MUL

CHHATRGUNJ V. D.C.

ARGHAKHANCHI

ANNEX 7

WATER QUALITY DATA

1. GENERAL

The Rural Water Supply and Sanitation Project runs a zonal water laboratory using the multiple tube method for bacteriological water testing. Chemical testing of water is done in laboratories in Kathmandu.

2. SAMPLING ROUTINE OF THE LABORATORY

The laboratory collects samples on regular basis at the rate of 7 samples a week. Number of samples is limited by the method, as one set of samples takes one week to analyze and one set can accommodate 7 samples.

Samples are collected from different types of water supplies to get the overall picture of the factors affecting the water quality. It has been difficult to accumulated enough rainy season samples, as the rainy season is shorter than the dry season, and also the electricity supply has failed several times during the rainy season, spoiling several sets of samples.

3. WATER QUALITY CRITERIA

WHO standards for the water quality have been use to describe the water quality.

<u>WHO standards for bacteriological quality of the rural water supplies :</u>

a) Untreated water entering a distribution system (spring and stream sources of the gravity water supplies)

faecal coliform	0	number/100 ml
total coliform	3	number/100 ml

b) Unpiled water supplies (hand pumps and other wells)

faecal coliform	0	number/100 ml
total coliform	10	number/100 ml

These standards, are however, very strict, as especially the Terai tube wells mostly serve only a few households.

4. SOME CONCLUSIONS OF THE TABULATION OF DATA

Some conclusions can be made looking at the tabulation of the data:

- water quality in tube wells is generally good, better than any other group of sources. Overall percentage of polluted samples only 7 %.
- very shallow tube wells (below 10 m) show some pollution during the rainy season, but hardly any polluted samples were found during the dry season.
- wells with platform seemed to have overall better water quality during the rainy season also.
- water quality deteriorates considerably in rivers during the rainy season and is also not good during the dry season. They seem to represent the worst water supply quality of all tested groups.
- water quality in open wells also deteriorates considerably during the rainy season, and is also not good during the dry season. Of all Terai sources, this seems to be worst type of water supply.
- spring sources seem to have a big difference between the dry season and rainy season quality, but samples from protected springs are still too few to establish the effect of the protection on the water quality.

Tabulation of the original data is presented below.

FOLLOW-UP OF THE BACTERIOLGICAL WATER QUALITY IN THE TUBE WELLS

Updated on 1.12.1993

Depth of the tube well	Dry season				Rainy season				TOTALS		
	Platform		No platform		Platform		No platform				
m	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)	
0 - 10	2	14	1	42	1	5	4	14	8	75	11%
11 - 20	0	11	0	8	0	3	1	1	1	23	4%
21 - 30	0	22	0	7	4	22	1	6	5	57	9%
31 - 40	0	19	0	10	0	20	1	2	1	51	2%
41 - 50	0	14	0	0	0	16	1	2	1	32	3%
51 - 60	0	2	0	2	0	8	0	0	0	12	0%
61 or more	0	13	1	2	1	7	0	1	2	23	9%
TOTALS	2	95	2	71	6	81	8	26	15	273	7%
% polluted	2%		3%		7%		31%		7%		

OBS! DEFINITION OF POLLUTED HERE IS 1 OR MORE E.COLI IN 100 ml

OTHER SOURCES

Open wells ■	Dry season		Rainy season		TOTALS	
	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)
0 - 10	4	23	8	8	12	31
% polluted	17%		100%		39%	

OBS! DEFINITION OF POLLUTED HERE IS 1 OR MORE E.COLI IN 100 ml

	Dry season		Rainy season		TOTALS	
	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)
Rivers	16	44	7	9	23	53
% polluted	36%		78%		43%	

OBS! DEFINITION OF POLLUTED HERE IS 1 OR MORE E.COLI IN 100 ml

All springs	Dry season		Rainy season		TOTALS	
	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)	No of polluted samples, 1 or more E.Coli in 100 ml	(Total number of samples)
Springs	3	48	12	31	15	79
% polluted	6%		39%		19%	

(no knowledge about the protection)

ANNEX 8

WATER SUPPLY SITUATION AND DEVELOPMENT PROJECTIONS OF THE VDCs

ASSUMPTIONS FOR THE FINANCIAL CALUCLATIONS OF THE PALPA DDP:

Investment Programme 1994 - 1997

1. No investment is assumed to be done in the improved water supply systems (gravity and protected springs) which fall into Service Level 1 or 2.

2. Rehabilitation is assumed for 20 % of those households which use improved water supply (gravity or protected spring) but fall into Service Level 3 or 4.

3. New gravity systems are assumed for 50 % of households presently using KUWA, KULO or STREAM sources.

4. New point source construction is assumed for:

   - 100 % of those households which use UNPROTECTED SPRING, and fall into Service Level 2;

   - 50 % of those households which use UNPROTECTED SPRING, and fall into Service Levels 3 & 4;

Investment Programme 1998 - 2002

1. The purpose is to cover all the remaining households in the ratio:

   70 % gravity systems
   30 % point source improvments

VILLAGE DEVELOPMENT COMMITTEE	EXISTING SITUATION IN 1993			Population in 1997	WATER SUPPLY DEVELOPMENT PLAN 1994 -1997					Population covered in 1997	% of total population in 1997	CAPITAL COSTS, 1994 - 1997, NRs				TOTAL CAPITAL COSTS 1994 - 1997
	Population in 1993	Population in S.L.1 and improved S.L.2	% of pop. in S.L.1 and improved S.L.2		People in S.L.1 and improved S.L.2 in 1997	Completing schemes under const-ruction	Rehabili-tation	New point sources	New gravity			Completing schemes under const-ruction	Rehabili-tation	New point sources	New gravity	
												800 NRs/capita	1,000 NRs/capita	400 NRs/capita	1,600 NRs/capita	
ARCHALE	2,706	1,707	63%	2,816	1,776		362	52	194	2,384	85%	0	362,144	20,813	310,806	693,763
ARGALI	4,776	1,913	40%	4,970	1,991		500	219	281	2,990	60%	0	499,509	87,414	449,559	1,036,482
BAHADURPUR	1,810	1,313	73%	1,883	1,367		85	59	21	1,531	81%	0	84,639	23,588	33,301	141,528
BAKAMALANG	3,278	2,207	67%	3,411	2,296	424	262	90	94	3,166	93%	339,200	262,242	36,076	149,853	787,371
BALDENGGADI	2,246	147	7%	2,337	153		32	128	815	1,128	48%	0	31,913	51,338	1,304,275	1,387,526
BANDI POKHARA	4,000	1,213	30%	4,200	1,263		397	850	395	2,905	69%	0	396,833	339,944	632,712	1,369,488
BARANGDI	3,050	1,027	34%	3,174	1,068		433	191	128	1,820	57%	0	432,908	76,314	205,354	714,576
BHAIRABSTHAN	3,199	860	27%	3,329	895	97	121	364	97	1,574	47%	77,600	120,715	145,690	155,403	499,408
BHUWAN POKHARI	6,446	480	7%	6,708	500		380	808	1,623	3,311	49%	0	380,182	323,294	2,597,449	3,300,925
BIRKOT	4,555	640	14%	4,740	666		118	219	1,436	2,439	51%	0	117,940	87,414	2,297,744	2,503,097
BAUGHA GUMBA	3,905	1,247	32%	4,064	1,297		459	56	10	1,823	45%	0	459,271	22,200	16,650	498,122
BAUGHA POKHARATHOK	3,855	1,020	26%	4,012	1,061		451	62	239	1,814	45%	0	450,946	24,975	382,957	858,879
CHAPPANI	3,357	513	15%	3,493	534	76	308	187	267	1,373	39%	60,800	308,031	74,926	427,358	871,115
CHHAHARA	5,925	1,707	29%	6,166	1,776		189	926	1,488	4,379	71%	0	188,704	370,470	2,380,995	2,940,168
CHIDIPANI	5,630	2,800	50%	5,859	2,914		326	163	399	3,802	65%	0	326,069	65,214	638,262	1,029,545
CHIRTUNGDHARA	5,038	2,060	41%	5,243	2,144	721	554	336	326	4,081	78%	576,800	553,623	134,590	521,710	1,786,723
DARCHHA	6,245	3,000	48%	6,499	3,122		555	225	683	4,586	71%	0	555,011	90,189	1,093,371	1,738,570
DARLAMDANDA	3,117	1,493	48%	3,244	1,554		364	66	208	2,192	68%	0	363,532	26,363	333,006	722,901
DEURALI	3,721	1,307	35%	3,872	1,360		198	354	382	2,294	59%	0	198,416	141,528	610,512	950,456
DEVI NAGAR	3,763	2,533	67%	3,916	2,636		393	184	323	3,535	90%	0	392,670	73,539	516,160	982,369
DOBHAN	6,320	973	15%	6,577	1,013		179	2,040	1,464	4,695	71%	0	178,991	815,865	2,342,144	3,337,001
GALDHA	3,824	2,160	56%	3,979	2,248	985	369	180	215	3,997	100%	788,000	369,082	72,151	344,107	1,573,340
GANDAKOT	5,677	3,787	67%	5,908	3,941	113	672	552	378	5,655	96%	90,400	671,563	220,617	604,961	1,587,541

VILLAGE DEVELOPMENT COMMITTEE	EXISTING SITUATION IN 1993			WATER SUPPLY DEVELOPMENT PLAN 1994 -1997							CAPITAL COSTS, 1994 - 1997, NRs				TOTAL CAPITAL COSTS 1994 - 1997
	Population in 1993	Population in S.L.1 and improved S.L.2	% of pop. in S.L.1 and improved S.L.2	Population in 1997	People in S.L.1 and improved S.L.2 in 1997	Completing schemes under construction	Rehabilitation	New point sources	New gravity	Population covered in 1977	% of total population in 1997	Completing schemes under construction 800 NRs/capita	Rehabilitation 1,000 NRs/capita	New point sources 400 NRs/capita	New gravity 1,600 NRs/capita	
GEJHA	5,905	2,987	51%	6,145	3,108		469	395	472	4,444	72%	0	468,984	158,178	754,814	1,381,976
GOTHADI	4,652	1,367	29%	4,841	1,422		250	656	1,055	3,382	70%	0	249,755	262,242	1,687,232	2,199,229
HEKLANG	3,859	1,767	46%	4,016	1,838	153	165	0	607	2,764	69%	122,400	165,116	0	971,268	1,258,784
HUMIN	3,980	2,967	75%	4,142	3,087		179	0	146	3,412	82%	0	178,991	0	233,104	412,095
HUNGI	5,324	2,967	56%	5,540	3,087		71	7	347	3,512	63%	0	70,764	2,775	555,011	628,549
JALPA	3,755	1,793	48%	3,90[illegible]	1,866		287	409	364	2,927	75%	0	287,218	163,728	582,761	1,033,707
JHADEWA	5,259	2,173	41%	5,47[illegible]	2,262	713	207	593	1,204	4,978	91%	570,400	206,741	237,267	1,925,886	2,940,295
JHIRUBAS	3,074	2,427	79%	3,199	2,525		375	14	0	2,914	91%	0	374,632	5,550	0	380,182
JUTHAPAUWA	3,544	1,033	29%	3,688	1,075		121	663	777	2,636	71%	0	120,715	265,018	1,243,224	1,628,956
JYAMIRE	3,286	2,173	66%	3,419	2,262	70	290	42	146	2,809	82%	56,000	289,993	16,650	233,104	595,748
KACHAL	3,477	760	22%	3,618	791		104	624	912	2,432	67%	0	104,064	249,755	1,459,678	1,813,497
KASENI	5,280	1,420	27%	5,494	1,478	1,268	425	579	515	4,263	78%	1,014,400	424,583	231,717	821,416	2,492,115
KHALIBAN	5,934	1,093	18%	6,175	1,138	424	172	1,325	1,939	4,998	81%	339,200	172,053	530,035	3,102,509	4,143,797
KHANICHHAP	2,684	1,040	39%	2,793	1,082		309	66	215	1,673	60%	0	309,418	26,363	344,107	679,888
KHANIGAON	2,610	1,133	43%	2,716	1,179	60	255	28	694	2,216	82%	48,000	255,305	11,100	1,110,021	1,424,426
KHASAULI	3,054	980	32%	3,178	1,020	585	155	350	80	2,190	69%	468,000	155,403	140,140	127,652	891,196
KHYAHA	3,348	900	27%	3,484	937		68	0	56	1,060	30%	0	67,989	0	88,802	156,790
KOLDANDA	4,059	1,540	38%	4,224	1,603	708	475	153	284	3,222	76%	566,400	474,534	61,051	455,109	1,557,094
KUSUMKHOLA	2,462	560	23%	2,562	583		176	28	108	894	35%	0	176,216	11,100	172,053	359,369
MADAN POKHARA	6,276	3,207	51%	6,531	3,337	54	874	316	572	5,153	79%	43,200	874,142	126,265	915,767	1,959,374
MASYAM	5,219	2,820	54%	5,431	2,935		420	728	423	4,507	83%	0	420,420	291,381	677,113	1,388,914
MITYAL	4,295	2,827	66%	4,469	2,942		455	253	489	4,139	93%	0	455,109	101,289	782,565	1,338,963
MUJHUNG	3,070	1,233	40%	3,195	1,283		405	173	461	2,323	73%	0	405,158	69,376	738,164	1,212,698

VILLAGE DEVELOPMENT COMMITTEE	EXISTING SITUATION IN 1993			WATER SUPPLY DEVELOPMENT PLAN 1994 -1997						CAPITAL COSTS, 1994 - 1997, NRs				TOTAL CAPITAL COSTS 1994 - 1997
	Population in 1993	Population in S.L.1 and improved S.L.2	% of pop. in S.L.1 and improved S.L.2	Population in 1997	People in S.L.1 and improved S.L.2 in 1997	Completing schemes under construction	Rehabilitation	New point sources	New gravity	Population covered in 1977	% of total population in 1997	Completing schemes under construction	Rehabilitation	New point sources	New gravity	
												800 NRs/capita	1,000 NRs/capita	400 NRs/capita	1,600 NRs/capita	
MAYAR MANTALES	3,535	1,680	48%	3,679	1,748		493	208	135	2,584	70%	0	492,572	83,252	216,454	792,278
PALING MAIKADI	3,500	1,073	31%	3,642	1,117		293	579	364	2,353	65%	0	292,768	231,717	582,761	1,107,246
PHEK	3,829	1,233	32%	3,984	1,283		167	676	694	2,820	71%	0	166,503	270,568	1,110,021	1,547,092
PHOKSINGKOT	5,679	3,173	56%	5,910	3,302	1,236	211	0	663	5,412	92%	988,800	210,904	0	1,060,070	2,259,774
PIPAL DANDA	6,760	4,814	71%	7,034	5,009	70	273	97	385	5,834	83%	56,000	273,343	38,851	616,062	984,255
POKHARATHOK	2,851	1,687	59%	2,967	1,755		370	108	66	2,299	77%	0	370,470	43,013	105,452	518,935
RAHARAS	2,344	1,787	76%	2,439	1,859		343	118	121	2,441	100%	0	342,719	47,176	194,254	584,149
RAMPUR	7,228	1,093	15%	7,521	1,138	922	498	770	2,113	6,440	86%	1,537,600	498,122	308,031	3,380,014	5,723,767
RINGNERAH	2,613	1,320	51%	2,719	1,374		230	108	284	1,996	73%	0	230,329	43,013	455,109	728,451
RUPSE	2,160	907	42%	2,248	944	110	232	229	208	1,722	77%	88,000	231,717	91,577	333,006	744,300
SAHALKOT	2,149	1,800	84%	2,236	1,873		228	24	0	2,125	95%	0	227,554	9,713	0	237,267
SATYAWATI	3,352	800	24%	3,488	833		87	271	833	2,023	58%	0	87,414	108,227	1,332,025	1,527,666
SIDDHESWAR	3,139	913	29%	3,266	950	365	222	569	316	2,422	74%	292,000	222,004	227,554	505,060	1,246,618
SILUWA	5,234	1,367	26%	5,447	1,422		276	753	1,412	3,863	71%	0	276,118	301,093	2,258,893	2,836,104
SOMADI	3,430	1,620	47%	3,569	1,686	71	226	354	343	2,680	75%	56,800	226,167	141,528	549,460	973,955
TAHUN	4,386	3,127	71%	4,564	3,254		229	35	236	3,753	82%	0	228,342	13,875	377,407	620,224
TANSEN MUNICIPALITY	7,252	2,680	37%	7,546	2,789	9	705	475	538	4,516	60%	7,200	704,863	190,091	860,266	1,762,421
TELGHA	3,606	1,113	31%	3,752	1,159		230	371	371	2,131	57%	0	230,329	148,465	593,861	972,656
THIMURE	3,671	1,973	54%	3,820	2,054		187	191	298	2,730	71%	0	187,316	76,314	477,309	740,939
YANGHA GUNGA	5,121	1,107	22%	5,329	1,152		394	350	857	2,753	52%	0	394,057	140,140	1,370,876	1,905,074
	272,724	112,544	41%	283,798	117,114	10,234	20,306	21,999	33,568	203,222	72%	8,187,200	20,306,447	8,799,692	53,708,367	91,001,706

VILLAGE DEVELOPMENT COMMITTEE	EXISTING SITUATION IN 1997			WATER SUPPLY DEVELOPMENT PLAN 1998-2002						CAPITAL COSTS, 1998 - 2002, NRs		TOTAL CAPITAL COSTS 1998 - 2002
	Population in 1997	Population in S.L.1 and improved S.L.2	% of pop. in S.L.1 and improved S.L.2	Total population in 2002	People in S.L.1 and improved S.L.2 in 2002	New point sources	New gravity	Population covered in 2002	% of total population in 2002	New point sources	New gravity	
						400	1,600					
						NRs/capita	NRs/capita					NRs
ARCHALE	2,816	2,384	85%	2,960	2,506	136	317	2,960	100%	54,410	507,827	562,237
RGALI	4,970	2,990	60%	5,223	3,143	624	1,457	5,223	100%	249,695	2,330,491	2,580,187
AHADURPUR	1,883	1,531	81%	1,980	1,609	111	259	1,980	100%	44,440	414,772	459,211
BAKAMALANG	3,411	3,166	93%	3,585	3,328	77	180	3,585	100%	30,856	287,990	318,846
ALDENGGADI	2,337	1,128	48%	2,456	1,186	381	890	2,456	100%	152,498	1,423,314	1,575,812
NDI POKHARA	4,200	2,905	69%	4,414	3,053	408	953	4,414	100%	163,339	1,524,493	1,687,831
BARANGDI	3,174	1,820	57%	3,336	1,913	427	996	3,336	100%	170,693	1,593,139	1,763,832
HAIRABSTHAN	3,329	1,574	47%	3,499	1,654	553	1,291	3,499	100%	221,326	2,065,713	2,287,039
HUWAN POKHARI	6,708	3,311	49%	7,050	3,480	1,071	2,499	7,050	100%	428,358	3,998,011	4,426,369
BIRKOT	4,740	2,439	51%	4,982	2,563	726	1,693	4,982	100%	290,252	2,709,019	2,999,271
BAUGHA GUMBA	4,064	1,823	45%	4,271	1,915	707	1,649	4,271	100%	282,643	2,638,002	2,920,645
AUGHA POKHARA	4,012	1,814	45%	4,216	1,907	693	1,617	4,216	100%	277,131	2,586,555	2,863,686
CHAPPANI	3,493	1,373	39%	3,672	1,443	669	1,560	3,672	100%	267,461	2,496,300	2,763,761
CHHAHARA	6,166	4,379	71%	6,480	4,602	563	1,314	6,480	100%	225,321	2,102,999	2,328,320
HIDIPANI	5,859	3,802	65%	6,157	3,996	649	1,513	6,157	100%	259,403	2,421,098	2,680,502
HIRTUNGDHARA	5,243	4,081	78%	5,510	4,289	366	855	5,510	100%	146,511	1,367,436	1,513,947
DARCHHA	6,499	4,586	71%	6,830	4,820	603	1,407	6,830	100%	241,244	2,251,614	2,492,858
DARLAMDANDA	3,244	2,192	68%	3,409	2,303	332	774	3,409	100%	132,875	1,238,101	1,370,976
URALI	3,872	2,294	59%	4,070	2,411	498	1,161	4,070	100%	199,083	1,858,109	2,057,193
DEVI NAGAR	3,916	3,535	90%	4,116	3,716	120	280	4,116	100%	47,973	447,752	495,726
DOBHAN	6,577	4,695	71%	6,912	4,935	593	1,384	6,912	100%	237,263	2,214,453	2,451,716
ALDHA	3,979	3,997	100%	4,182	4,201	0	0	4,201	100%	0	0	0
NDAKOT	5,908	5,655	96%	6,209	5,943	80	186	6,209	100%	31,874	297,495	329,370
GEJHA	6,145	4,444	72%	6,458	4,671	536	1,251	6,458	100%	214,472	2,001,735	2,216,207
THADI	4,841	3,382	70%	5,088	3,555	460	1,073	5,088	100%	183,985	1,717,193	1,901,178
KLANG	4,016	2,764	69%	4,221	2,905	395	921	4,221	100%	157,911	1,473,839	1,631,751
HUNIN	4,142	3,412	82%	4,353	3,586	230	537	4,353	100%	92,028	858,925	950,953
HUNGI	5,540	3,512	63%	5,823	3,691	640	1,492	5,823	100%	255,818	2,387,630	2,643,448
LPA	3,907	2,927	75%	4,107	3,076	309	721	4,107	100%	123,659	1,154,155	1,277,815
HADEWA	5,473	4,978	91%	5,752	5,232	156	364	5,752	100%	62,339	581,833	644,173
JHIRUBAS	3,199	2,914	91%	3,362	3,062	90	210	3,362	100%	35,946	335,496	371,442
THAPAUWA	3,688	2,636	71%	3,876	2,770	332	774	3,876	100%	132,717	1,238,689	1,371,405
AMIRE	3,419	2,809	82%	3,594	2,952	192	449	3,594	100%	76,990	718,577	795,568
KACHAL	3,618	2,432	67%	3,803	2,556	374	873	3,803	100%	149,648	1,396,714	1,546,362
KASENI	5,494	4,263	78%	5,775	4,480	388	906	5,775	100%	155,307	1,449,536	1,604,843
KALIBAN	6,175	4,998	81%	6,490	5,253	371	866	6,490	100%	148,440	1,385,441	1,533,881
KHANICHHAP	2,793	1,673	60%	2,935	1,758	353	824	2,935	100%	141,296	1,318,762	1,460,057
KHANIGAON	2,716	2,216	82%	2,855	2,329	158	368	2,855	100%	63,030	588,284	651,314
ASAULI	3,178	2,190	69%	3,340	2,302	311	727	3,340	100%	124,562	1,162,578	1,287,140
YAHA	3,484	1,060	30%	3,662	1,114	764	1,783	3,662	100%	305,702	2,853,216	3,158,917
KOLDANDA	4,224	3,222	76%	4,439	3,387	316	737	4,439	100%	126,325	1,179,031	1,305,356
SUNKHOLA	2,562	894	35%	2,693	940	526	1,227	2,693	100%	210,333	1,963,109	2,173,442
DAN POKHARA	6,531	5,153	79%	6,864	5,416	434	1,014	6,864	100%	173,754	1,621,700	1,795,454
HASYAM	5,431	4,507	83%	5,708	4,737	291	680	5,708	100%	116,565	1,087,936	1,204,501

VILLAGE DEVELOPMENT COMMITTEE	EXISTING SITUATION IN 1997 Population in 1997	Population in S.L.1 and improved S.L.2	% of pop. in S.L.1 and improved S.L.2	Total population in 2002	WATER SUPPLY DEVELOPMENT PLAN 1998-2002 People in S.L.1 and improved S.L.2 in 2002	New point sources	New gravity	Population covered in 2002	% of total population in 2002	CAPITAL COSTS, 1998 - 2002, NRs New point sources 400 NRs/capita	New gravity 1,600 NRs/capita	TOTAL CAPITAL COSTS 1998 - 2002 NRs
MITTAL	4,469	4,139	93%	4,697	4,350	104	243	4,697	100%	41,671	388,928	430,599
MUJHUNG	3,195	2,323	73%	3,358	2,442	275	641	3,358	100%	109,882	1,025,566	1,135,448
NAYAR NAMTALES	3,679	2,584	70%	3,866	2,716	345	805	3,866	100%	138,010	1,288,096	1,426,107
PALING MAINADI	3,642	2,353	65%	3,828	2,473	406	948	3,828	100%	162,554	1,517,169	1,679,722
PHEK	3,984	2,820	71%	4,188	2,964	367	857	4,188	100%	146,846	1,370,564	1,517,410
PHOKSINGKOT	5,910	5,412	92%	6,211	5,688	157	366	6,211	100%	62,787	586,011	648,798
PIPAL DANDA	7,034	5,834	83%	7,393	6,132	378	883	7,393	100%	151,346	1,412,564	1,563,910
POKHARATHOK	2,967	2,299	77%	3,118	2,416	211	491	3,118	100%	84,202	785,889	870,092
RAHABAS	2,439	2,441	100%	2,564	2,566	0	0	2,566	100%	0	0	0
RAMPUR	7,521	6,440	86%	7,905	6,769	341	795	7,905	100%	136,338	1,272,486	1,408,824
RINGNERAH	2,719	1,996	73%	2,858	2,098	228	532	2,858	100%	91,204	851,233	942,436
RUPSE	2,248	1,722	77%	2,362	1,810	166	387	2,362	100%	66,264	618,464	684,728
SAHALKOT	2,236	2,125	95%	2,350	2,233	35	82	2,350	100%	14,032	130,969	145,002
SATYAWATI	3,488	2,023	58%	3,666	2,126	462	1,078	3,666	100%	184,779	1,724,605	1,909,384
SIDDHESWAR	3,266	2,422	74%	3,433	2,546	266	621	3,433	100%	106,503	994,026	1,100,529
SILUWA	5,447	3,863	71%	5,724	4,060	499	1,165	5,724	100%	199,732	1,864,162	2,063,893
SOMADI	3,569	2,680	75%	3,751	2,817	280	654	3,751	100%	112,125	1,046,503	1,158,629
TAHUN	4,564	3,753	82%	4,797	3.945	256	597	4,797	100%	102,263	954,454	1,056,717
TANSEN MULICIP	7,546	4,516	60%	7,931	4,746	956	2,230	7,931	100%	382,245	3,567,620	3,949,865
TELGHA	3,752	2,131	57%	3,944	2,240	511	1,193	3,944	100%	204,465	1,908,339	2,112,804
THIMURE	3,820	2,730	71%	4,015	2,869	344	802	4,015	100%	137,485	1,283,190	1,420,675
YANGHA GUNGA	5,329	2,753	52%	5,601	2,893	812	1,895	5,601	100%	324,898	3,032,385	3,357,284
	283,798	203,222	72%	298,274	213,588	25,412	59,295	296,295		10,164,909	94,872,486	105,037,395

ANNEX 9

ENVIRONMENTAL GUIDELINES

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1. INTRODUCTION

These Guidelines are aimed to be used as a checklist in Environmental Impact Assessment in the planning, construction, and operation or the rural water supply systems in Lumbini Zone.

Socio-cultural and socio-economic impacts such as more time to other works, or more leisure time, provision of labour or money for maintenance are not considered as environmental impacts. Therefore they are not discussed in these guidelines. However, they are important issues of community participation and they are natural, intrinsic aspects to be considered in the implementation.

Improved health and improved economic conditions are accepted long term objectives and in the short run, that is during the course or the Project, any measurable improvements are not to be expected. Therefore also the possible negative impacts such as undesirable population growth, environmental impacts of increasing solid wastes, and transport are not scrutinized in this stage. However, impacts of solid waste disposal are included in health education as issues of environmental hygiene in the villages.

2. ECONOMIC VALUES

2.1 Siting of System Components

In siting of system components alternative locations should be considered. Impacts on following interests is expected due to siting and construction, or operation of the water supply component.

- areas of importance for agriculture, forestry or fishing,
- areas of important ground water or surface water resources,
- places of cultural values.

These areas will be identified later in each district.

2.2 Critical Value of Use of Water

Use of water for drinking and preparing food is considered to be the most valuable use of water, after that comes water for washing dish and personal hygiene, after that water for washing cloths and water or other household purposes. This means, that especially in developing countries, where water consumption is 50 l/c/d or below, the water for household purposes has definitely the highest priority. After that comes water for kitchen gardening, agriculture and for other purposes.

2.3 Critical Cost of Water Supply System

Cost of a water supply system for a community or for an individual household should not more than the cost of re-settlement with water supply in a new place.

3. CULTURAL VALUES

In siting of the system components an alternative location should be considered if impact on following is expected due to siting, construction or operation of the system:

- nature conservation areas, unique ecosystems, important wildlife habitats,
- areas of unique or exceptional aesthetic quality,
- tourism attraction or recreational areas,
- important cultural, historical, or scientific resources areas,
- areas important for vulnerable human populations,
- schools, hospitals, graveyards, sanctuaries, places of worship, etc.

These areas will be identified later in each district.

4. ENVIRONMENTAL IMPACTS CAUSED BY THE CONSTRUCTION OF WATER SUPPLY SYSTEMS.

4.1 System Components and Construction Activities.

The main components of a rural water system are the following:

- water source; spring, groundwater well or stream source
- water treatment plant
- pumping station
- main conveyor line, either pumping main or gravity main with break pressure tanks
- water tank
- distribution lines
- distribution points; either house connections or tapstand
- hand pump wells
- access roads
- power lines

In addition to above, the environmental impacts of the construction and use of pit latrines, pour flush latrines, and flush toilets are scrutinized.

The activities, which may have the environmental impacts in the construction of the components are following.

- site selection
- site clearance
- earth moving
- drainage of the site
- transport and storage of construction materials.

The impacts of the different construction activities are described in detail in Annex 1.

4.2 Site Selection

Site selection has an impact on the change of the existing land use, therefore the decision on the site selection may have an impact on economic or cultural values.

4.3 Site Clearance

Site clearance removes the protective vegetation and the site is exposed to erosion due to rainfall. Also it changes the landscape and may have an impact on cultural values.

4.4 Earth Moving

Earth moving is the heavy part of the construction and it opens and reforms the ground surface. Earth moving makes the site extremely vulnerable for erosion due to heavy rainfall. On steep slopes in hilly areas there is also a risk of heavy landslides. Proper site selection and drainage arrangement and timing of the earth moving are therefore often extremely important.
Earth moving always destroys the natural landscape, and creates dusty or muddy environment. In case of cultural values in the neighborhood the impact of the earth moving is extremely strong. Earth moving in dam construction for water intake construction makes the water turbid in downstream.

4.5 Drainage of the Site

Drainage of the site in a hilly terrain have to be planned carefully in order to avoid erosion on the side itself or along the drainage furrow. The drainage water may also cause flooding, if not drained properly.

5.4 Stream Water Diversion or Regulation

Stream water diversion or regulation may reduce the flow in the main stream. In case of dam and storage reservoirs, algae growth may occure in the storage reservoir. Reduced flow may have an impact on vegetation and previous water use. Reduced flow may also cause the deterioration of water in downstream due to reduced flushing. Usually, however, the demand for water supply is insignificant compared with the flow of the stream.

5.5. Water Treatment Plant Operation

Water treatment plant operation will not be a common practice in Lumbini Zone. Main activities having environmental impact are chemical feeding, sludge removal, and overflow, these activities may have impact if they are not properly made.

5.6 Operation of Pumping Station

Water pumping by electricity of engine driven pumps will not be a common solution in the Lumbini Zone. There may be some pumped systems in the Terai Districts. The main impacts are considered to be overflow and noise on the pumping, and the risk of the leakage of the fuel, which may penetrate into the ground water.

5.7 Overflow and Rainwater Drainage

Overflow drainage will be arranged at most of the system components. The main impact is flooding and erosion, if the drainage is not properly done. The same impact has also the rainwater, if drainage is not properly done.

5.8 Use of Water Points

Use of water points, i.e. taps and hand pump wells may cause flooding if the points are not properly drained. Use of water near the wells may also cause pollution of the well water. Therefore proper designs have to be made for drainage near the water points.

Cattle watering causes easily overgrazing and muddy surroundings. In case of wells there is also a risk of pollution of the well water.

4.6 Transportation and Storage of Material

Transportation and storage of the construction material is a remarkable activity on large sites. In rural water supply projects the materials are usually taken by trucks to the nearest point and then carried to the site. The environmental impact is quite minimal if material is carried to the site.

However, if the track improvement is needed, the risk of erosion may arise due to water flowing along the track. The nuisance is bigger, if much material has to be transported along narrow and muddy village roads, and stored on places where they are of aesthetic nuisance, or the storage is too close to such a place.

5. ENVIRONMENTAL IMPACT CAUSED BY OPERATION OF WATER SUPPLY SYSTEMS

5.1 Main Operation Activities.

The main activities causing environmental impacts in the operation of water supply systems are the following :

- spring water tapping
- ground water abstraction
- stream flow diversion and regulation
- water treatment plant operation
- water pumping
- overflow drainage
- use of water points
- cattle watering
- discharge of waste water
- use of access roads

The main primary impacts of the operation activities on the environment are described below. The secondary impact are described in detail in Annex 2.

5.2 Spring Water Tapping

Spring water tapping may cause reduced seepage in the area, and reduced flow for previous purposes, which may then have impact on vegetation, wild life watering, or cattle watering.

5.3 Ground Water Abstraction

Ground water abstraction may cause lowering of ground water level, especially in case of electric or motor driven pumps in urban or semi - urban water supplies. This may cause changes in vegetation and reduced amount of water for previous purposes. Also drying of previous wells may occure.

5.9 Discharge of Waste Water

Discharge of waste water may have many impacts if is not properly done. Usually in households without house connection the amount of waste water is so small that it can easily be disposed on the plot without nuisance. In case of a house connection the amount of water discharged is higher, and thus also the risk of nuisance due to water is higher. Discharge on land is preferred, because discharge on a stream causes water pollution in downstream.

5.10 Use of Access Roads

Use of access roads is a normal activity and the use for operating a water supply system is insignificant. However, the impact is noise and dust due to vehicle traffic. If the road is not properly aligned, drained or protected, the risk of erosion due to rainwater is always there.

5.11 Power Lines

Use of power lines does not usually have much impact on the environment. The lines have to be free from tall trees and cutting of trees naturally has an impact on the landscape. Also the cutting of the trees may increas the risk of erosion. The erosion may occure also because of unproper drainage or finishing the power line structures.

5.12 Use of Sanitary Installations

Use of sanitary installations is improvement in the housing standard. The impacts on the environment depend very much on the design and location of the installation. The main impacts due to unproper design of location are odors and flies; ground water pollution may occure if the bottom of the pit is below the ground water level. The flushing of the toilet increases the risk of overflow, ground water pollution, and water pollution in downstream. Flush toilet without septic tank and soak pit are extremely hazardous for hygienic and water pollution point of view.

5.13 Use of Improved Water Supply System

Use of improved water supply system is an benefit as such. However, some adverse impacts are mentioned here. In case of epidemic caused by a source used by the whole community, one common source may be more hazardous than several scattered sources. Therefore the careful protection of the source is necessary. Because water is easily available, the consumption also will be higher, this also means increased amount of waste water with disposal problems.