WATER SERVICE PROVIDERS

Capacity Assessment and Benchmarking

DATA YEAR 2071-72 (2014-15)

(NWSC, WSMB and KUKL)

Sector Efficiency Improvement Unit (SEIU)

Ministry of Water Supply and Sanitation

2016

Government of Nepal

(Data Book based on 2014-2015 WSP data and 2016 Field Survey)

FOREWORD

Access to safe drinking water and improved sanitation is a basic right of people as per the Constitution of Nepal. Development of water supply and sanitation system and sustainable management of the existing systems are the priority program of Government of Nepal. The Ministry of Water Supply and Sanitation has been instituted to realize this priority and sustainable development of water and sanitation sector.

Urban Water Supply and Sanitation National Policy, (2009) states that Benchmarking and Monitoring of urban water supply system against predefined indicators and service standard will be accorded a high priority at the national level.

Water supply service in Nepal is operated and maintained by mainly Water Users and Sanitation Committee (WUSC) in rural and small towns. Water supply system in bigger towns and cities are managed by Nepal Water Supply Corporation (NWSC) or Water Supply Management Board (WSMB). Water supply system in the Kathmandu valley is managed by Kathmandu Valley WSMB and operated by Kathmandu Upatyaka Khanepani Limited (KUKL).

Benchmarking concept initiated with publication of first data book in 2013-14 and second data book 2014-15 encouraged service providers for thinking towards better management of the water supply system. This data book is a result of assessment of the capacity of water supply system/service providers in 26 towns managed by NWSC, WSMB and KVWSMB/KUKL and it provides performance scenario in the relatively large towns. This will encourage respective service providers to make improvement plan as well as learn from the best practices of the others. All of the small and large town water service providers are encouraged to take part in the benchmarking and regularly update the information. This data book will also serve as a guide for the benchmarking and improvement planning with examples.

Not all 63 WSPs that were covered under last year's databook could be approached this time to include in this data book. However, the Ministry hopes that those remaining WSPs will also enter their data online in the newly established database, SEIU will approach them and facilitate for updating their data in the web based Database.

Ministry appreciates the cooperation and support provided in the process by all service providers included in this data book. The Ministry also would like to thank to all agencies and persons involved in the study and analysis and publishing this data book. Special thanks goes to JICA Nepal and Mr. Ryuji Ogata for their technical and financial support.

EXECUTIVE SUMMARY

Urban Water Supply and Sanitation National Policy, (2009) states that Benchmarking and monitoring of urban water supply system against predefined indicators and service standard will be accorded a high priority at the national level.

Water supply service in Nepal is operated and maintained by mainly Water Users and Sanitation Committee (WUSC) in rural and small towns. About 266 relatively larger scale small town water supply systems are managed by WUSC. Water supply system in the larger and older towns are managed by NWSC or WSMB. Water supply system in the Kathmandu valley is managed by KVWSMB and operated by KUKL. This study is an assessment of the capacity of water supply system/service providers in 26[1] towns including 23 towns managed by NWSC, two towns managed by WSMB (Bharatpur and Hetauda) and one managed by KVWSMB/ KUKL. This data book is outcome of the assessment which has covered Benchmarking data, comparisons and process for updating with ways to improve the performance.

Data forms consist of eight categories of information sheet: Institution, Staff information, System information, Coverage, Customer service, Production, Revenue and Expenses. Forms have been developed in excel sheet, linked to a list of data profiles and Performance Indicators (PIs). Excel format also includes sheet for assets calculation and plan for improvement and extension with a tentative cost calculation for major improvement works. Key ten PIs have been grouped together and score calculated as integrated group indicator. Field visit plan for site observation was prepared in six different packages. In each town the first day (arrival day) was spent for planning for three activities: BM data collection, water quality sampling and consumer survey. Information collection and site visit were done on the second day and workshop was conducted on the third day based on findings and discussed on improvement plan and moved to the next town. Benchmarking data was collected for fiscal year 2071/72 (2014-2015). Water quality samples were collected from all sources and five selected taps in 25 towns other than Kathmandu. In Kathmandu, 21 samples from sources and 103 samples from selected taps were collected. Consumer survey in all 26 towns was conducted based on twelve questions related to service level and users satisfaction of 50 households in each town.

NWSC and KUKL have systematic MIS and WSMBs have maintained annual report. None of the WSP maintained updated system map. There is no documented SOP, but most of the WSP staff understands how to operate the system based on their field experience. Financial data are mostly systematic. Data related to production are maintained based on established flow rate and supply hours and there is no system for keeping water use (consumption data). Only 50% WSPs have a water quality monitoring system in place. All WSPs have chlorination units in place, but application is neither regular nor controlled to maintain required free residual chlorine (FRC). There is no system for consumer survey.

The staff ratio varies from 2.8 to 15 per 1000 connection with an average 8.3. Smaller systems have a high staff ratio. Coverage varies from 14% to 98% with an average of 56%. Less coverage in the town where there is an alternate source such as hand tube wells. Metered connections vary from 84% to 100% with an average of 96%. NRW varies from 12% to 65% with an average of 38%. In the absence of accurate data relating to production and water use these data may change in the future even in the same situation mainly due to absence of flowmeter. Therefore, Data Calculation Methods as Annex B was prepared for consistent data management in the future benchmarking. Water production varies from 62 lpcd to 255 lpcd with an average of 137 lpcd but actual water available for use is only 56 lpcd in average. Water production cost is 2.5 NRs/m3 to

1 *Hemja water supply started reconstruction work from 2071-2072 (2014-2015) and therefore BM data for Hemja in 2014-2015 was not available but water quality test and customer survey was done.*

24 NRs/m3 with an average of 12 NRs/m3. In some system cost becomes high due to the costs of power and treatment. Tariff collection ratio is 70% to 100% with an average value of 90%. Operating ratio is 0.2 to 2.8 with a weighted average of 1.3 (Weighted average 1.0 indicates sustained operation and maintenance). Generally, smaller systems have a high operating ratio due to high personnel cost. Supply hours vary from 2 to 12 hours/day with an average of 6.5 hours/day.

A web-based Information Management System (MIS) has been developed and data updated for participating towns. WSP can update data by itself and analyze data and compare with others. The public can view data profile, PIs data and make comparisons on the selected PIs or timeline. SEIU can provide registration, approve submitted data. This will be extended to all town water supply systems in the future.

Regarding water quality testing result in 25 towns other than Kathmandu, five towns met the physicochemical standard at all sources. Six towns met E-coli standard at all sources. Twelve towns met the physicochemical standard at taps and five towns met E-coli standards in taps. Main parameters exceeding standards are Color, pH, Turbidity, Iron, Manganese, Aluminium, Nitrate and E-coli.

E-coli was detected in 47% sources and 55 % taps and detected in taps even which are not detected at sources in three towns. Free residual chlorine (FRC) at tap met standard (0.1mg/L-0.2mg/L) only 10%. There is a practice to use chlorine in all towns but only two town maintained FRC in all taps. Iron was detected in taps even though it was absent in the sources in some towns.

In overall, out of 25 towns, the percentage of towns meeting Nepal standard at sources in terms of physical, chemical and biological parameters are 95%, 97% and 53% respectively. Bacteriological contaminations in the tube wells are mainly due to absent of protective platforms. Similarly, percentage of taps meeting Physical, Chemical and Biological standard are 94%, 97% and 45% respectively. This indicates further contamination in the distribution network. In overall 95% parameters met the standards at sources and 86% parameters met the standards as a whole.

About water quality testing in Kathmandu valley, selected 21 sources were tested for full 27+1 parameters and selected 103 taps (representing grid of 1/15km) were selected for 10 parameters. Among tested sample at source, 86.6% met standard for all parameters and 42.9% sample met standard for bacteriological parameter. Parameters exceeding standard at sources are colour, turbidity, ammonia, odour, pH, Iron, Manganese and E-coli. Sample in taps indicated that about 67% samples met standard in overall parameters, 44% samples met standard in E-coli and 18% samples met standard in FRC. All parameters tested was found to be exceeding standard in some taps. Main objection in the tap water is high Turbidity (38%), low pH (40%), absent of FRC (82%), high iron (27%) and presence of E-coli (66%).

Consumer survey indicated that users saying that water is always clean varies form 2% to 92% with 49% in average. About 60% people use water for drinking directly from the tap, 10% boil and 30% use some kind of filter at home. People reported that there is prevalence of diarrhea is 1.2 times/person per year.

WSPs need to understand the system with updated maps and document standard process of operation. The collection ratio can be improved by regulating government taps. Operating ratio can be reduced by improving cost efficiency, reducing water leakages. Small system either need to increase taps or develop alternate ways of system management with few staff. Water quality monitoring should be in place. WSP first need to update information system and PIs. They need to make an improvement plan for system upgrade and make extension of service. Government needs to fund for improvement and extension beyond the capacity of WSP. SEIU needs to monitor Performance of WSPs and support technically for updating BM data and making improvement plan.

Improvement plan was made for 23 towns except Banepa, Pokhara and Kathmandu valley where improvement activity has been started through Kavre Valley Integrated Water Supply Project (GON fund),

Pokhara Water Supply Improvement Project (JICA grant aid) and Melamchi Water Supply Development Projects (GON and ADB, JICA fund). Improvement plan only includes improvement of existing facilities. Extension work to meet future demand and/or extended area is not included. Improvement work mainly involves pipe replacement because it is either very old, unable to carry required flow or extension within service areas. Washouts with valve box are required in the large networks where people felt turbid or colored water. Most of the WSPs are in need of bulk meter. Some WSPs felt a need of additional wells or sources. Most of the WSPs have some kind of water testing kits and they wanted to establish a regular mini lab. Most of the WSP have some kind of chlorine dosing units but either it is not sufficient or it is not systematic. Therefore, the work to make the units functional is needed.

Total estimated cost for improvement plan of existing facilities is calculated as NRs 4.49 billion, as shown in Annex E. Of the total estimated amount, major cost is for pipe replacement and its total amount is NRs 4.24 billion. Other costs such as washout, bulk meter, additional source, mini lab and chlorination system etc. is NRs 0.25 billion only in total

ABBREVIATIONS AND ACRONYMS

A/C	Account
ADB	Asian Development Bank
BLP	Bleaching Powder
BM	Benchmarking
CR	Collection Ratio
CS	Consumer Survey
DDC	District Development Committee
DUDBC	Department of Urban Development and Building Construction
DWSS	Department of Water Supply and Sewerage
ENPHO	Environment & Public Health Organization
FRC	Free Residual Chlorine
FY	Fiscal Year
GIS	Geographic Information System
GON	Government of Nepal
HR	Human Resources
HQ	Headquarters
JICA	Japan International Cooperation Agency
KTM	Kathmandu
KUKL	Kathmandu Upatyaka Khanepani Limited
KVWSMB	Kathmandu Valley Waters Supply Management Board
LPCD	Litter Per Capita Per Day
LPS	Litter Per Second
MIS	Management of Information System
MLD	Million Litter Per Day
MWSDB	Melamchi Water Supply Development Board
MWSS	Ministry of Water Supply and Sanitation
NRs	Nepali Rupee
NRW	Non Revenue Water
NDWQS	Nepal Drinking Water Quality Standard
NWSC	Nepal Water Supply Corporation
NWSSTC	National Water Supply and Sanitation Training Centre
OHT	Overhead Tank
O&M	Operation and Maintenance
OR	Operating Ratio
PID	Project Implementation Directorate

PIs	Performance Indicators
RSF	Rapid Sand Filter
RT	Reservoir Tank
SEIU	Sector Efficiency Improvement Unit
SH	Service Hours
SOP	Standard Operation Procedure
ST	Sedimentation Tank
VDC	Village Development Committee
WQ	Water Quality
WS	Water Supply
WSMB	Water Supply Management Board
WSTFC	Water Supply Tariff Fixation Commission
WSP	Water Supply Provider
WSSDO	Water Supply and Sewerage District Office
WTP	Water Treatment Plant
WUSC	Water Users and Sanitation Committee

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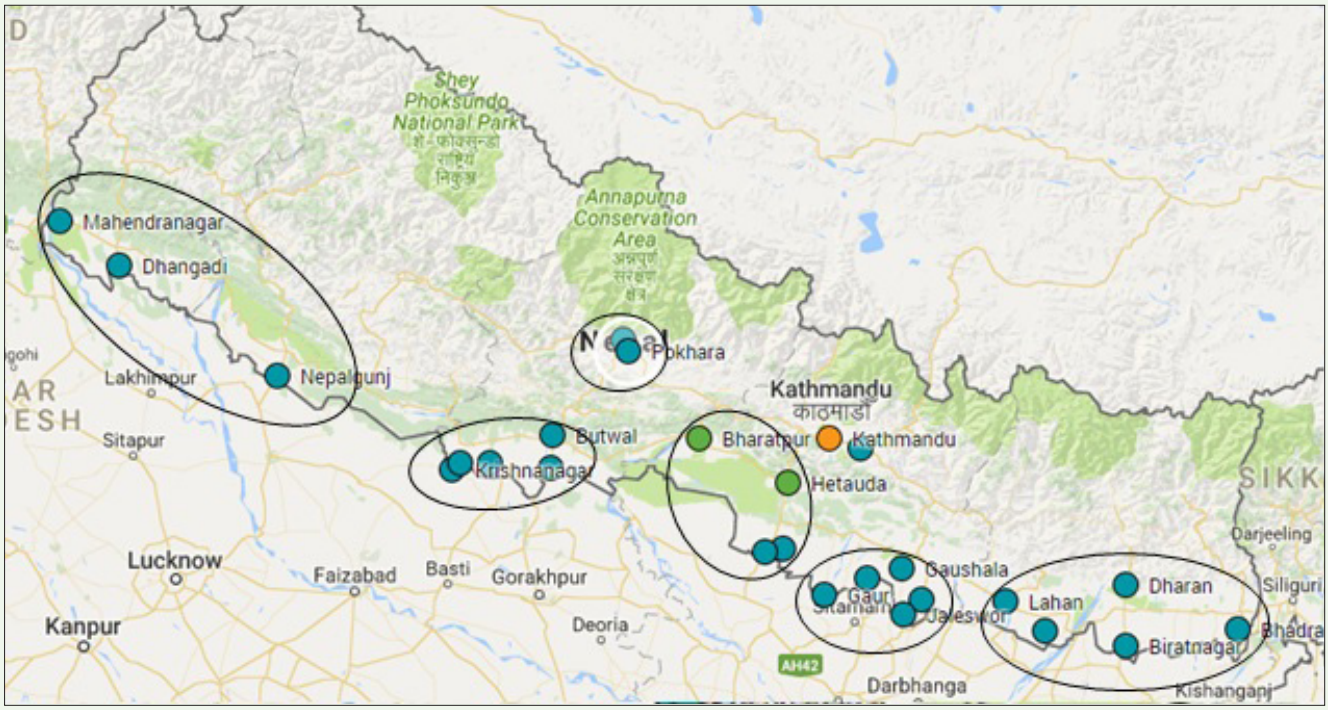
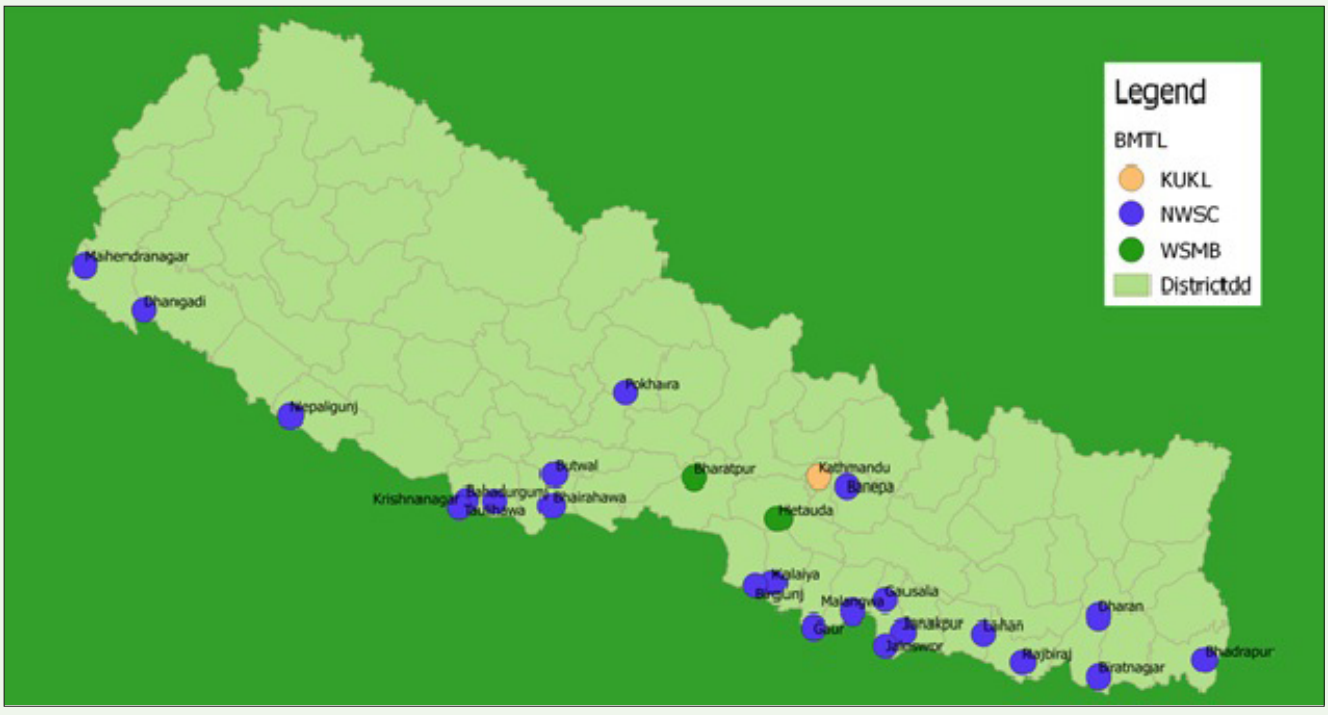
CHAPTER 1: INTRODUCTION



Location of Participating WSPs (Office) in Google Map

From East C1: Bhadrapur, Biratnagar, Dharan, Rajbiraj, Lahan. C2: Janakpur, Jaleswor, Gaushala, Malangwa, Gaur. C3: Kalaiya, Birgunj, Hetauda, Bharatpur. C4: Pokhara, Hemja. C5: Bhairahawa, Butwal, Taulaiwa, Bahadurgunj, Krishnanagar C6: Nepalgunj, Dhangadi, Mahendra Nagar. KTM : KUKL, Banepa.



Location of WSP (Office) with BM data in QGIS map

List of WSP covered in this assessment

S.No	Town	District	Category	Latitude	Longitude
1	Bhadrapur	Jhapa	NWSC	26.560093	88.033181
2	Biratnagar	Morang	NWSC	26.457230	87.286396
3	Dharan	Sunsari	NWSC	26.82781	87.284863
4	Rajbiraj	Saptari	NWSC	26.544805	86.745733
5	Lahan	Siraha	NWSC	26.726613	86.480287
6	Janakpur	Dhanusha	NWSC	26.737171	85.920171
7	Jaleshwor	Mahotari	NWSC	26.651101	85.799123
8	Gaushala	Mahotari	NWSC	26.924792	85.795218
9	Malangwa	Sarlahi	NWSC	26.859332	85.55957
10	Gaur	Rautahat	NWSC	26.76285	85.27788
11	Kalaiya	Bara	NWSC	27.0348	85.00211
12	Birgunj	Parsa	NWSC	27.017307	84.882853
13	Hetauda	Makawanpur	WSMB	27.434834	85.037602
14	Bharatpur	Chitwan	WSMB	27.690074	84.439631
15	Pokhara	Kaski	NWSC	27.205377	83.970975
16	Hemja	Kaski	NWSC	27.278624	83.93245
17	Bhairahawa	Rupendehi	NWSC	27.518080	83.448188
18	Butwal	Rupendehi	NWSC	27.709196	83.46504
19	Taulihawa	Kapilbastu	NWSC	27.544781	83.049947
20	Bahadurganj	Kapilbastu	NWSC	27.551937	82.844387
21	Krishnanagar	Kapilbastu	NWSC	27.507056	82.794506
22	Nepalgunj	Banke	NWSC	28.061113	81.623131
23	Dhangadhi	Kailali	NWSC	28.706305	80.578755
24	Mahendranagar	Kanchanpur	NWSC	28.967939	80.180359
25	Banepa	Kavre	NWSC	27.63527	85.51996
26	Kathmandu	Kathmandu	KUKL	27.69625	85.31368

List of WSP with sources, coverage and connections

S.No	Town	Sources			Total Population	Population served	No. of taps
		Surface	Ground	Tested			
1	Bhadrapur		4	4	22000	12062	1822
2	Biratnagar		10	10	250000	62018	11156
3	Dharan	3	5	8	125000	123013	16601
4	Rajbiraj		3	3	37000	17000	2296
5	Lahan		5	5	40000	16583	2478
6	Janakpur		3	3	155000	21408	3253
7	Jaleshwor		2	2	31827	6312	789
8	Gaushala		1	1	3200	3003	546
9	Malangwa		2	2	30000	7122	1079
10	Gaur		3	3	34937	8735	1108
11	Kalaiya		2	2	42000	11165	1447
12	Birgunj		6	6	204000	52395	7242
13	Hetauda	4	13	17	82000	78337	11184
14	Bharatpur		24	24	239292	96360	17493
15	Pokhara	6	5	11	300000	208026	35260
16	Hemja			2	21600	21000	202
17	Bhairahawa		6	6	68473	30056	3626
18	Butwal	2	13	15	138742	86213	14464
19	Taulihawa		2	2	15000	5712	820
20	Bahadurganj		1	1	10700	3848	433
21	Krishnanagar		2	2	30000	6060	990
22	Nepalgunj		3	3	75000	24234	4054
23	Dhangadhi		7	7	36000	26220	4469
24	Mahendranagar		4	4	48936	11298	2002
25	Banepa	5		5	71099	23397	3309
	Sub Total		**126**	**148**	**2111806**	**961576**	**148123**
26	Kathmandu	35	59	21	2560000	2059940	199416

1.1 Background

Urban Water Supply and Sanitation National Policy, (2009) aims to improve the health status and quality of life of people through the provision of sustainable water supply services to all urban populations. One of the objectives of the policy is to enhance institutional and operational capacity at local level for effective operation and maintenance of the water supply services. The policy states that Benchmarking and monitoring of urban water supply system against predefined indicators and service standards will be accorded a high priority at the national level.

Water supply service in Nepal is operated and maintained by mainly Water Users and Sanitation Committee (WUSC) in rural and small towns. About 176 relatively larger scale small town water supply systems are managed by WUSC. Water supply system in the larger and older towns are managed by NWSC or WSMB. Water supply system in the Kathmandu valley is managed by KVWSMB and operated by KUKL. This study is an assessment of capacity of water supply system/service providers in 26 towns including 23 towns managed by NWSC, two towns managed by WSMB (Bharatpur and Hetauda) and one managed by KVWSMB/KUKL. SEIU under Ministry of Water Supply and Sanitation with the support of ADB, initiated performance indicator (PI) based database establishment (called benchmarking) and published "Water Service Providers Data Book (2013-2014)" covering 63 service providers including eleven operated by NWSC and WSMBs. This data book provides BM data for 25 towns managed by NWSC, WSMBs and KUKL. It provides Data profile, system descriptions with plans for improvements, comparisons and process to update BM data and improvement plan.

Benchmarking data were collected for fiscal year 2071/72 (2014-2015). Water quality samples were collected from all sources and five selected taps in general. Consumer survey was conducted based on twelve questions related service level and user satisfaction in 50 Houses.

1.2 Methodology

Design of Data Collection Form: Based on previous questionnaire, need of present indicators, and small to large situation questionnaire has been developed and grouped logically. Forms have been modified after first batch of field visit to match the actual situation. The form consists of eight categories of information sheet: Institution, Staff information, System information, Coverage, Costumer service, Production, Revenue and Expenses. The form has been developed in excel sheet, linked to a list of data profiles and Performance Indicators (PIs). Excel format also includes sheet for assets calculation and plan for improvement and extension with a tentative cost calculation for major improvement works. Key ten PIs have been grouped together and calculated as integrated group indicator considering: Staff ratio, Metered connections, NRW (water use), Water supply hours, Water qualities, Production (LPCD), production cost (NRs/m3), operating ratio (cost/revenue), collection ratio (collection/Billing) and water supply service coverage.

Field visit plan: Plan for a site visit was prepared in six different packages. Visit of Kathmandu and Banepa was covered in between. In each town the first day (arrival day) was spent in planning for three activities: BM data collection, WQ sampling and consumer survey. Information collection and site visit were conducted on the second day and workshop was conducted on the third day and moved to the other site. Water quality samples were collected based on schedule of sources and water supply. Consumer survey was generally completed on the second day.

A web based MIS has been developed and data updated for participating towns. MIS system has been practiced and tested in Pokhara, workshop organized for core group and feedback received. Training for larger group inviting two persons from each of the participating WSP has been organized in NWSSTC. WSP can update data by self and analyze data and compare with others. The public can view data profile, PIs data and make comparisons on the selected PIs or timeline. SEIU can provide registration, approve submitted data. This will be extended to all town systems. A handout on data calculation and making an improvement plan has been prepared.

CHAPTER 2: BENCHMARKING

2.1 Benchmarking and Indicators

Benchmarking is the methods of evaluating performance of the water supplier. This helps to compare a supplier with others and learn from the best practices. This then allows organizations to develop plans on how to make improvements or adapt specific best practices, usually with the aim of increasing some aspect of performance which provides relative comparisons of attained results by suppliers.

Benchmarking is used to measure performance using a specific indicator. Benchmarking indicators cover technical, managerial and financial indicators. Benchmarking process helps responsible agencies to understand its position in terms of performance, compare among water supply system in the various towns and encourage best practices or best performing towns. Following 10 Indicators has been defined as key performance Indicators (PIs) for the benchmarking of water supply services in Nepal

SN	Indicator	Unit	Definition
1	Water Coverage	%	(Population with access to water services /Total population under the service area of the utility)*100
2	Staff Ratio	No	(Total number of staff/ Total number of tap connections) *1000
3	Metered Ratio	%	(Total number of tap connections with an operating meter/Total number of tap connections) *100
4	Water Production (Use) Rate	LPCD	Average daily water supplied to the distribution system (Used)/Population covered by water service
5	Non-Revenue Water (NRW)	%	(Average daily water production - average daily water consumption)/Average daily water production*100
6	Production cost	NRs/m3	Annual operational cost/Average daily water production/365
7	Operating ratio	-	Annual operational cost/ Annual Sales revenue (Billing)
8	Collection ratio	-	Annual tariff collection/ Annual Billing
9	Service Hours	HR/day	Average hours of service per day from water supply.
10	Water Quality*	%	(Number of sample meeting standard/ Number of samples tested in supply point) *100

*Note: *Can be segregated as Physicochemical, Biological and FRC etc.*

2.2 Situation Analysis and suggestions for improvement

1.0 Institutional management

Situation:

NWSC branches function under technical delegation of NWSC-HQ. WSMB is autonomous at local level guided by WSMB and KUKL operates under KVWSMB. None of WSP has kept updated system and network maps and documented SOP. NWSC have very good MIS but currently not managed by the Center. WSMB and KUKL prepared annual reports. Financial information is well maintained, but production and water use data are not well maintained. In the absence of institutional home and regulations, there is no basis for institutional development and performance improvement.

Suggestions:

Have a good vision of WSP indicating coverage and standard of service level, Prepare standard process for operations, including: production and supply, pump operation, leakage control, complaint management, consumer survey, chlorination, WQ monitoring, MIS etc.

Develop MIS and maintain information relating to production, water use, NRW, No of complaints, Leakage repair, electricity use, Chlorine use, WQ monitoring/compliance at source and taps, operation expenses and water sales revenue.

Analyze the data and make an improvement plan for required performance using key indicators. Keep a record of population, HH size and growth rates in the various zones of the service area.
Carry out special study for water use pattern for various seasons and years.

2.0 Staff development

Situation:

Generally, staff Ratio is higher in small system. Staff Ratio varies from 2.8 to 15.3 with an average of 8.3 WSP with a small system and high staff Ratio unable to maintain operating ratio. NWSC has approved staff number for their branches which is higher than the current numbers. KUKL also unable to recruit approved staff. WSMB has tendencies to outsource or hire temporary staff for operations. Managers reported that existing staff are not competent to current needs.

Suggestions:

Design units, including management, A/C, Admin, production, Distribution, Revenue.
Prepare appropriate job description.
Identify staff composition based on functions.
Link staff performance with MIS and Performance indicators of WSP.

3.0 System Information

Situation:

WSP like Hetauda, Butwal and Pokhara depends mainly on surface system and use tube well to meet demand during low flow periods. Rest all depends on tube well only. Water is generally supplied from the ground tank in surface system and from OHT from the ground water system. WSP like Gaushala (ST), Lahan (ST), Rajbiraj (RSF), Bhadrapur (RSF), Mahendranagar (RSF) has WTP supported by JICA and in use at various levels. There is ST and flocculation system in Dharan and Butwal but have not been used properly. RSF constructed in Butwal is not in use. Pokhara is in need of full- fledged WTP which is under process of construction with the support of JICA. Some WSP like Hetauda, Biratnagar, Bharatpur have used pressure filter in some units. Distribution systems in most towns are very old which is insufficient to let flow current demand and in need of replacement, upgrading and extension to meet new demand. The number of taps per km of networks varies from 21-145 with 64 average. Assets in terms of connections ranged from NRs 19000 to NRs 175000 with average of NRs 69000.

Suggestions:

Prepare updated system map showing key features, show in Google maps. Prepare updated network maps showing pipe size, length and node elevations.
Analyze for hydraulic situation. Prepare a plan for improvement and extension to meet future demand.
Prepare assets management and make list of system components and find total assets and assets per unit connections.
Prepare improvement plan and plan for extension for future needs.

4.0 Coverage and Connections

Situation:

General connection types are Private, Public and Institutional (Government offices). Some WSPs have disconnected public taps. NWSC have record of 1043 public taps connected before 2050 in 10 branches

for which GON pays @ NRs1600/tap/month. Some public taps are connected as community taps upon request by local bodies. There are only 900 public taps in place which is about 0.3% of taps are public taps. Total connections are 0.346 millions. Average connection density is 64/Km with a range of 21-145. In year 2071/72 about 3.4 % new taps were connected. About 95.3% taps are metered. None of the WSP able to maintain required flow and pressure in all taps. People mostly collect water on the ground. Generally, coverage in the area like Dharan, Pokhara and Butwal where there is no alternate option for water is very high. Coverage in Terai where there are options using hand pumps is very low, indicating the scope for expanding coverage with more taps if the service level is improved.

Suggestions:

Keep a record of trend of population growth in the service area, area covered and population served by the system

Install water meter in all kinds of taps including the public.

Maintain flow and pressure by updating pipes, zoning and adding sources.

Prepare appropriate strategy to expand coverage area and population coverage.

5.0 Water services

Situation:

There is no system for user satisfaction survey. Opinion of management team regarding the satisfaction level varies from 25-100 with an average value of 61%. Average user satisfaction level based on a survey carried during visit is 56%. Number of leakages vary from 0.6- 14.8 with an average of 3.9/km. Pressures in the taps are below expectation of users. The majority of people collects water from the ground. Average service hours vary from 2-12 with an average of 7 hours. Water service providers in city like Kathmandu, Dharan, Pokhara are having load shedding (electricity supply cut off) in the part of the area and are unable to distribute every day.

Suggestions:

Maintain service level relating to supply time, supply hours, continuity, cleanliness, and sufficiency. Address to the complaints of consumers systematically and analyzes the record area wise and time wise.

Make a plan for consumer survey with minimum of two times in a year covering all clusters. Analyze the survey data and link with the operating system.

Establish linkage with users forming users group. Make a plan for consumer education and encourage people for water conservation, source protection and maintenance. Encourage users to reuse wastewater. Organize regular training workshop for users and student, including system visits.

6.0 Production, Use and NRW

Situation:

Generally there is no system for recording daily production except few WSP who maintains log book. Production is calculated based on general flow rate form sources and pumping hours from the wells. Water production varies from 65 to 255 with average 137 LPCD. Consumption varies from 46 lpcd to 109 lpcd with average 81 lpcd. Monthly consumption based on metered taps range from 12-19 units. NRW is 12-65% with average 38%. For the real NRW a reliable production data are required. Water consumption has been calculated based on actual units consumed, derived from tariff or sampling. Consumption for unmetered taps has been assumed as 1.5 to 2 times the average consumption by private tap based on the situation. For public taps, it has been assumed to be 2 to 5 times based on the use of public taps and supply hours. WSP thinks that real loss in pipes cannot be more than 20% rest accounts for illegal use of water or unknown leakages in old pipes.

Suggestions:

Prepare production and supply schedule based on demand. Keep a record of production based on flow meter or as appropriate on daily and monthly basis.

Make an appropriate schedule for water supply. Prepare appropriate zoning, maintain flow and pressure at various zones. Take care of low pressure zones. Prepare efficient way of leakage detection and control.

Keep record of water use using meter reading data make an appropriate estimate for unmetered taps and estimate NRW.

Make a plan for reducing NRW in coordination with production and distribution units.

7.0 Water Quality

Situation:

In most of the cases, there is a system for chlorination in all WSPs. But none of the WSP does it regularly and controls the required FRC in all locations. All WSP had once WQ test kits in place, but now only 50% WSP doing regular WQ testing. Few WSP maintains test data and post on the notice board. Tests have indicated that the sample meeting biological, physical and chemical parameters are 53%, 98% and 96% at source and 45%, 85%, 93% at taps respectively. This indicates further contamination at the network.

Suggestions:

Identify critical water quality parameters to be monitored at the sources, after WTP and at taps.
Monitor water quality parameters based on schedule. Establish a mini lab for regular testing.
Identify key hazards to be controlled at the source, production and distribution network.
Install appropriate chlorination unit at the source, tank and network (if necessary) and control FRC.
Apply water safety plan as a method/approach to maintain continuous safety of supply water.
Establish linkage with health office and keep record of water borne diseases.

8.0 Revenue & Operation Expenses

Situation:

There is centralized financial system within NWSC hence they get operation budget from the HQ. WSMB can make use of revenue for operation and capital development. NWSC branches also get capital budget based on availability of funds and proposal submitted. Main revenue is billing for water tariff. Average billing is NRs 257 ranging from 140-433 per month. The collection ratio varies from 0.7 to 1.0 with average 0.9. The operating ratio varies from 0.24 to 2.8 with an average of 1.3. Minimum ratio is of Pokhara because water produced from river and supplied without treatment and there are no other options. The operating ratio for small systems are generally high.

Suggestions:
Keep record of operating costs with categories like personnel, energy, chemicals, maintenance and administration. Minimize the cost applying preventive maintenance and in view of life cycle cost.

Keep report of revenue from water sales and other revenue actually collected. Analyze operating cost ratio and collection ratio. Make a plan for reducing operating ratio (up to 0.5) and collection ratio (up to 1.0).

Establish linkage with DDC, Municipalities and donors to collect funds for extension and major improvement.

Update minimum tariff and increment to match the required operating ratio taking care of prevailing rate and affordability of users. Make plans for staff efficiency, minimize water loss and efficient maintenance.

2.3 Key Findings

SN	Type	Indicators	Units	Average	Min	Max
1	Staff	Staff Ratio (000)	No/Taps	8.3	2.8	15.3
2	Coverage	Coverage by water supply	%	45.6	13.8	98.4
3	Coverage	Metered connections	%	96.2	84.0	100.0
4	Production	NRW	%	37.6	12.3	64.9
5	Production	Water production rate	LPCD	136.7	61.5	254.7
6	Revenue & Exp	Production cost	NRs/m3	12.4	2.5	23.6
7	Revenue & Exp	Collection Ratio	Unit less	0.9	0.7	1.0
8	Revenue & Exp	Operating Ratio	Unit less	1.3	0.24	2.8
9	Service	Supply hours	Hour	6.5	2.0	12.0
10	WQ	Sample meeting WQ (Avg)	%	42.7	0.0	100.0

- Staff ratio varies from 2.8 to 15 with average 8.3 Small system have a high staff ratio. Expected staff ratio is 5 for larger systems. Smaller systems need to have alternate management system of increase coverage(taps)
- Coverage varies from 14% to 98% with an average of 56%. Less coverage in the town where there is an alternate source. Expected coverage is 100%, which is possible by increasing service level.
- Metered connections vary from 84% to 100% with an average of 96%. Expected value is 100%, which is possible by replacing meter to unmeter connections and to public taps.
- NRW varies from 12% to 65% with an average of 38%. In the absence of accurate data relating to production and water use these data may change in the future even in the same situation. Expected NRW is below 20%. This is possible by regulating the illegal use and then by leakage control.
- Water production varies from 62 lpcd to 255 lpcd with an average of 137 lpcd but actual water available for use is only 56 lpcd. Expected water availability is 100 lpcd which is possible by reducing water loss and increasing production based on demand.
- Water production cost is 2.5 NRs/m3 to 24 NRs/m3 with an average of 12 NRs/m3. Expected production cost is NRs 10/m3. This is possible by efficient operation. In some system cost becomes higher due to the cost of power and treatment.
- Collection ratio is 0.7-1 with an average value of 0.9. Expected collection ratio is 1.0 which is possible by education and easy way of tariff payment and regulating government taps.
- Operating ratio is 0.24 to 2.8 with average 1.3. Expected value is 0.5 Operating ratio can be reduced by reducing operation cost or by increasing taps.
- Supply hours vary from 2 hour to 12 hours with an average of 6.5 hours. Expected value is 8 hours or more. This is possible by controlling leakage and zoning and increasing production or reservoir capacity in some cases.
- WQ compliance based on WQ monitoring by WSP varies from 0% to 100% with average 43%. Expected value is 100% meeting physical, chemical and biological parameters in all taps. This is possible through applying a water safety plan, regulated chlorination, regular monitoring and leakage control.

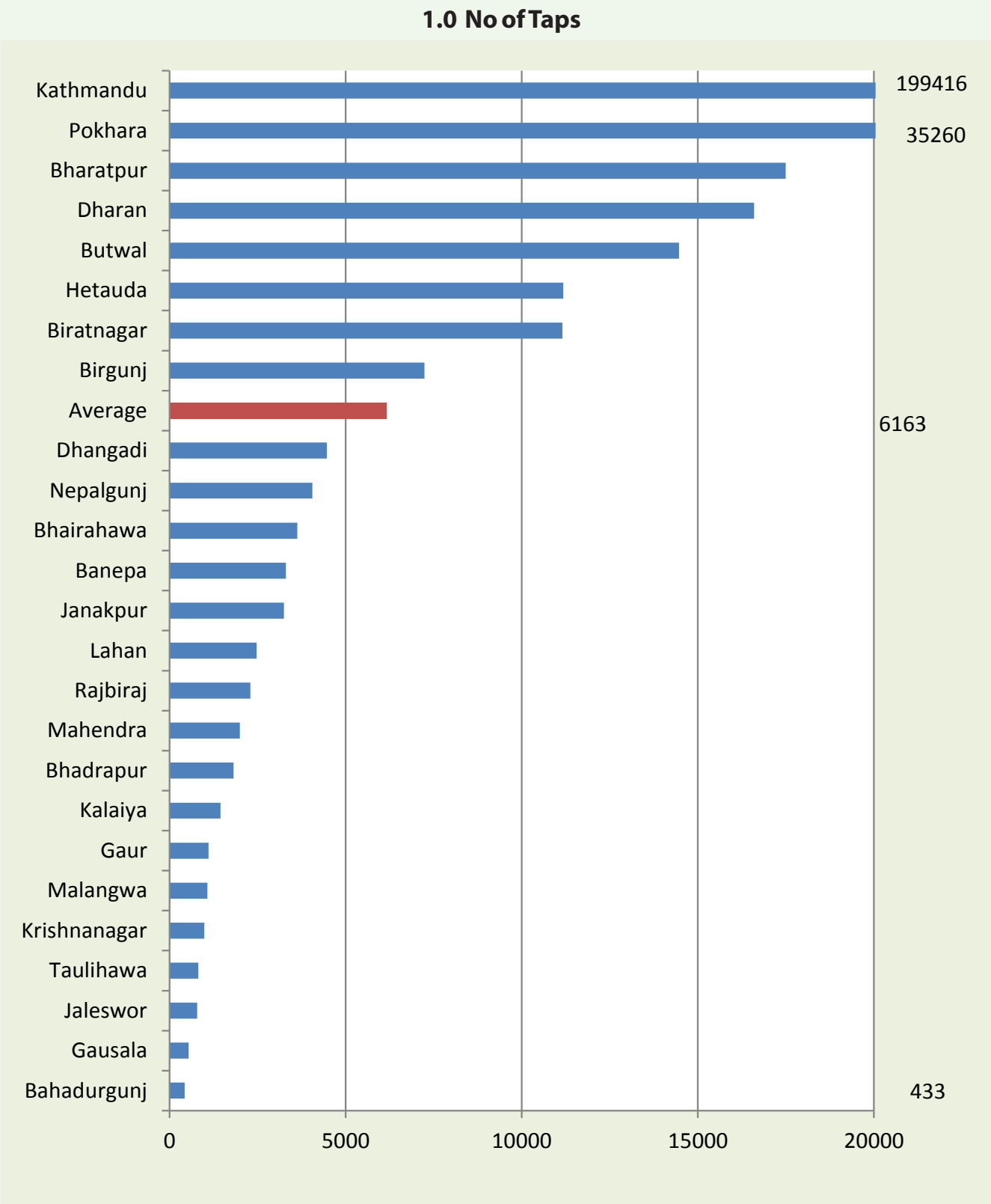
2.4 Town Wise Status of Performance Indicators

SN	Type	Indicators	1	2	3	4	5	6	7	8	9	10
			Bhadrapur	Biratnagar	Dharan	Rajbiraj	Lahan	Janakpur	Jaleswor	Gaushala	Malangwa	Gaur
1	Staff	Staff Ratio (Staff/100 Taps)	12.1	3.9	3.6	7.8	7.7	8.0	12.7	14.7	13.0	15.3
2	Assets	Assets/connections (000)	90	45	39	51	47	49	118	144	69	77
3	Coverage	Coverage by water supply (%)	55	25	98	46	41	14	20	94	24	25
4	Coverage	Metered connections (%)	97	100	98	90	96	98	95	100	84	97
5	Production	NRW (%)	24	42	42	36	45	12	52	65	25	27
6	Production	Water production rate (LPCD)	115	175	122	114	126	84	143	200	126	86
7	Production	Water use rate (LPCD)	87	102	71	73	69	74	69	70	95	63
8	Revenue & Exp	Production Cost (NRs/m3)	21	7	10	16	11	23	16	4	22	24
9	Revenue & Exp	Cost of water Used (NRs/m3)	28	12	17	25	19	26	33	12	29	32
10	Revenue & Exp	Collection Ratio (Collection/Billing)	1.0	0.9	1.0	1.0	0.9	0.7	0.9	0.8	0.7	0.7
11	Revenue & Exp	Operation Ratio	1.5	0.7	0.7	2.1	1.1	1.9	2.8	1.0	2.6	2.1
12	Revenue & Exp	Average tariff NRs/tap/M)	338	286	365	199	243	206	206	150	221	228
13	Revenue & Exp	Average unit tariff (NRs/m3)	18.6	15.7	22.5	11.5	15.1	9.3	10.9	10.3	8.3	9.9
14	Service	Supply hours	9.0	11.0	5.0	3.5	5.0	2.5	6.5	5.0	7.0	7.0
15	Service	Leakage Rate (No.Km/Yr)	1.3	3.7	1.8	6.2	2.6	2.0	2.7	5.5	8.2	4.2
16	Service	Complain Rate (No/Tap/Yr)	19.5	35.5	6.5	9.1	9.7	1.8	7.6	76.9	8.9	4.5
17	Service	Connection density (No/Km)	37	53	82	66	54	106	36	36	92	46
18	Service	HH satisfied (%)	70	100	70	60	90	57	57	57	64	47.2
19	Service	Discuntinuty (No water Days) (%)	0.0	0.0	20.5	0.0	0.5	0.0	0.0	2.7	1.6	0.0
20	WQ	Physiochemical standard (%)	100	100	0	100	0	0	0	0	0	0
21	WQ	Biological standard (%)	100	56	0	0	0	0	0	0	0	0
22	WQ	Sample meeting FRC (%)	100	67	0	75	0	0	0	0	0	0
23	WQ	Sample meeting WQ (Avg) (%)	100	74	0	58	0	0	0	0	0	0

SN	Type	Indicators	11	12	13	14	15	16	17	18	19	20
			Kalaiya	Birgunj	Hetauda	Bharatpur	Bhairahawa	Butwal	Taulihawa	Bahadur	Krishnanagar	Pokhara
1	Staff	Staff Ratio (Staff/100 Taps)	9.7	4.3	4.0	2.8	6.9	4.5	13.4	9.2	15.2	2.8
2	Assets	Assets/connections (000)	83	57	61	71	68	34	121	175	103	26
3	Coverage	Coverage by water supply (%)	27	26	96	40	44	62	38	36	20	69
4	Coverage	Metered connections (%)	97	96	98	100	99	99	100	94	95	98
5	Production	NRW (%)	39	23	28	33	45	57	54	27	37	58
6	Production	Water production rate (LPCD)	129	106	118	161	117	255	169	97	169	238
7	Production	Water use rate (LPCD)	78	82	85	108	65	109	77	71	106	101
8	Revenue & Exp	Production Cost (NRs/m3)	14	10	7	7	10	5	15	4	17	2
9	Revenue & Exp	Cost of water Used (NRs/m3)	23	13	10	10	18	11	32	6	28	6
10	Revenue & Exp	Collection Ratio (Collection/Billing)	0.8	0.7	1.0	0.9	0.9	0.9	0.9	1.0	0.9	0.9
11	Revenue & Exp	Operation Ratio	1.7	0.9	0.9	0.7	1.2	0.6	2.2	0.8	1.7	0.2
12	Revenue & Exp	Average tariff NRs/tap/M)	261	257	208	269	249	341	239	140	319	433
13	Revenue & Exp	Average unit tariff (NRs/m3)	10.9	10.0	11.2	14.0	13.4	15.7	13.5	6.8	13.7	21.4
14	Service	Supply hours	8.0	11.0	6.0	12.0	8.0	6.1	6.0	4.5	5.0	4.0
15	Service	Leakage Rate (No.Km/Yr)	1.9	2.6	4.9	1.7	3.4	2.1	2.8	0.6	2.1	14.8
16	Service	Complain Rate (No/Tap/Yr)	4.1	5.0	0.9	12.7	18.0	12.4	25.9	8.3	10.5	10.2
17	Service	Connection density (No/Km)	46	52	53	39	52	129	48	21	39	145
18	Service	HH satisfied (%)	0	90	80	25	75	95	80	47	0	0
19	Service	Discuntinuty (No water Days) (%)	0.0	0.0	2.7	0.0	0.0	0.8	0.0	0.5	0.5	0.0
20	WQ	Physiochemical standard (%)	0	100	100	100	99	100	100	100	100	75
21	WQ	Biological standard (%)	0	100	0	100	0	100	0	100	0	0
22	WQ	Sample meeting FRC (%)	0	100	100	100	80	100	93	0	100	83
23	WQ	Sample meeting WQ (Avg) (%)	0	100	67	100	80	100	64	67	67	53

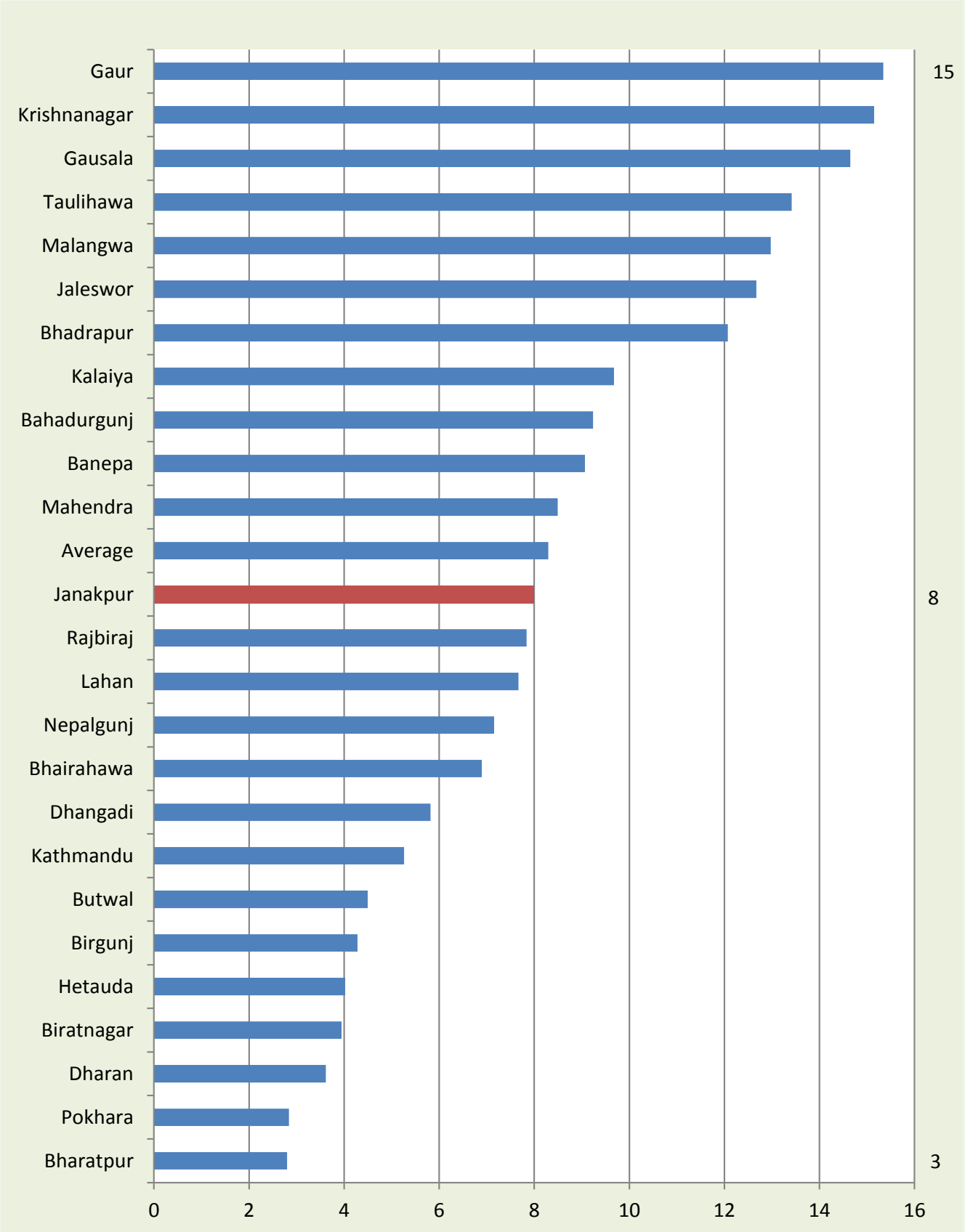
SN	Type	Indicators	21	22	23	24	25	26	27	28	29
			Nepalgunj	Dhangadi	Mahendranagar	Banepa	KUKL	Avg	Min	Max	Medain
1	Staff	Staff Ratio (Staff/100 Taps)	7.2	5.8	8.5	9.1	5.3	8.6	2.8	15.3	8.2
2	Assets	Assets/connections (000)	76	41	69	69	39	77	26	175	69
3	Coverage	Coverage by water supply (%)	32.3	72.8	23.1	32.9	80.5	43.8	13.8	95.5	34.4
4	Coverage	Metered connections (%)	99.8	99.7	85.5	95.6	92.6	96.1	84.0	100.0	97.6
5	Production	NRW (%)	37.1	18.4	58.8	27.1	24.6	37.5	12.3	64.9	35.2
6	Production	Water production rate (LPCD)	160.4	106.8	164.6	73.9	56.4	138.0	56.4	254.7	127.7
7	Production	Water use rate (LPCD)	100.8	87.1	67.8	53.9	42.5	80.2	42.5	108.7	77.
8	Revenue & Exp	Production Cost (NRs/m3)	9.1	10.0	11.1	21.0	17.6	12.5	2.47	23.6	10.6
9	Revenue & Exp	Cost of water Used (NRs/m3)	14.4	12.3	26.9	28.8	23.4	19.8	5.8	32.8	20.5
10	Revenue & Exp	Collection Ratio (Collection/Billing)	0.9	0.9	0.9	0.9	0.7	0.8	0.7	1.0	0.9
11	Revenue & Exp	Operation Ratio	1.1	0.7	1.3	1.6	1.0	1.4	0.2	2.8	1.1
12	Revenue & Exp	Average tariff NRs/tap/M)	239	258	239	210.8	329	250	140	433	239
13	Revenue & Exp	Average unit tariff (NRs/m3)	11.8	14.6	18.9	15.7	17.3	12.9	6.8	21.4	12.6
14	Service	Supply hours	6.0	12.0	8.5	2.0	1.5	6.2	1.5	12.0	6.0
15	Service	Leakage Rate (No.Km/Yr)	3.5	6.0	4.3	4.9	4.9	4.2	0.6	14.8	3.4
16	Service	Complain Rate (No/Tap/Yr)	20.2	13.4	11.4	3.8	4.0	13.0	0.9	76.9	9.6
17	Service	Connection density (No/Km)	39	89	65	54	122	66	21	145	52
18	Service	HH satisfied (%)	90	90	60	57	0	54	0	95	57
19	Service	Discuntinuty (No water Days) (%)	0.8	0.3	0.5	50.0	20.0	4.0	0.0	50.0	0.4
20	WQ	Physiochemical standard (%)	0.0	0.0	100.0	0.0	90.0	53.2	0.0	100.0	82.5
21	WQ	Biological standard (%)	0.0	0.0	100.0	0.0	65.0	28.3	0.0	100.0	0.0
22	WQ	Sample meeting FRC (%)	0.0	0.0	50.0	0.0	68.0	43.7	0.0	100.0	25.0
23	WQ	Sample meeting WQ (Avg) (%)	0.0	0.0	83.3	0.0	74.3	41.7	0.0	100.0	56.2

2.5 Data Comparison Charts



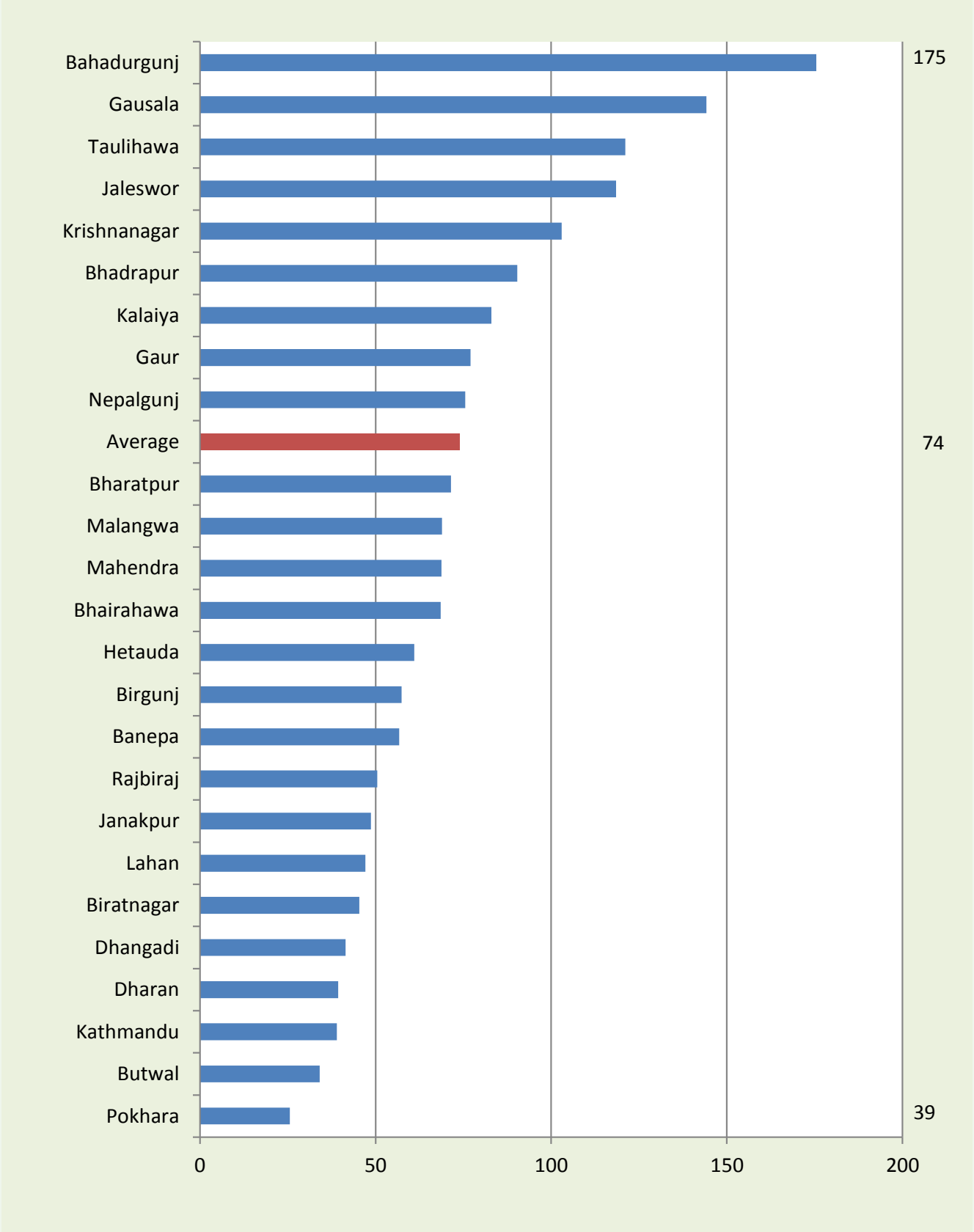
WSP with scattered community and lower number of connections have a lower Asset Ratio. Assets ratio indicates capital associated with connections. Lower Assets indicated higher utilization or sharing of capital.

2.0 Staff Ratio (Number of Staff/1000 Taps)



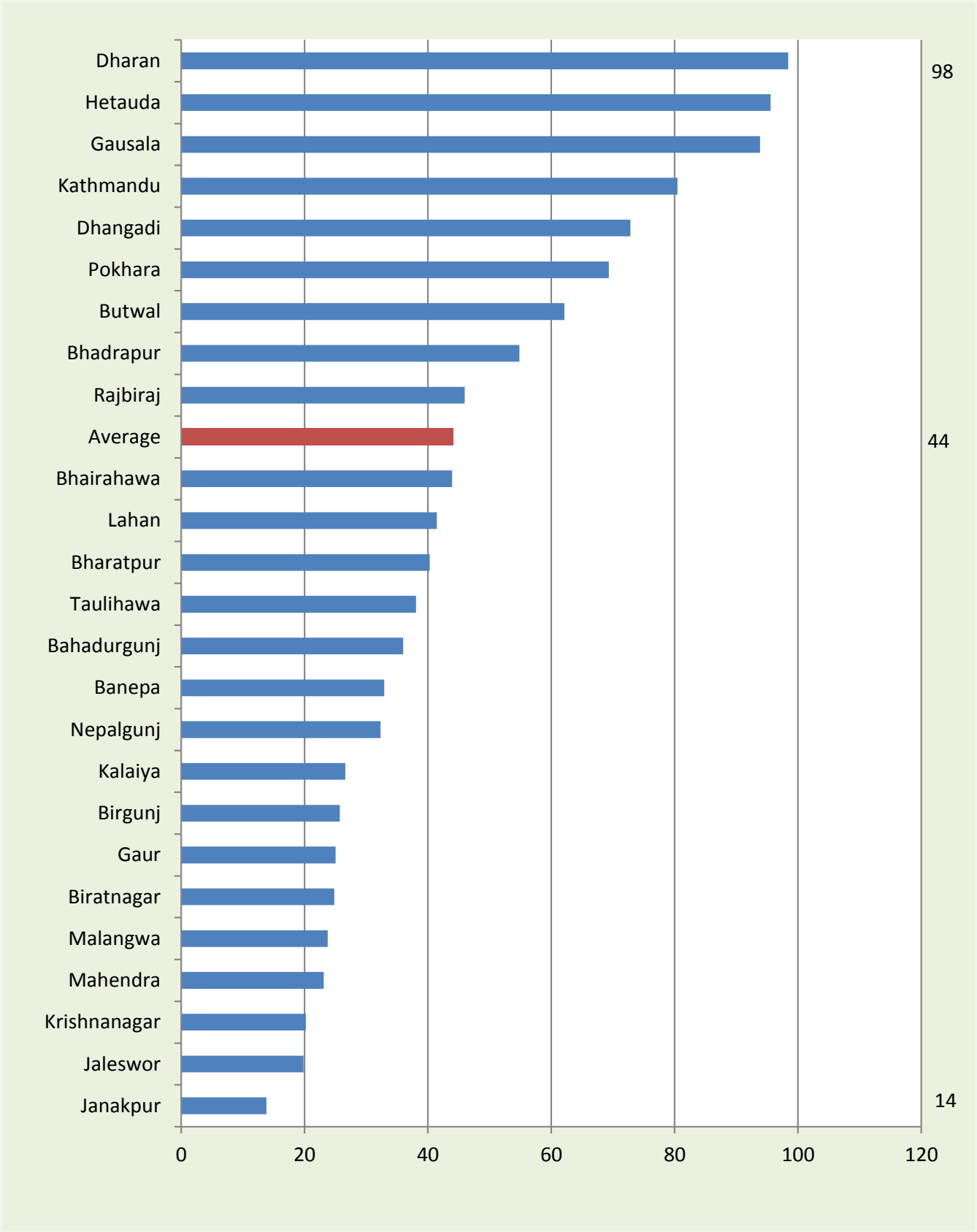
Generally, water supply coverage with optional system for water fetching have low coverage of the WSP system. Similarly, water supply coverage is high in the town where service level is higher. Exact service level depends on the accuracy of data related to the service area and population in the service area.

3.0 Assets (000) per connection



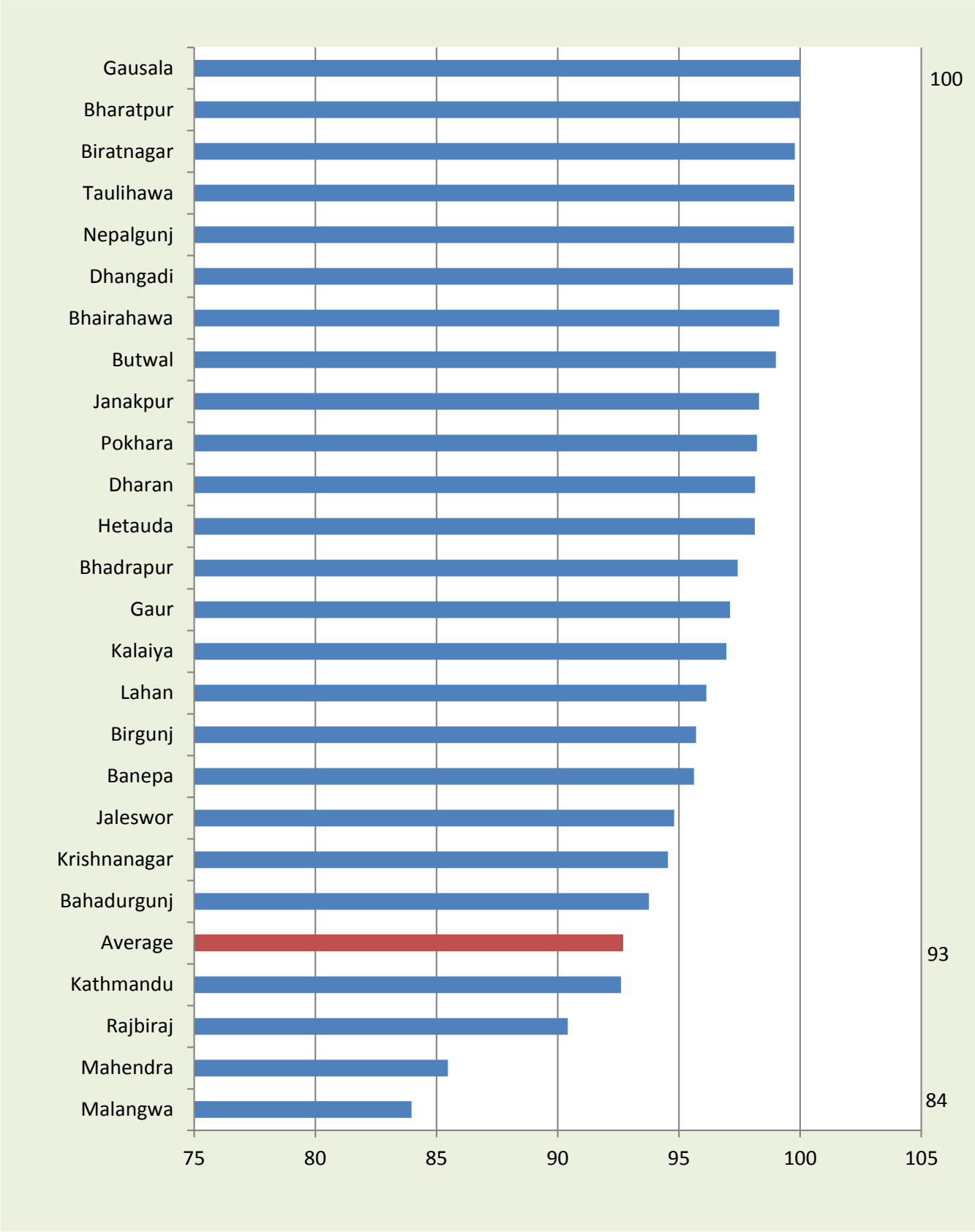
WSP with scattered community and lower number of connections have a lower Asset Ratio. Assets ratio indicates capital associated with connections. Lower Assets indicated higher utilization or sharing of capital.

4.0 Water Supply Service Coverge



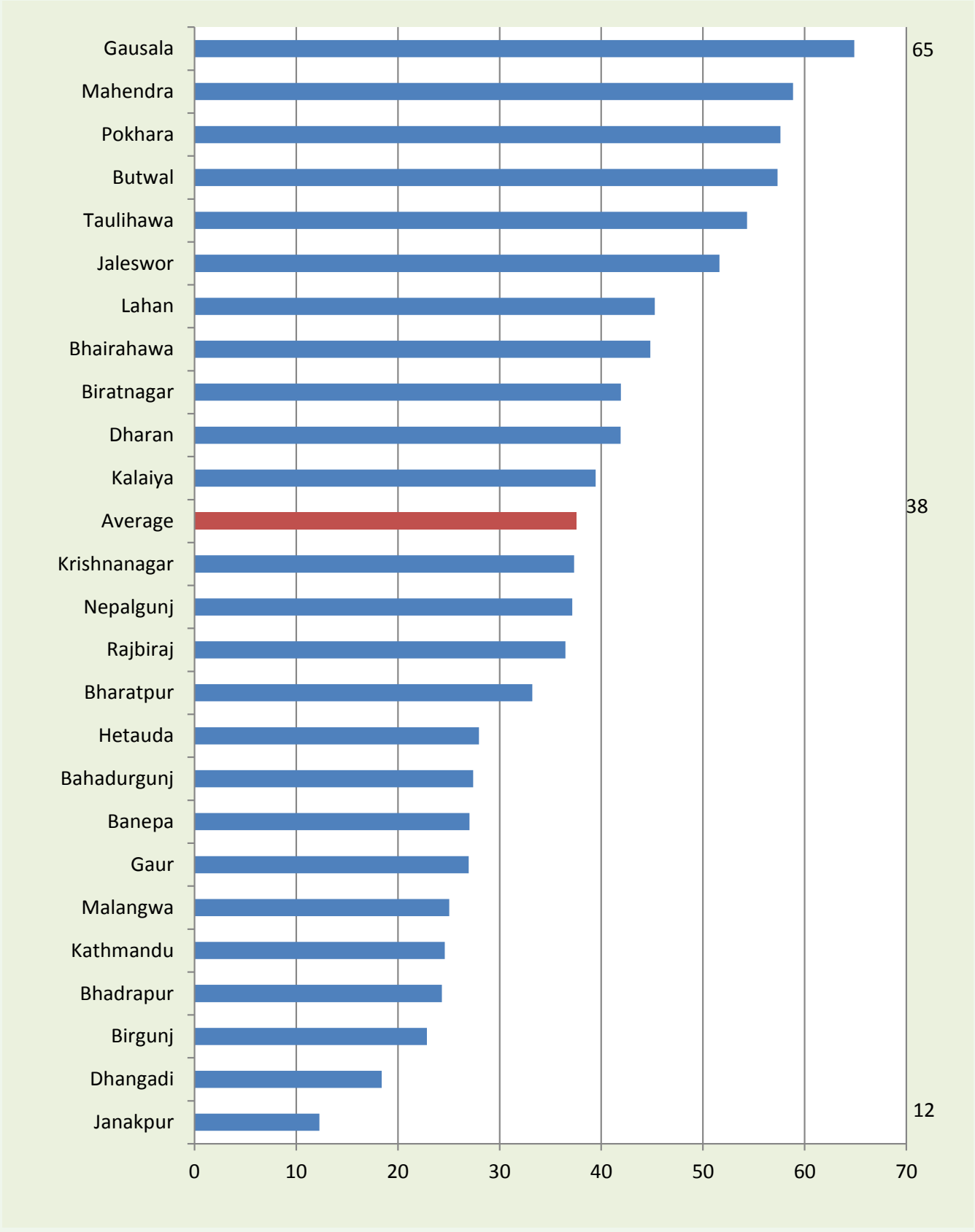
Generally, water supply coverage with optional system for water fetching have low coverage of the WSP system. Similarly, water supply coverage is high in the town where service level is higher. Exact service level depends on the accuracy of data related to the service area and population in the service area.

5.0 Metered Connections (%)



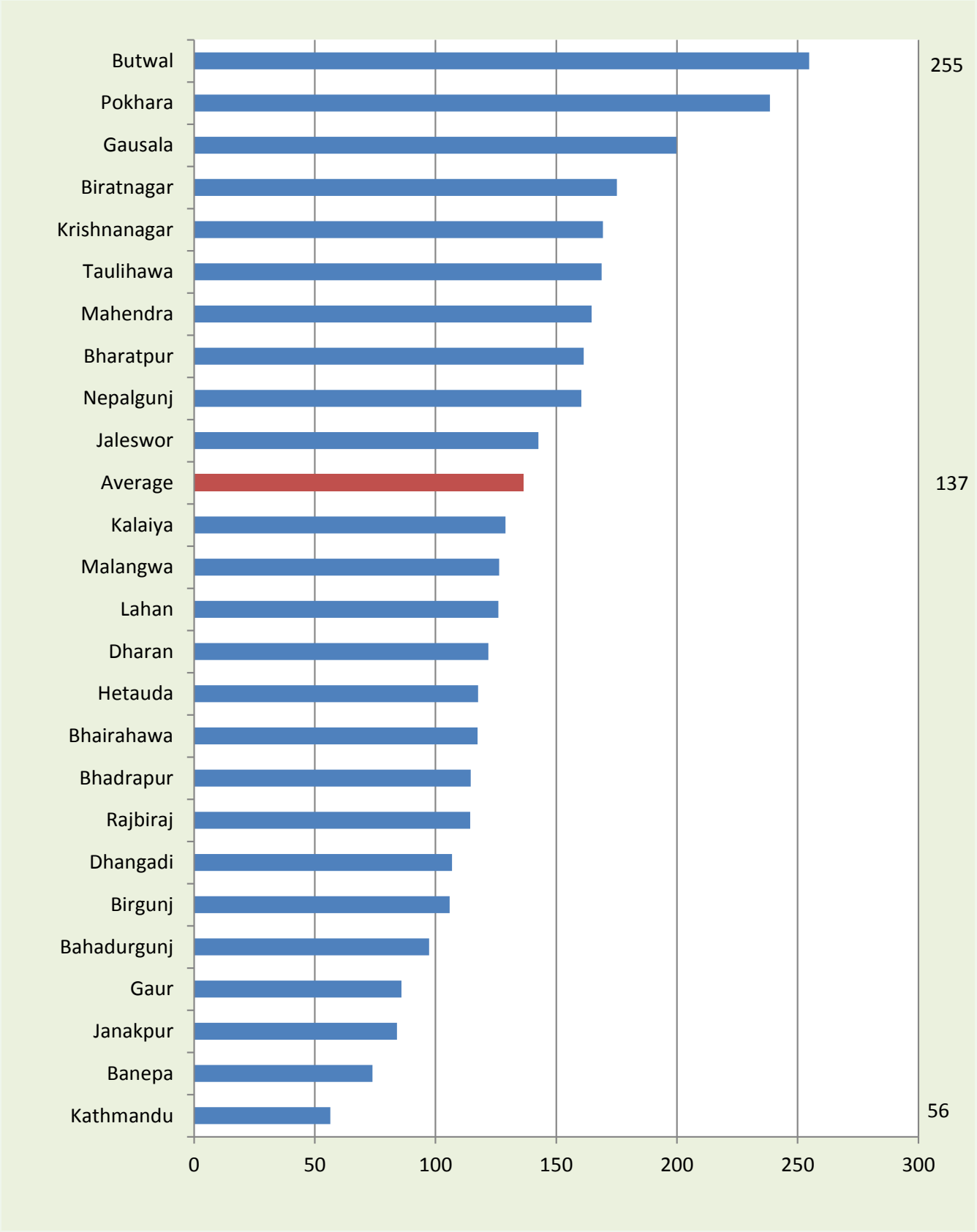
Unmetered taps include public taps and non-functioning taps. WSPs which have a regular program for repair and replacement of meter are able to maintain higher meter ratio. In few towns, people feel comfortable to use unmetered tap where as in few town WSPs feel so resulting higher revenue.

6.0 NRW (Production -Consumption)%



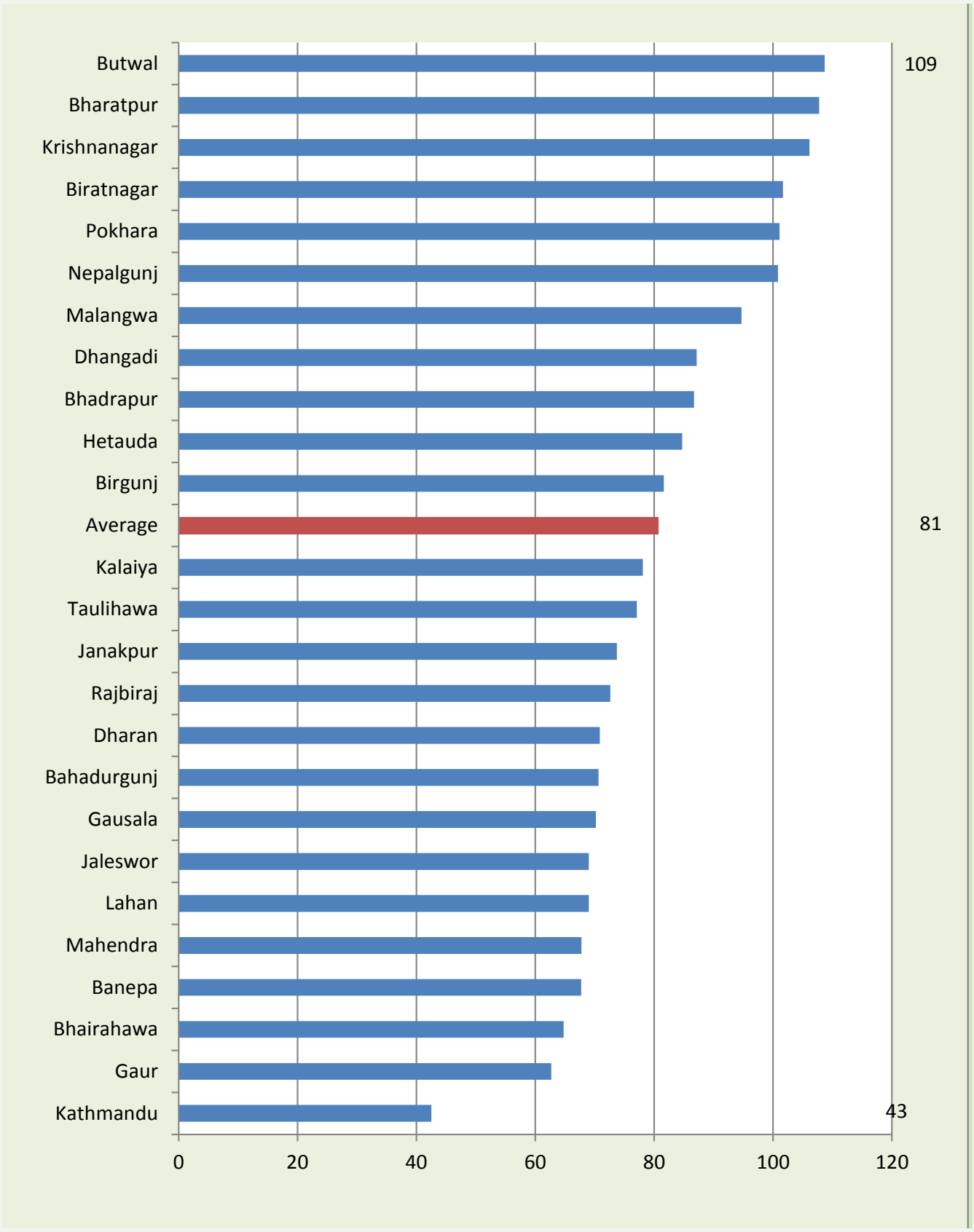
NRW has been calculated as the difference between production and consumption (use). Consumption data are somehow closed to accurate because it has been verified by revenue from metered taps. But production data are not very reliable. NRW includes leakage and illegal use of water. WSP can explore.

7.0 Water Production Rate (LPCD)



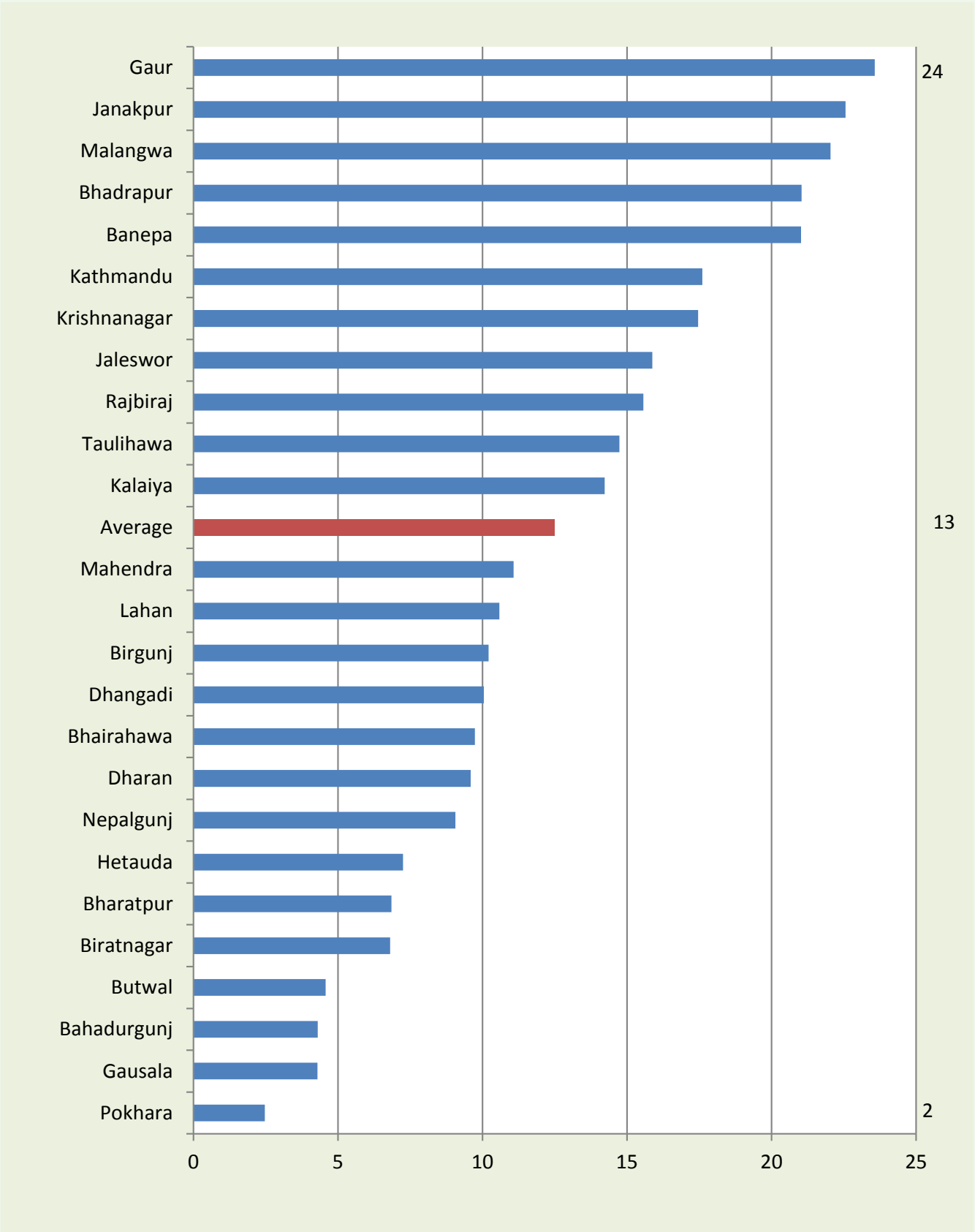
Generally, low production rate is due to lack of water sources. In some towns of Terai low production is due to less demand in the view that there are alternate sources at household level. Some WSP have very high rate of production and waste as NRW which will not affect for their operation budget which comes from center. But actual use is much lower (see next chart)

8.0 Water Consumption Rate (LPCD)



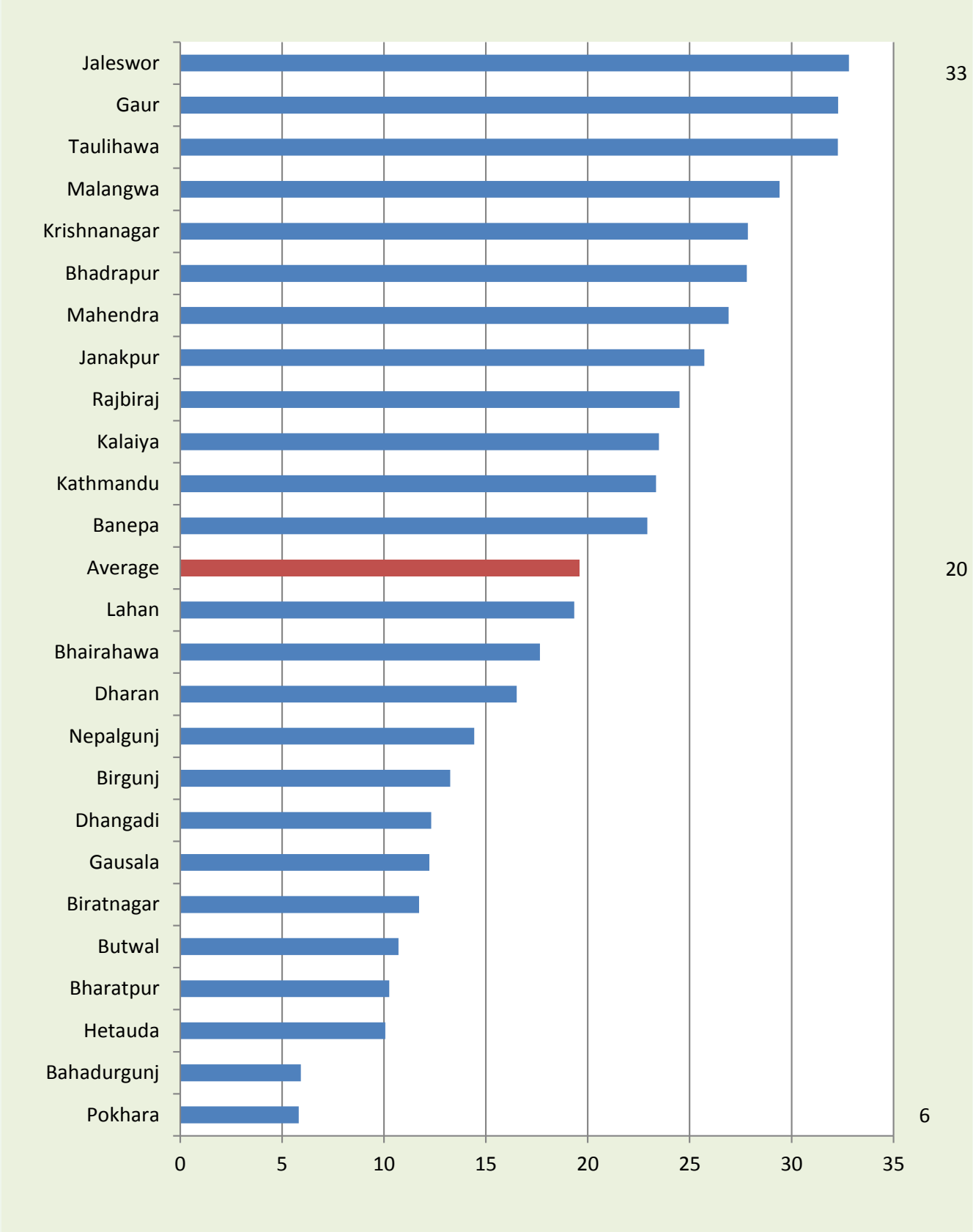
Water available for the consumption (Use) is lower than production. It is 60% of production in average. Generally, higher consumption rate is either due to availability of water or there are no alternate sources at Household level. Low consumption is either there is low level water availability for use or less demand from the supply system. About 100 LPCD is expected to be sufficient.

9.0 Production Cost (NRs/m3 Produced)



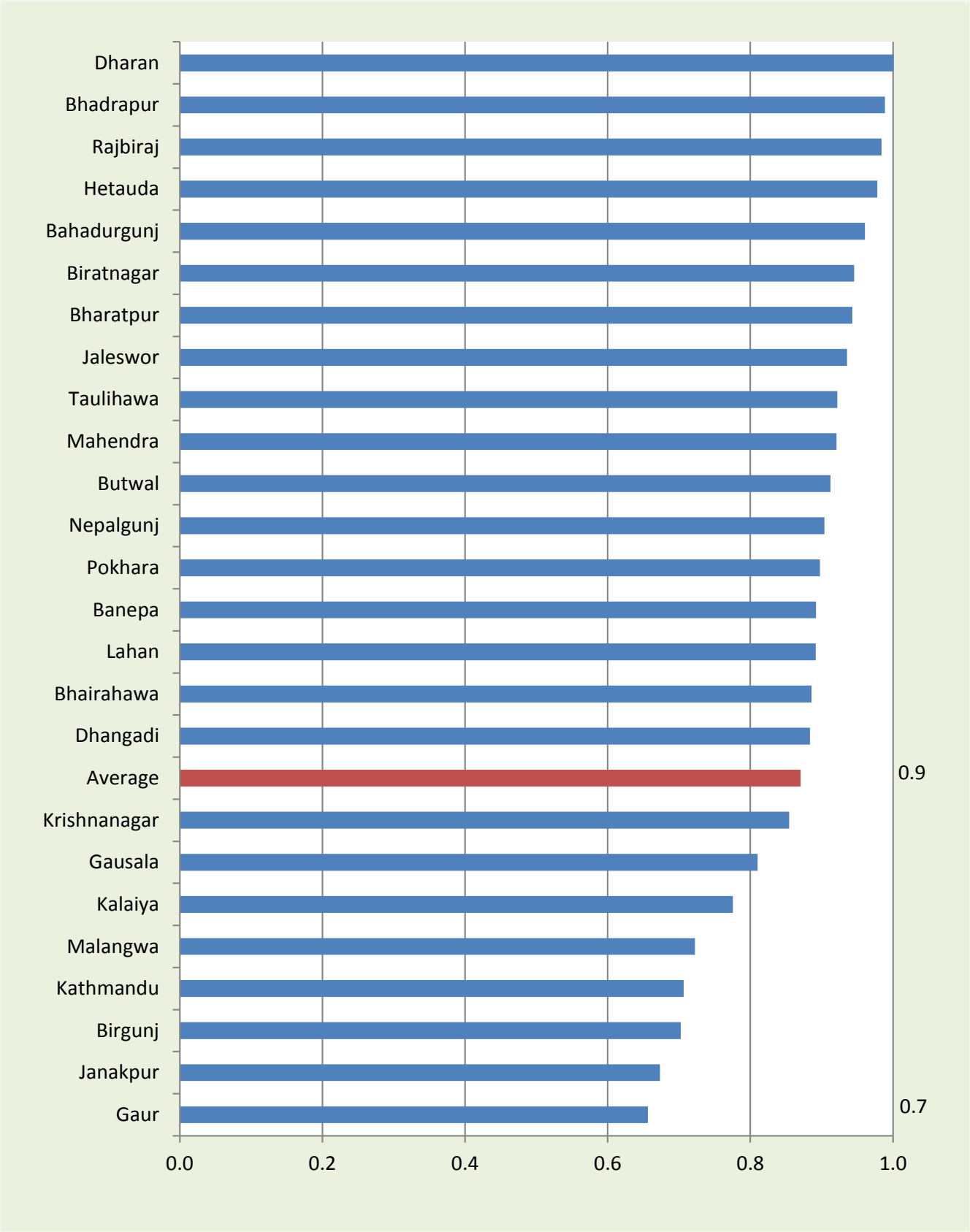
Higher production cost indicated higher operating ratio in terms of staff, electricity or maintenance. Generally WSP with low production or requiring electricity or treatment process for production have higher production cost.

10.0 Cost of Water Used (NRs/m3 Used)



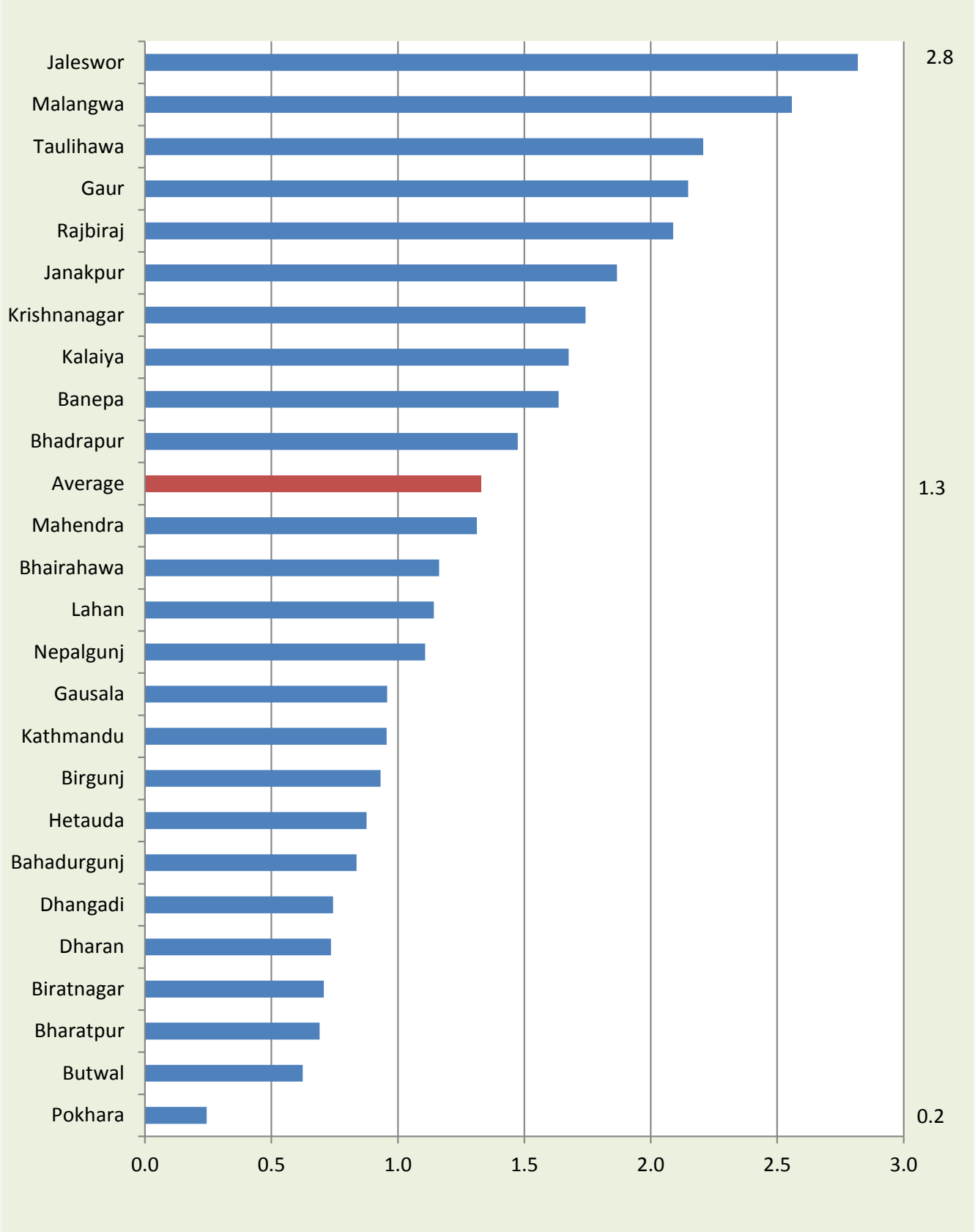
Cost of water used is very high in comparison to production cost due to high levels of NRW. In average cost increased from 12-20 (NRs/m3). Expected production cost when used is NRs 10/m3 or below.

11.0 Collection Ratio (Collection/Billing)



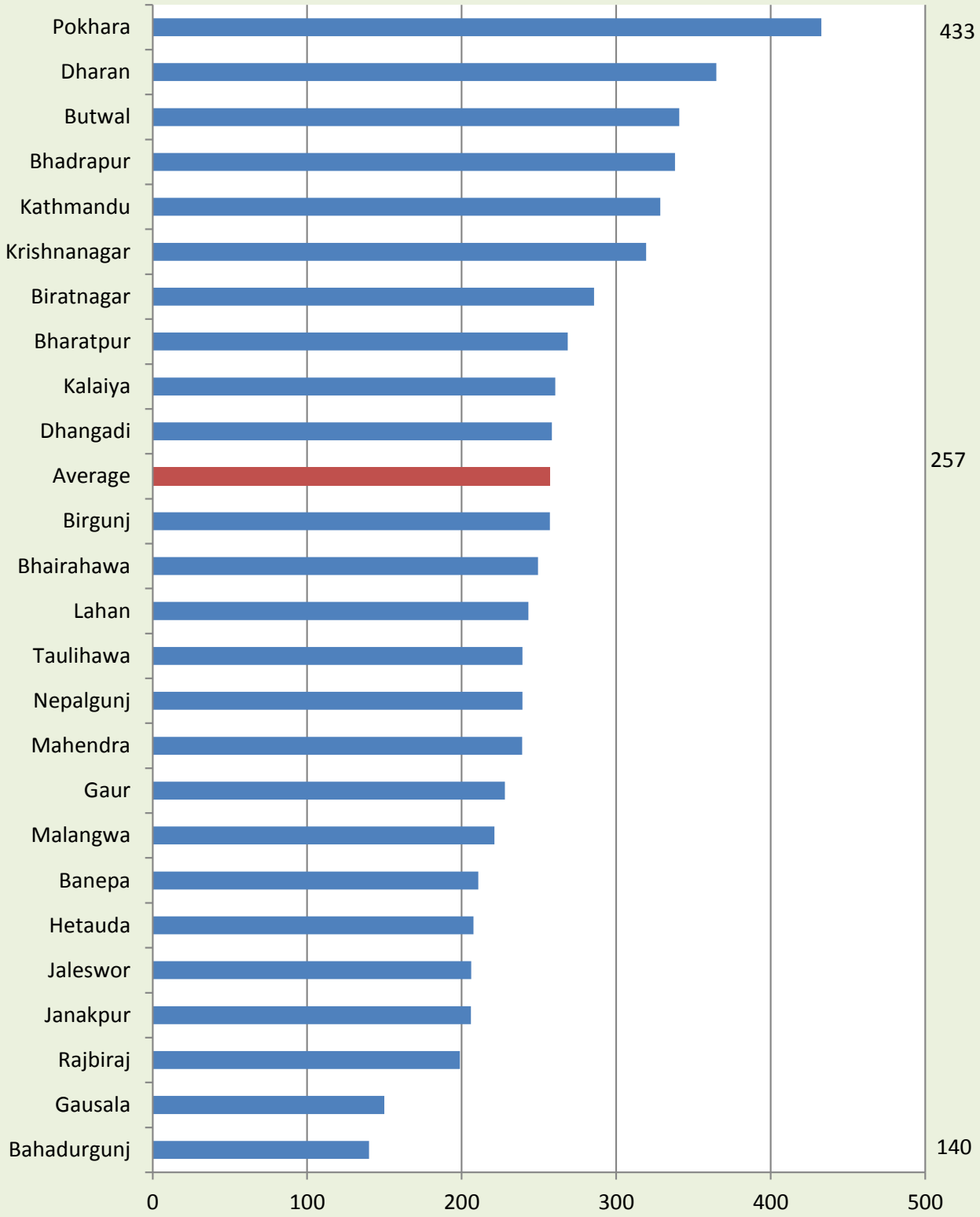
Some WSP able maintains a very good collection ratio. Expected value is 100 %. Low collection ratio is generally due to institutional (Government) connections that do not pay tariffs. In few towns, people do not pay or delay because of poor service level.

12.0 Operating Ratio (Operation Cost/Revenue)



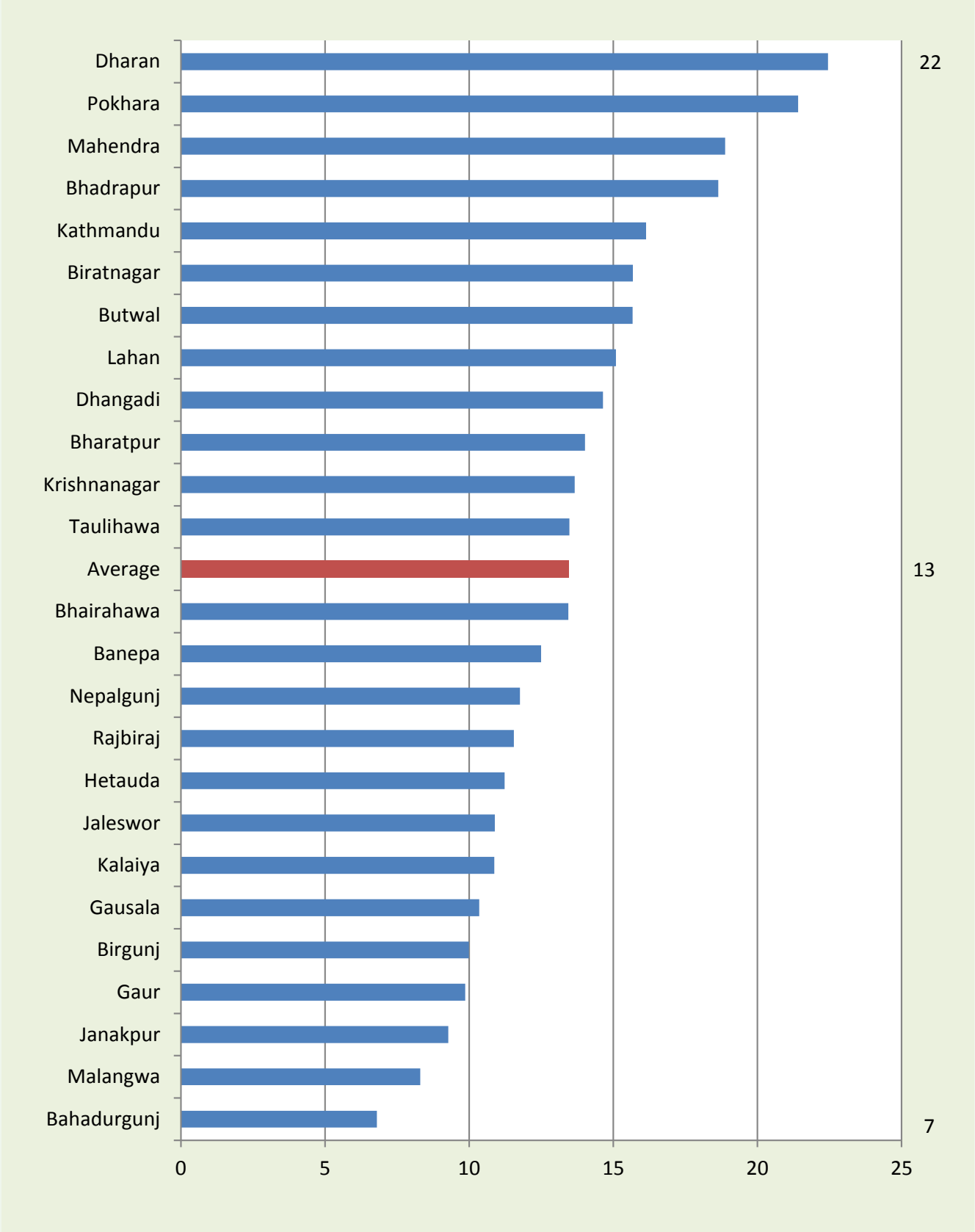
This indicator has links to many indicators related to production, use, NRW, operating cost and revenue. Generally WSP with higher connections are able to maintain lower Operating Ratio. System requiring electricity or treatment process, maintenance operates in higher operating ratio. Expected value is 0.5 which is possible only for Pokhara. Few WSP able to maintain OR up to 0.7. WSP with fewer connections have OR above one indicating loss.

13.0 Average Tariff (NRs/Tap/M)



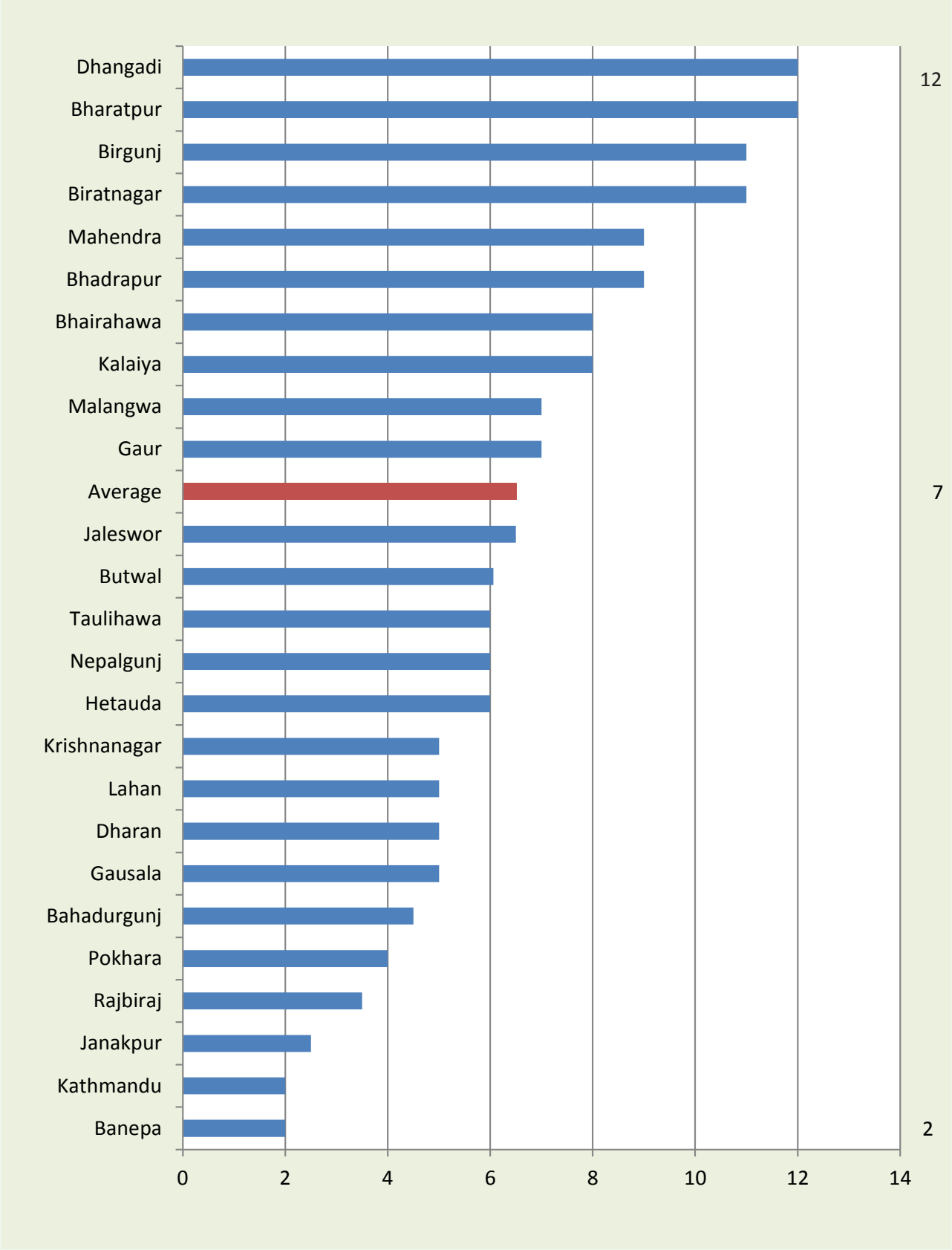
Average tariff actually billed is much higher than minimum tariff. Minimum tariff is mostly NRs 110 hence actual tariff is 2.3 times on average. This ratio depends on incremental tariff rate. It is maximum in KUKL but average use is near to minimum. Minimum unit for minimum tariff is generally 10 units and actual water used in metered tap ranges from 11-19 units. (see next chart)

14.0 Average Unit Tariff (NRs/M3)



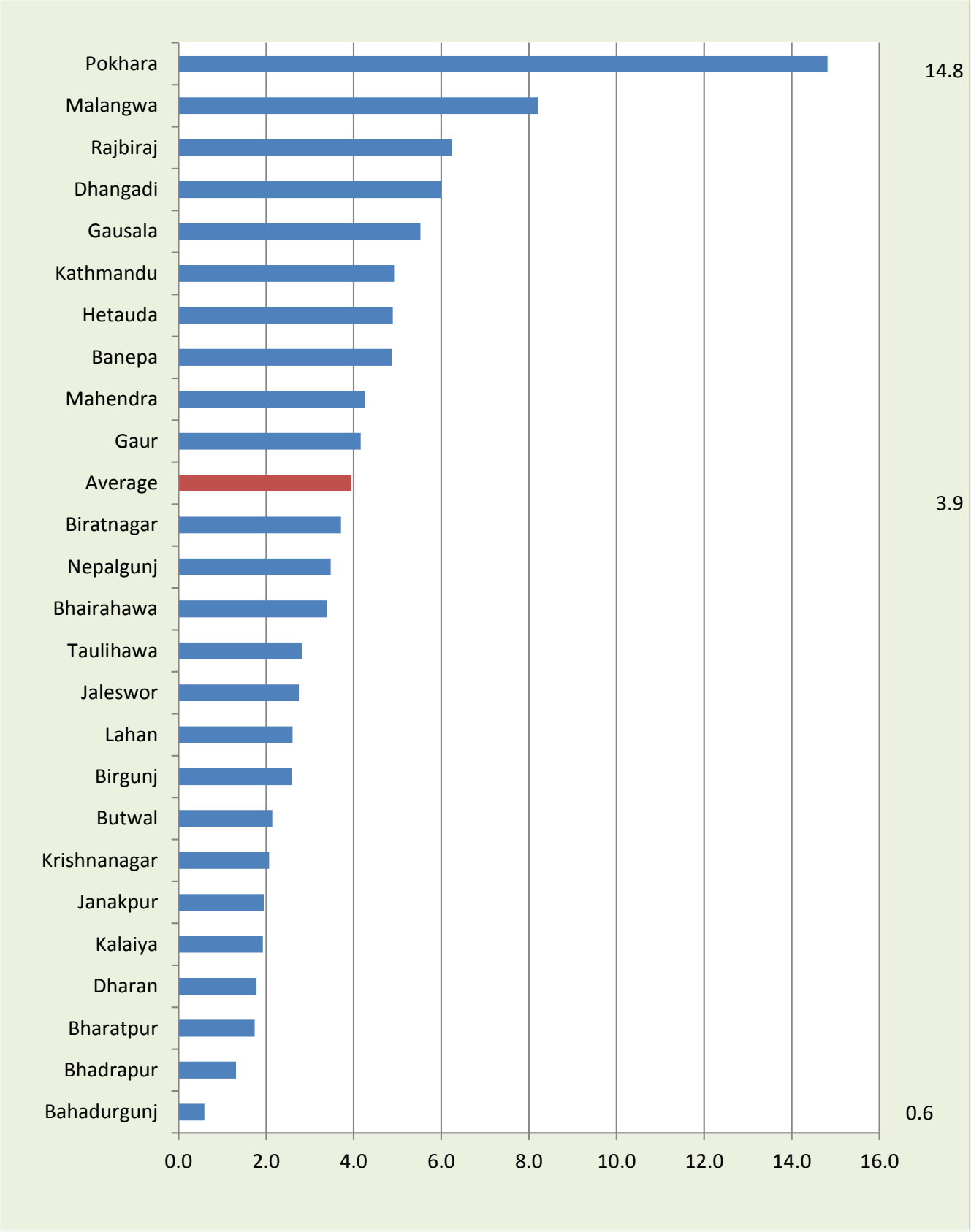
Unit tariff depends on minimum rate and the incremental rate plus use of water beyond minimum units. Lower unit rate is mainly due to lower unit consumptions. In average people are paying NRs 13/m3 of water used. Average cost of production as it is used was NRs 20/m3 indicating town water supply system in loss.

15.0 Supply Hour (Hours Per day)



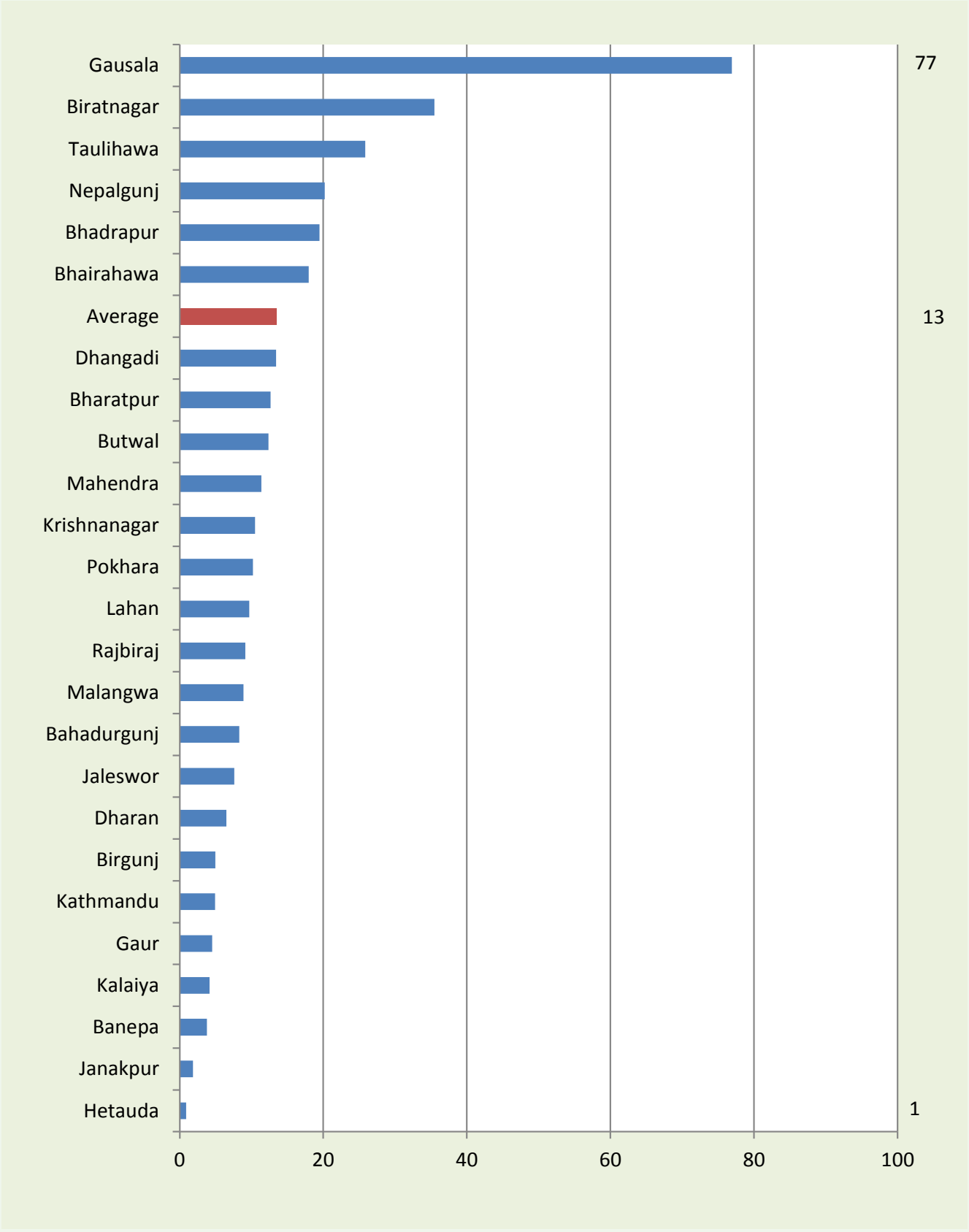
Average tariff actually billed is much higher than minimum tariff. Minimum tariff is mostly NRs 110 hence actual tariff is 2.3 times on average. This ratio depends on incremental tariff rate. It is maximum in KUKL but average use is near to minimum. Minimum unit for minimum tariff is generally 10 units and actual water used in metered tap ranges from 11-19 units. (see next chart)

16.0 Leakage Rate (No of Leakage/Km)



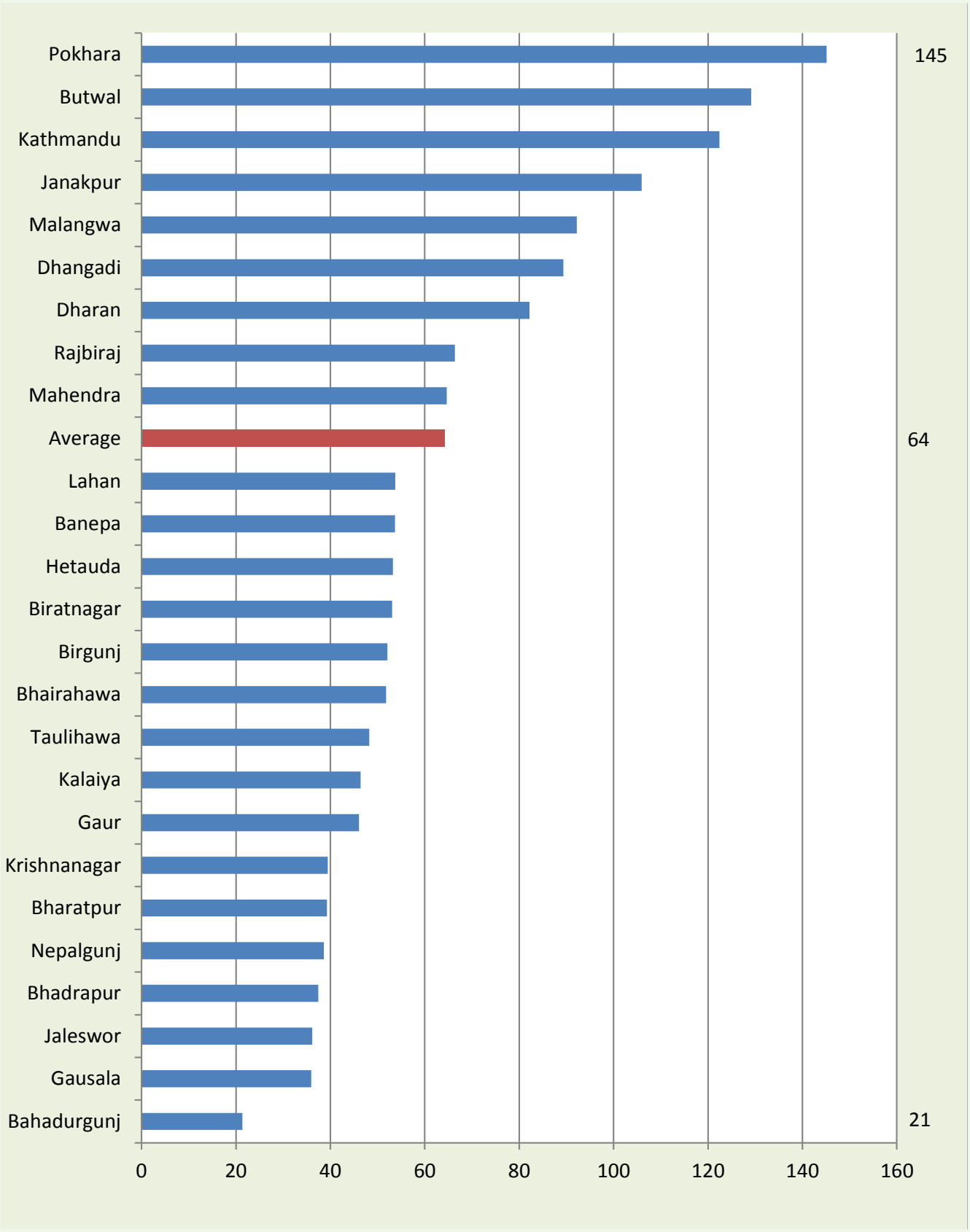
Leakage rate indicates number leakages with respects to network length. WSPs mostly keep records of numbers of leakages. Generally WSP with older system have a higher leakage rate.

17.0 Complain Rate (No/100 Taps)



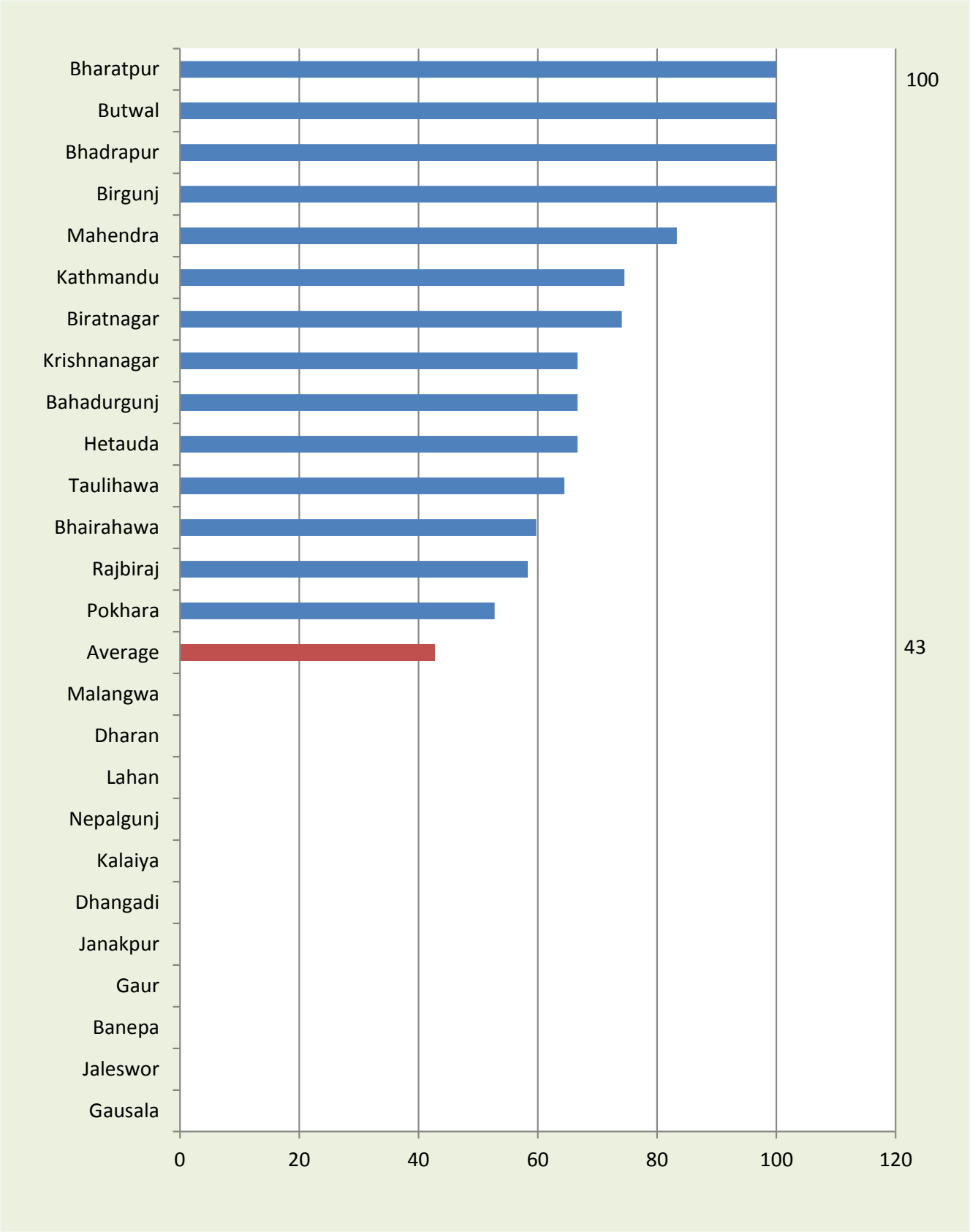
WSPs mostly keep records of complaints. Generally, higher complain rate indicated more problem but data in terms of complains are not uniform hence cannot be interpreted exactly.

18.0 Connection Density (Number of Taps/Km)



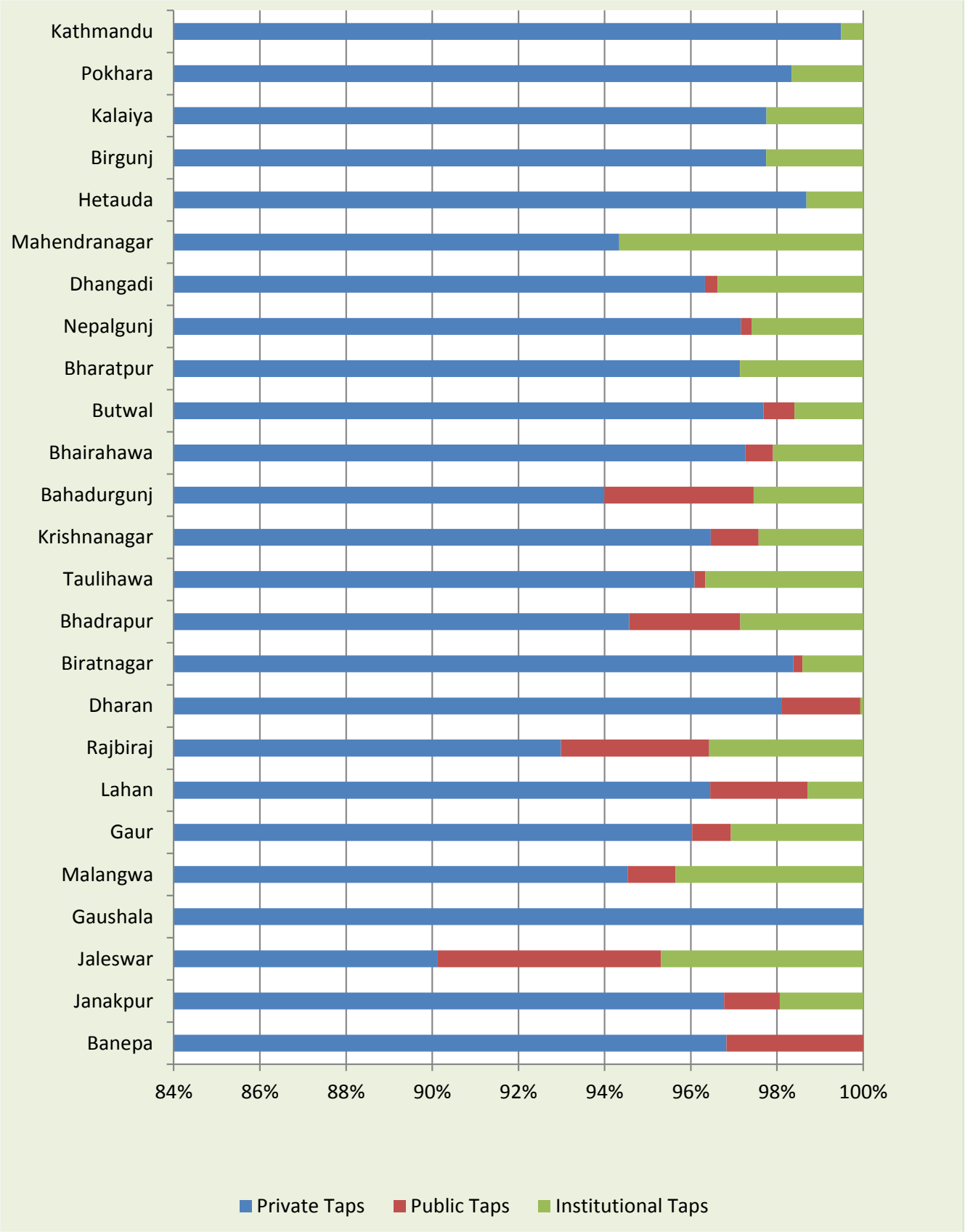
Connection density indicated concentration of connections in the length of the pipes. Generally WSP in the populated cities have higher connection density.

19.0 WQ Meeting Standard (%)



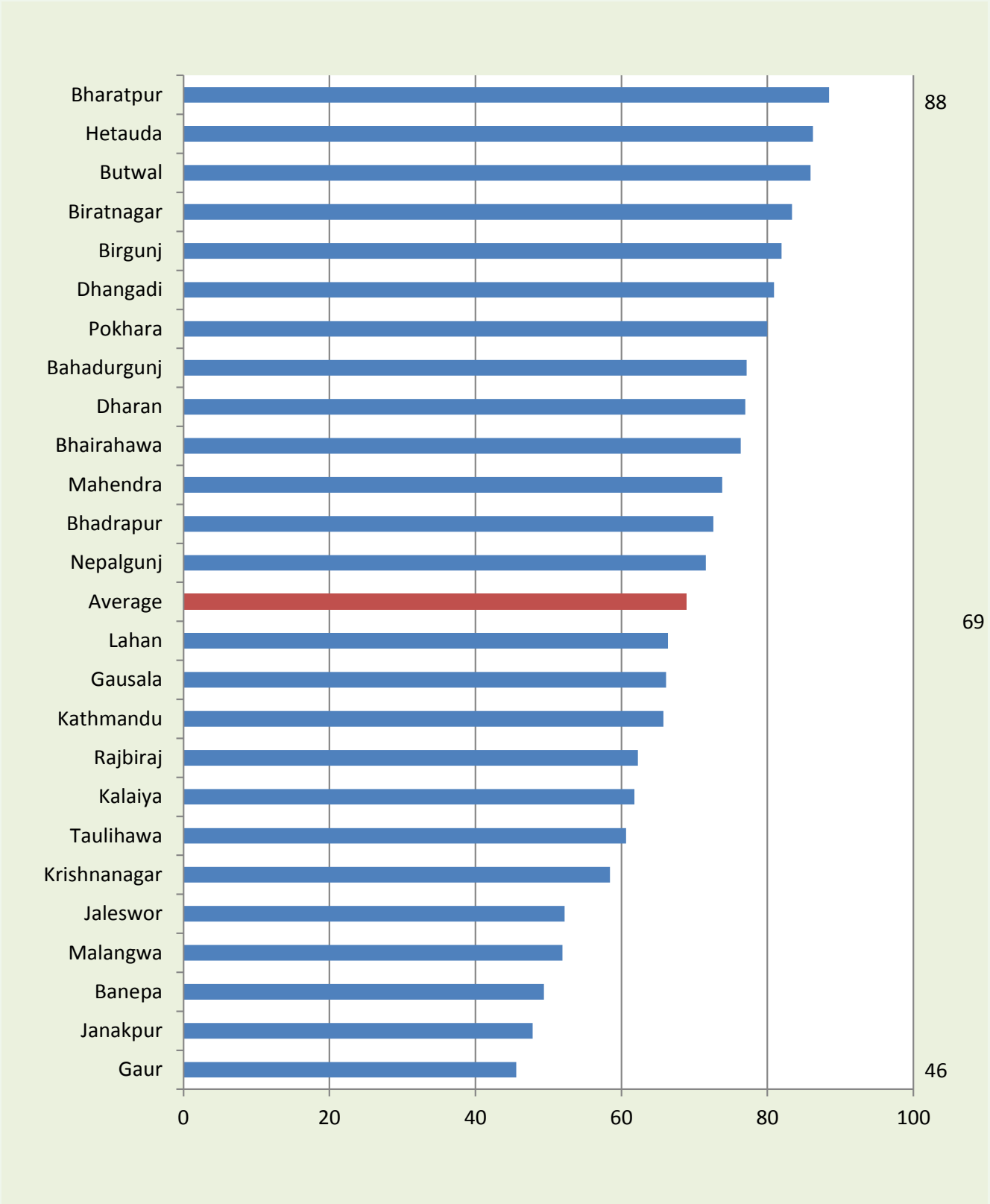
Only 50 % WSPs reported that WQ monitoring was in place in the data year (71-72). Few WSP discontinued after that and few resumed. The main reason for discontinuation is the lack of chemicals, test kits and staff. The higher value of meeting standard represents safe sources, protected sources, having treatment process, low level of contamination in the pipes or regular use of chlorine.

20.0 Type of taps in various towns



WSP has tendency to avoid public taps, but some taps are demanded by local bodies. In few WSPs, fixed tariff up to NRs 1600/taps/month is paid by the government. In some case local bodies pay fix rate of tariff for the public taps installed or retained upon their request.

21.0 Score in 10 Key PIs (%)



Generally, WSP with large number of connections are able to maintain higher PI score because of higher performance in financial indicators. KPIs score can be improved by improving ten PIs used. Some WSP even running with a very high operating ratio could not maintain KPIs due to negligence in water use and water qualities.

2.6 Town Wise System Description and Data Profile

2.6.1a System Descriptions: Bhadrapur

System Description:

There are four wells with 16-20 lps flow. Water is extracted from two wells at a time for 10 hours in total. Water is passed through sedimentation tank and RSF and stored in 350 m^3 ground tank and lifted to 450 m^3 OHT by a booster pump. Chlorine is applied after sedimentation. About 1.3 MLD water is supplied through 1800 taps for about average of 9 hours every day in two to three shifts.

Water Qualities:

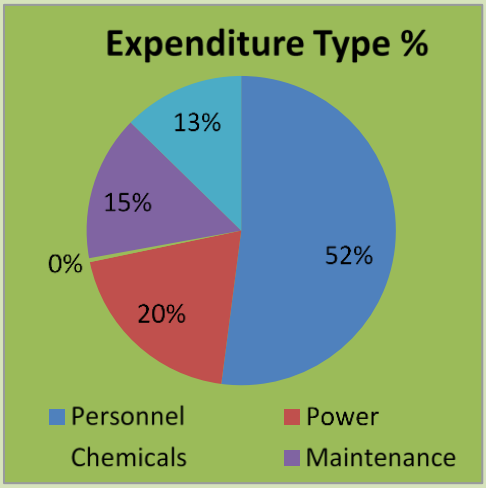
Water from the well is clean. Water is treated by sedimentation and filtration (RSF) process. Chlorine solution is applied before RSF continuously. Water qualities are tested using ENPHO kits @ one sample/day and the latest test results posted on the office board. Test indicated well water within standard except one well which was turbid. But E-coli was detected in most well and taps and FRC nil. EC increased in network indicating contamination. There is a need of protecting wells and leakage control in the networks and regular chlorination.

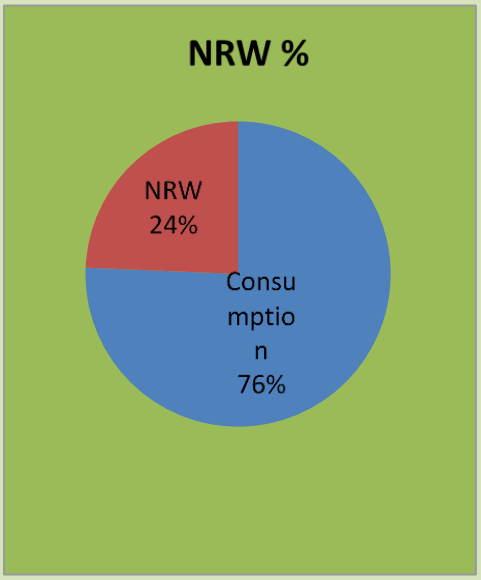
Future Plan:

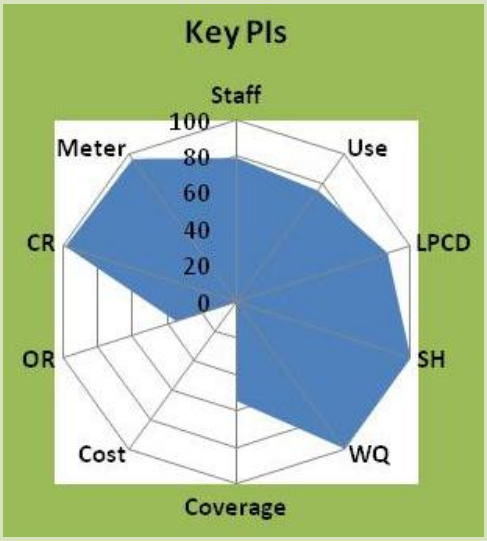
There is a need for improving existing system and reduce leakage, contamination and making better serviceability. This requires replacing 10 Km pipes (3"-6"), 10 Km new pipe laying for double line, add meter in public taps, and 20 washouts. Similarly, There is a need for increasing production and extending networks for the unreached area of ward no 1 and 2. This requires construction of one well and one OHT (250 m^3) and pipelines (2"-3") for 5 km. This area is likely to contained with Iron hence pressure filter is required.

Recommendation for performance improvement:

Staff ratio is high. System map, network map needs to be prepared and SOP needs to be documented. Production data needs to be maintained and leakage minimized. Chlorination need to be regularized. Operating ratio is not good which can be improved by reducing leakage, increasing taps or by reducing operation cost. Users satisfaction level is very good and can be enhanced further by taking care of pressure and water qualities.







2.6.1b Data Profile: Bhadrapur

Water Utility	WSP	NWSC-Bhadrapur (Jhapa)		
	Telephone	23520983	Email: nwscbhadrapur1@gmail.com	
	Head	Abadh Narayan Shah		
	Service Area (Wards)	Bhadrapur: 2, 4-10		
	No of staff	22	Staff per(1000) Taps	12
	Popupation covered	12062	WS Coverage (%)	55
Mission Statement				
Service Connections	Total Taps	1822	Private Taps	1723
	Public Taps	47	Metered Taps	1775
	New connections in FY	140	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	1.3	Users satisfied (%)	100
	No of break/Km/Yr	49	Supply hours	9
Water Production	Production(m3/day)	1382	NRW(%)	24
	Consumption(LPCD)	87	Production (LPCD)	115
Revenue and Expenses	Annual O&M Cost (NRs)	10614692	Annual Billing NRs)	7199759
	Collection Ratio	1.0	Operating Ratio	1.5
	Cost/m^3 of water used	28	Average billing (NRs/M)	338
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	19	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			240 (100)
	No of samples tested for biological parameters (%Passed)			240 (100)
	No of sample tested for FRC (%Passed)			240 (100)

2.6.2a System Descriptions: Biratnagar

System Description:

There are mainly four production units. Unit at Devkota Chowk collects water in 500 m^3 OHT from two wells and distribute to core area of the city. Unit in Tinpaini collects water in 450 m^3 OHT from two wells and distribute in the northern part of the city. Unit at Rani collects water in 500 m^3 OHT from one well in the southern part of the city. Unit in Munalpath collects water in 450 m^3 OHT from three wells and distributes water in the eastern part of the middle city. Tank is under completion and wells supply water directly to the networks. In addition, three wells located at Kanchanbari, BFM and Pichara supply directly to the networks. All networks are interconnected but supplies from Rani has been limited to the southern part by closing the valves. About 7.7 MLD water is supplied through 11000 taps for about an average of 11 hours every day in two to three shifts.

Water Qualities:

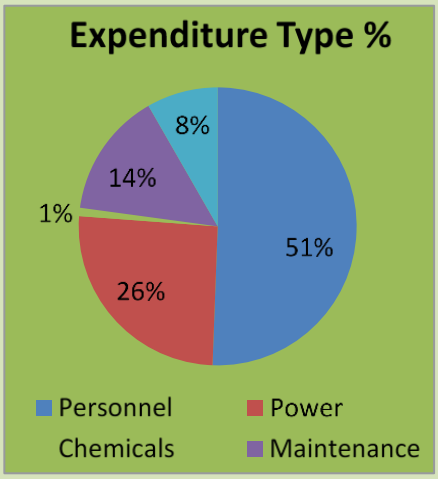
People used to notice unclean water some time. Chlorine is applied in tanks at Rani, Tin Paini and BLP in Devkota. Water quality is tested every month from about 9 points from wells, tanks and taps. The test indicated that Mn exceed in all wells, Fe is some wells and E-coli in some wells. FRC is nil in all taps and E- coli is present in most taps. There is pressure filter in Rani. Treatment units are required for wells and chlorine needs to be regularly applied. Flow varies from 0.05 to 0.6 lps.

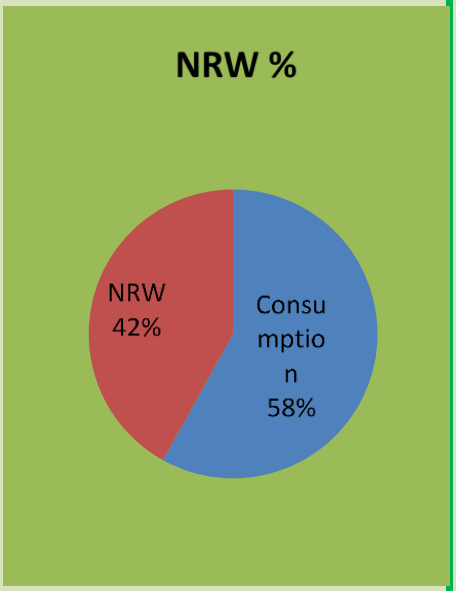
Future Plan:

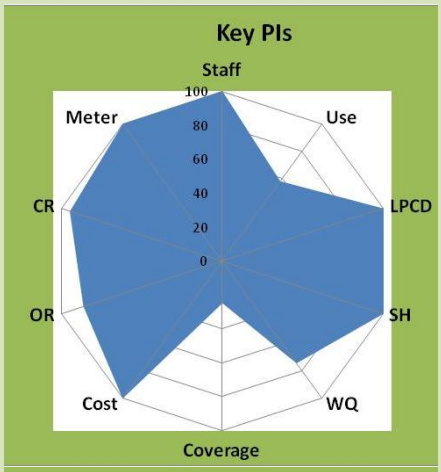
System is in need of replacing about 100 km old pipes (6"-12") of which 65 km will be replaced by STIUEIP project as a part of road improvement. About 400 valve chamber is needed for zoning and washouts. All seven stations need systematic chlorine dosing. Three stations Pichara, Munal and BFM need pressure filters. Similarly, system is in need to extending services in new area: wards 1, 5, 6, 7, 11, 13, 15, 16, 17, 18, 22. Six wells and 30 km pipe line and 60 valve chambers are required. This will add about 3000 new taps.

Recommendation for performance improvement:

System map, network map need to be prepared and SOP needs to be documented. Production data need to be maintained and leakage minimized. Chlorination needs to be regularized. Operating ratio is good. Users satisfaction level needs to be enhanced by improving continuity, timely, water quality and increasing supply or reducing leakages







2.6.2b Data Profile: Bhadrapur

Water Utility	WSP	NWSC -Biratnagar (Morang)		
	Telephone	021-523329	Email: srauni@gmail.com	
	Head	Santosh Rauniyar		
	Service Area (Wards)	Wards: 1-11		
	No of staff	44	Staff per(1000) Taps	4
	Popupation covered	62018	WS Coverage (%)	25
Mission Statement				
Service Connections	Total Taps	11156	Private Taps	10975
	Public Taps	24	Metered Taps	11132
	New connections in FY	245	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	3.7	Users satisfied (%)	70
	No of break/Km/Yr	210	Supply hours	11
Water Production	Production(m3/day)	10860	NRW(%)	42
	Consumption(LPCD)	102	Production (LPCD)	175
Revenue and Expenses	Annual O&M Cost (NRs)	26994118	Annual Billing NRs)	38165450
	Collection Ratio	0.9	Operating Ratio	0.7
	Cost/m^3 of water used	12	Average billing (NRs/M)	286
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	16	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			108 (100)
	No of samples tested for biological parameters (%Passed)			108 (56)
	No of sample tested for FRC (%Passed)			108 (67)

2.6.3a System Descriptions: Dharan

System Description:

Water from Sardu and Khardu streams treated (Flocculation and sedimentation) and collected in a 3000 m^3 tank located at the office and 135 m^3 tank at the campus. Some water also collected from Tarmakham stream during winter season directly to the reservoir tank. Surface sources collects about 4.5-25 mld. Hence, additional water up to 6.5 mld is produced from five wells @ 20 lps with 16 hours pumping and lifted to tank with further in two stages. Water is distributed to 1-19 wards of the municipality. The whole network is interconnected. About 15 mld water in the average is supplied through 16000 taps for about an average of 3.5 hours every day. Water supply hour varies from 5 hours to 1.5 hours on alternate days in the dry season.

Water Qualities:

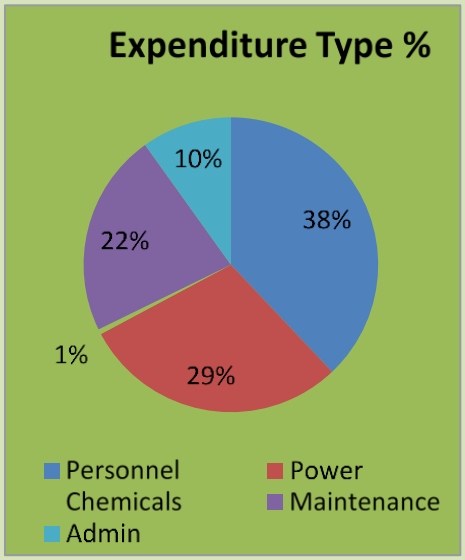
Water from stream becomes turbid during rainy season. Treatment plant unable to remove turbidity unless Alum is used. Chlorine is applied after flocculation and in tanks. The test indicated that streams contain E-coli and turbidity. In the taps FRC is nil and E-coli present. Flow ranges from 0.11-0.33 lps from taps. Treatment plant needs to be properly operated and chlorine be regulated.

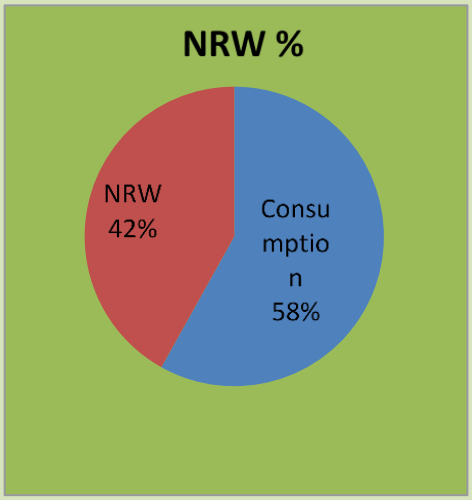
Future Plan:

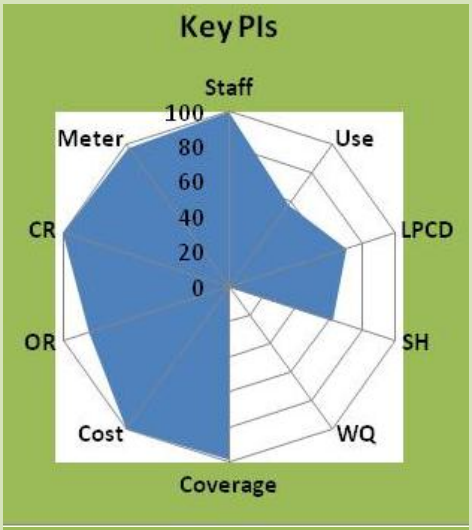
System is in need of replacing about 30 km old pipes (4"-10"), adding chlorine dosing units and adding 100 numbers of washout valves with chamber. This will add about 4000 new taps. Similarly, there is need for adding new sources for meeting demand in the dry season and extension of services in the new area of the municipality. One possibility is from the Chatara (Koshi) which includes 15 km transmission line through three stages pumping for lifting water up to 300 m. This also requires pipeline extension of 150 km (4-10") and about 6000 m^3 tanks divided into three locations. For the climate resilient, catchment area of Sardu source spread over 6 km^2 area needs conservation which has already been evacuated.

Recommendation for performance improvement:

There is need of maintaining production, consumption and leakage data and documenting SOP. Operating ratio is good. There is need of controlling leakages and improving water qualities and increasing supply hours. Users satisfaction level is very low which can be enhanced by improving supply hours, continuity and water quality.







2.6.3b Data Profile: Dharan

Water Utility	WSP	NWSC-Dharan (Sunsari)		
	Telephone	025-520400	Email: ersksshah@yahoo.com	
	Head	Sailendra Sah		
	Service Area (Wards)	Dharan 1-19		
	No of staff	60	Staff per(1000) Taps	4
	Popupation covered	123013	WS Coverage (%)	98
Mission Statement				
Service Connections	Total Taps	16601	Private Taps	16286
	Public Taps	304	Metered Taps	16293
	New connections in FY	784	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	1.8	Users satisfied (%)	60
	No of break/Km/Yr	202	Supply hours	5
Water Production	Production(m3/day)	15000	NRW(%)	42
	Consumption(LPCD)	71	Production (LPCD)	122
Revenue and Expenses	Annual O&M Cost (NRs)	52511000	Annual Billing NRs)	71364147
	Collection Ratio	1.0	Operating Ratio	0.7
	Cost/m^3 of water used	17	Average billing (NRs/M)	365
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	22	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			0 (0)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			0 (0)

2.6.4a System Descriptions: Rajbiraj

System Description:

The system has one OHT with capacity 450 m^3. Two wells in the compound and one well outside join together and feed water to the RSF (150 m^3). Clear water from RSF is collected in a ground water reservoir (450 m^3) and lifted to OHT by three booster pump (17 HP). Wells have average capacity of 15 lps and operated for about 12 hours. Chlorine is applied before RSF. About 2 MLD water is supplied through 2296 connections in 3.5 hours in a day in two shifts.

Water Qualities:

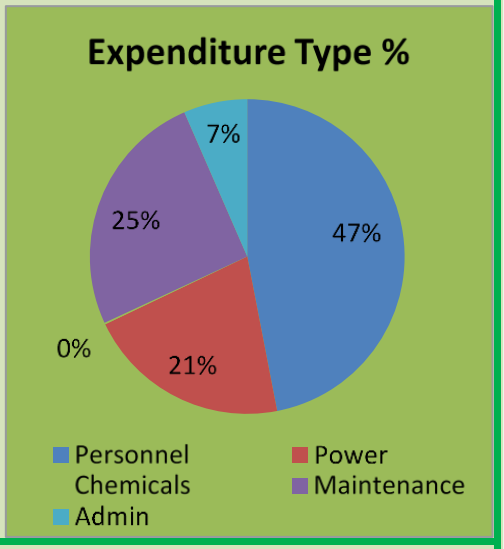
Many people complained that water is not clean time to time. Test indicated that wells have turbid water with Fe and Mn which has been controlled by RSF. E-coli present. Chlorine is applied, but tap water is still contaminated with E-coli and FRC nil and some taps turbid in some cases. It seems that chlorine has been consumed by Fe and Mn. There is Water Safety Plan team formed in 2068 but not active now. WQ can be improved by regularizing the chlorination and leakage control. Chlorine dosing can be maintained by adding some chlorine in the clear water tank. WTP needs to be operated properly. Flow in the taps varies from 0.03-0.33 lps.

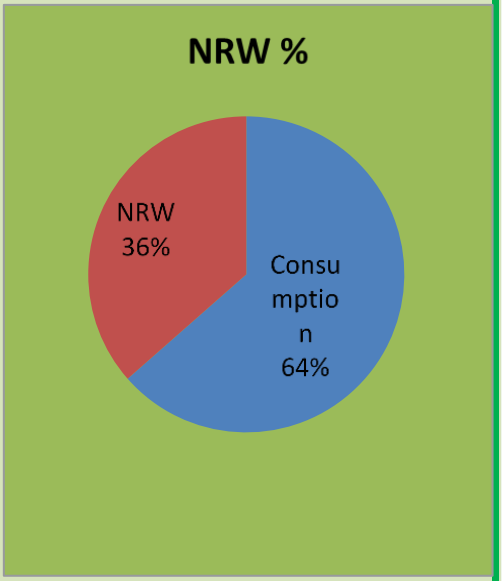
Future Plan:

System is in need of replacing about 13 km old pipes (2" HDPE), changing two booster pumps, adding chlorine dosing units and 15 numbers of washout valves with chamber. This will add about 500 new taps. Similarly, there is need for extension of services in the Ward 2, 10, 5 and 8. One OHT (450 m^3) and additional wells have been planned in ward 2. About 10 km pipes for ward 10, 2 km for ward 5 and 1.5 km for ward 8 are needed ranging from 3"-4".

Recommendation for performance improvement:

There is need of maintaining production, consumption and leakage data and documenting SOP. Operating ratio is not good which can be reduced by increasing taps, controlling leakage. Users satisfaction level is very low which can be improved by improving supply hours, time, quantity, flow control and WQ.





2.6.4b Data Profile: Rajbiraj

Water Utility	WSP	NWSC-Rajbiraj (Saptari)		
	Telephone	031-521254	Email: bariyaitajay@gmail.com	
	Head	Narendra Kumar Lal Karna		
	Service Area (Wards)	Rajbiraj 1,3-10		
	No of staff	18	Staff per(1000) Taps	8
	Popupation covered	17000	WS Coverage (%)	46
Mission Statement				
Service Connections	Total Taps	2296	Private Taps	2135
	Public Taps	79	Metered Taps	2076
	New connections in FY	66	Disconnections in FY	19
Costumer service	Complains/100 Taps/Yr	6.2	Users satisfied (%)	90
	No of break/Km/Yr	35	Supply hours	3.5
Water Production	Production(m3/day)	1944	NRW(%)	36
	Consumption(LPCD)	73	Production (LPCD)	114
Revenue and Expenses	Annual O&M Cost (NRs)	11044636	Annual Billing NRs)	5288845
	Collection Ratio	1.0	Operating Ratio	2.1
	Cost/m^3 of water used	25	Average billing (NRs/M)	199
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	12	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			24 (100)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			24 (75)

2.6.5a System Descriptions: Lahan

System Description:

The system has one OHT with capacity 450 m^3, which receives water from four wells with 20 lps average capacity. Two wells jointly pass water to ST and other two wells directly pump to OHT. Chlorine is added in the ST and lifted to OHT. One well in Laxminia supplies water directly to the system (6 hours). About 2 MLD water is supplied to 2478 connections in 6.5 hours in a day in two shifts.

Water Qualities:

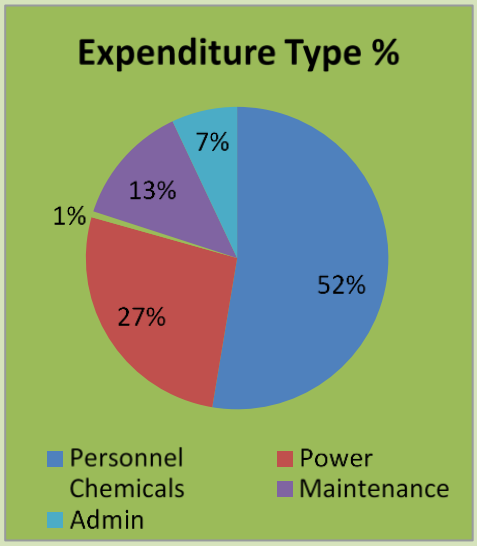
Two wells bring silts in the initial 15 minutes. Many people complained that water is not clean time to time. Test indicated that some wells contained manganese, turbidity above standard and E-coli in all. There is a system of chlorination in the tank, but FRC is nil in most taps and E-coli is present. WQ can be improved by regularizing the chlorination and leakage control. There is a need of water quality testing facilities on site for regular monitoring. Flow distribution varies from 0.07 to 0.3 lps.

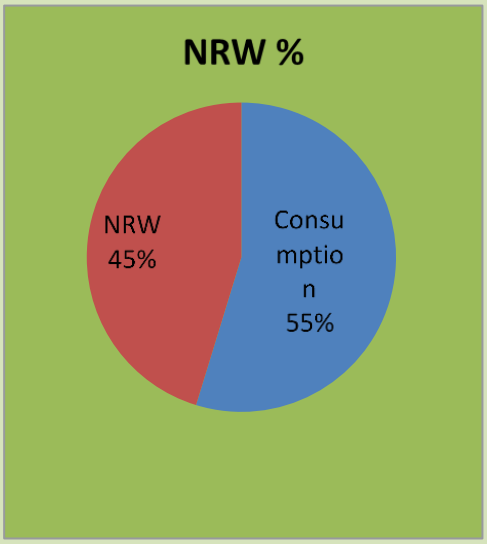
Future Plan:

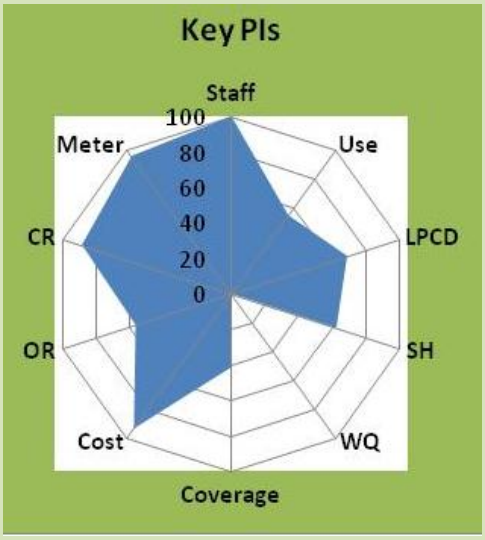
There is need of replacing 20 km (2"-4"), installing about 15 numbers of wash out valves for equitable water distribution purpose. There is bulk meter in two new wells and the same is needed for the four wells used in the office production units. Similarly, there is a need of 450 m^3 tank and 5 km trunk line and 217 km distribution lines for extending services to all in the existing service area of ward 1-10. This will add about 4000 taps.

Recommendation for performance improvement:

System map, network map need to be prepared and SOP needs to be documented. Production data need to be maintained and leakage minimized. Chlorination needs to be regularized. Operating ratio is not good which can be improved by reducing leakage, increasing taps or by reducing operation cost. WQ testing should be regularized. Users satisfaction level is very low which can be enhanced by improving timely supply, flow distribution and water qualities.







2.6.5b Data Profile: Lahan

Water Utility	WSP	NWSC-Lahan (Siraha)		
	Telephone	033-560931	Email: binodmishra33382@gmail.com	
	Head	Binod Kumar Mishra		
	Service Area (Wards)	1-10 out 22.		
	No of staff	19	Staff per(1000) Taps	8
	Popupation covered	16583	WS Coverage (%)	41
Mission Statement				
Service Connections	Total Taps	2478	Private Taps	2390
	Public Taps	56	Metered Taps	2382
	New connections in FY	426	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	2.6	Users satisfied (%)	47.2
	No of break/Km/Yr	46	Supply hours	5
Water Production	Production(m3/day)	2090	NRW(%)	45
	Consumption(LPCD)	69	Production (LPCD)	126
Revenue and Expenses	Annual O&M Cost (NRs)	8075000	Annual Billing NRs)	7069650
	Collection Ratio	0.9	Operating Ratio	1.1
	Cost/m^3 of water used	19	Average billing (NRs/M)	243
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	15	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			0 (0)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			0 (0)

2.6.6a System Descriptions: Janakpur

System Description:

The system has two production units. Office unit has one OHT of capacity 450 m^3 which receives water from one deep tubewell with discharge 20 lps (12hr pumping) and Ajaha Pokhari unit has one OHT of capacity 450 m^3 which receives water from two tubewell, one with discharge 15 lps (4 hour pumping) and another with discharge 18 lps (10 hour pumping). Both OHT supply water in interconnected distribution network in Janakpur Municipality. The system has two chlorination units, one for each OHT. About 1.8 MLD water is supplied through 3253 tap connections. Supply hour is 2.5 in an area a day.

Water Qualities:

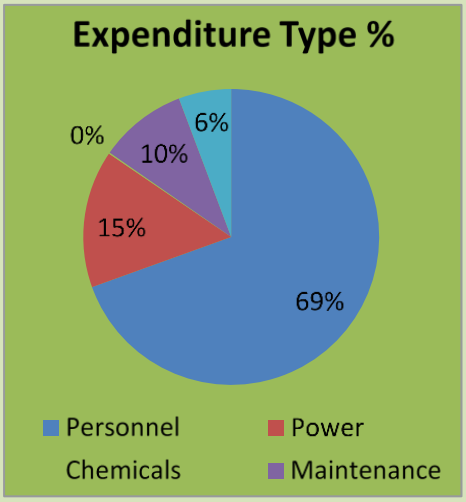
Water from all three wells looks clean and directly supplied after chlorination. Chlorine is applied (solution pumped to tank) regularly once a day in each tank. There is mini WQ test kit, but not in use for WQ monitoring. Residual chlorine appears at nearby taps but not at the far end. Test indicated that water is within standard at source except E-coli. E-coli was detected in taps where there is no FRC. Turbidity, ammonia, nitrate, nitrite and even Iron increased in the network. WQ can be improved by replacing old pipe, installing washouts, controlling leakages and regularizing the chlorination.

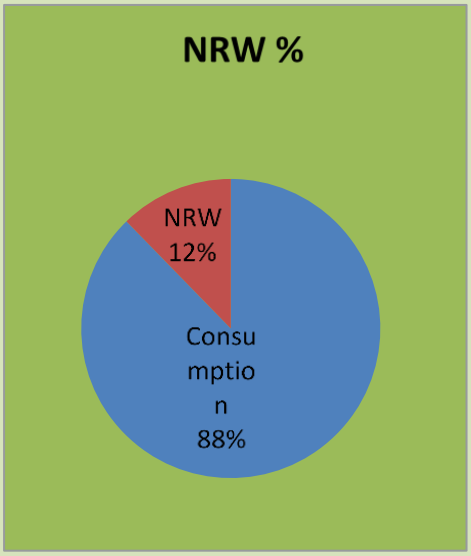
Future Plan:

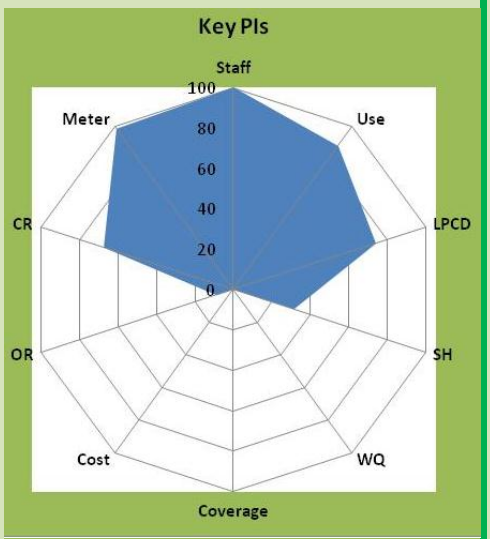
System is in need of replacing 10 km pipeline, adding 20 valves for controlling flow, leakage and contamination. System is in need of operationalizing already installed wells, establishment of systematic chlorine dosing system and workable mini laboratory for regular monitoring of water qualities.

Recommendation for performance improvement:

Train existing manpower for the efficient operation of the system and update information relating to production, consumption and leakage control and documenting standard operating procedures. Replace all the pipeline which have cross contamination with wastewater and adopt a systematic leakage control process. Decrease cost component or extend the service to achieve operating ratio. Users satisfaction level is very low which can be enhanced by improving continuity, service hours, pressure and water qualities.







2.6.6b Data Profile: Janakpur

Water Utility	WSP	NWSC -Janakpur (Dhanusha)		
	Telephone	041-520158	Email: smahto45@yahoo.com	
	Head	Suresh Kumar Mahato		
	Service Area (Wards)	Janakpur1-12,14 out 16 wards		
	No of staff	26	Staff per(1000) Taps	8
	Popupation covered	21408	WS Coverage (%)	14
Mission Statement				
Service Connections	Total Taps	3253	Private Taps	3148
	Public Taps	42	Metered Taps	3198
	New connections in FY	122	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	2.0	Users satisfied (%)	57
	No of break/Km/Yr	31	Supply hours	2.5
Water Production	Production(m3/day)	1800	NRW(%)	12
	Consumption(LPCD)	74	Production (LPCD)	84
Revenue and Expenses	Annual O&M Cost (NRs)	14823914	Annual Billing NRs)	7941147
	Collection Ratio	0.7	Operating Ratio	1.9
	Cost/m^3 of water used	26	Average billing (NRs/M)	206
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	9	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			0 (0)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			0 (0)

2.6.7a System Descriptions: Jaleswor

System Description:

The system has one OHT with capacity 450 m^3, which receives water from three tubewells each of discharge 20 lps, but one at a time, and supplies water through distribution network in Jaleshwor Municipality. The total pumping hour is 12 hours per day. The system has one manual chlorination unit. About 0.9 MLD water is supplied through 789 tap connections and water supply hour is 6.5 hours.

Water Qualities:

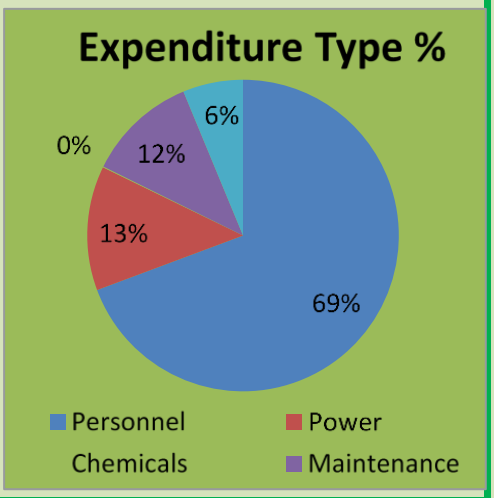
Water quality from all three well is generally clean and safe. During the initial phase of pumping water is turbid containing silt particle, but gets clear in around 10 minutes. Chlorine is applied regularly at the rate of 1.5 kg once a day in transmission pipe (cone feeding) which gets pumped to OHT during well operation. Conductivity test showed that there is some leakage in some part of the network, but E-coli was nil. Test at source and five taps indicated that water is within standard at source and taps. WQ can be maintained and verified by continuous monitoring which is not in place now.

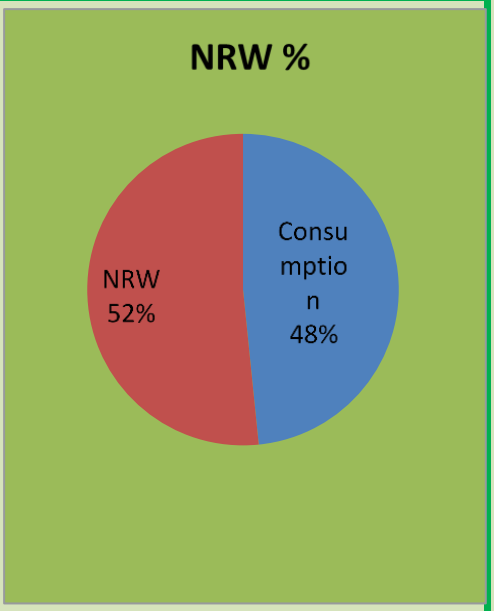
Future Plan:

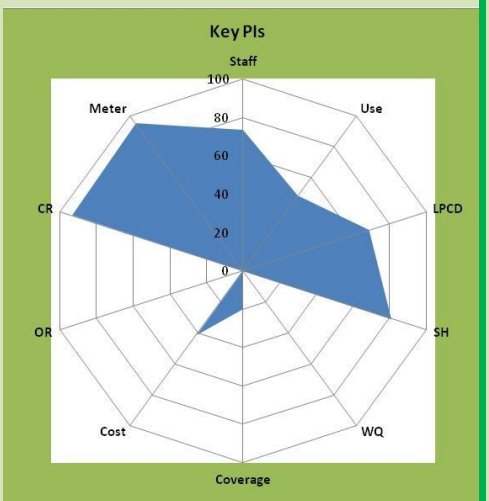
System is in need of replacing about 13 km pipes and add about 20 washout valves. Systematic chlorination unit is needed and test kits should be updated. Similarly, there is need for extending services by installing one OHT (450 m^3) with well and 13 km pipe lines for the ward no 10. This will add about 1400 taps.

Recommendation for performance improvement:

Information system is very good. Staff ratio is high (13) and operating ratio is not good (2.8). Collection ratio is good (0.94) Calculated NRW is very high (52) which can be reduced by confirming production rates and by controlling leakage and illegal use which is likely. Users satisfaction level is good. Relation with users can be further enhanced by improving continuity and flow distribution.







2.6.7b Data Profile: Jaleswor

Water Utility	WSP	NWSC- Jaleswor (Dhanusha)		
	Telephone	044-520089	Email: sunilsingh22766@yahoo.com	
	Head	Sunil Kumar Singh		
	Service Area (Wards)	Jaleswor 1-7,10 out 17 wards		
	No of staff	10	Staff per(1000) Taps	13
	Popupation covered	6312	WS Coverage (%)	20
Mission Statement	Adequate of portable water for all in a efficient and effective manner			
Service Connections	Total Taps	789	Private Taps	711
	Public Taps	41	Metered Taps	748
	New connections in FY	211	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	2.7	Users satisfied (%)	57
	No of break/Km/Yr	22	Supply hours	6.5
Water Production	Production(m3/day)	900	NRW(%)	52
	Consumption(LPCD)	69	Production (LPCD)	143
Revenue and Expenses	Annual O&M Cost (NRs)	5216124	Annual Billing NRs)	1850135
	Collection Ratio	0.9	Operating Ratio	2.8
	Cost/m^3 of water used	33	Average billing (NRs/M)	206
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	11	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			0 (0)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			0 (0)

2.6.8a System Descriptions: Gaushala

System Description:

The system has one OHT with capacity 450 m^3, which receives water from one deep tubewell of discharge 14 lps (12 hour pumping) and supplies water through a distribution network in Gaushala Municipality. The system has one manual chlorination unit in which operators dropped dissolved chlorine in the OHT. About 0.6 MLD water is supplied through 546 tap connections. Water supply hour is 5hours in the wet season and 3 hours in the dry season. Distribution network is wide spread.

Water Qualities:

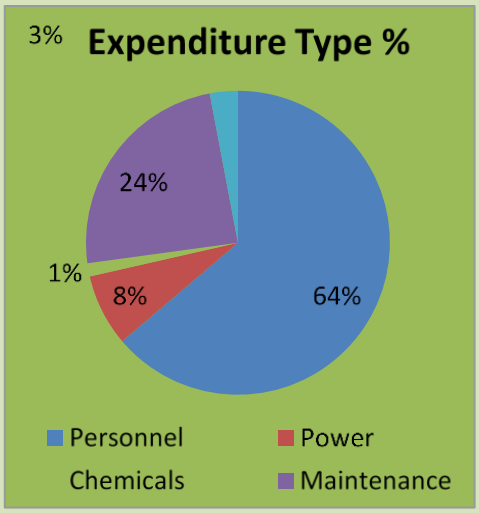
Water quality of the well is generally clean. Due to the old pipes and leakages people in some areas used to notice Turbidity sometimes. There is a system of chlorination applied into the tank once in a day (about 3Kg). Water sample tested in the well indicated that source water meet the standard. Samples tested from five taps also meet the standard. FRC was found in all taps and E-coli nil. WQ can be maintained by regularizing the chlorination and leakage control. There is a need of water quality testing facilities on site for regular monitoring. There is an unequal water distribution in the fragmented cluster due to pressure variations.

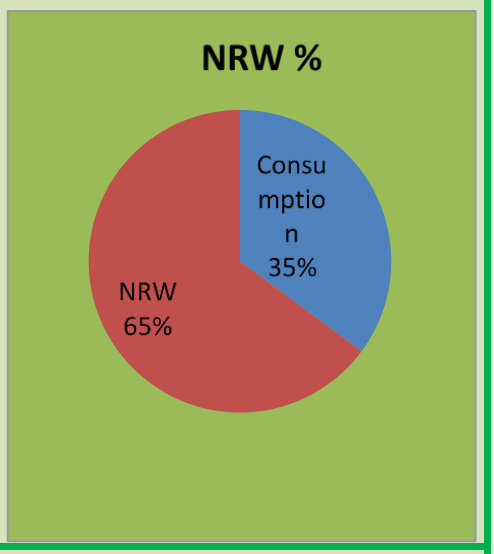
Future Plan:

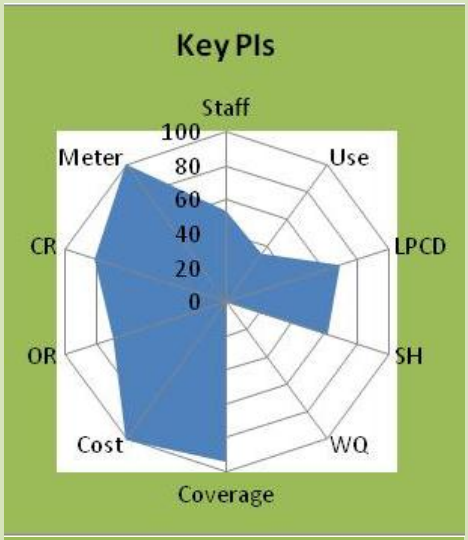
There is need of replacing existing old pipes (4"-8") for about 5 km, installing about 20 numbers of wash out valves for cleaning pipes and separating the zones for maintenance and equitable water distribution purpose and installing systematic chlorination system. This will add about 200 new taps. There is also need of pipe extension in ward 5 (2km), ward 6 (3 km) and ward 8 (6 km) which will add about 400 taps.

Recommendation for performance improvement:

System has been recently operated by NWSC taking over from users committee. Information related to production, consumption need to be maintained and operating process documented. There are meter in all taps, production cost minimum and coverage good. There is need for controlling leakage and regular water quality monitoring. Users satisfaction level is very low which can be improved by improving continuity of supply, supply hours, flow distribution and water qualities.







2.6.7b Data Profile: Gaushala

Water Utility	WSP	NWSC -Gaushala (Mahottari)		
	Telephone	046-520450	Email: sunilsingh22766@yahoo.com	
	Head	Sunil Kumar Singh		
	Service Area (Wards)	Gaushala(5-8) out of 11 wards		
	No of staff	8	Staff per(1000) Taps	15
	Popupation covered	3003	WS Coverage (%)	94
Mission Statement				
Service Connections	Total Taps	546	Private Taps	546
	Public Taps	0	Metered Taps	546
	New connections in FY	80	Disconnections in FY	20
Costumer service	Complains/100 Taps/Yr	5.5	Users satisfied (%)	57
	No of break/Km/Yr	15	Supply hours	5
Water Production	Production(m3/day)	600	NRW(%)	65
	Consumption(LPCD)	70	Production (LPCD)	200
Revenue and Expenses	Annual O&M Cost (NRs)	940691	Annual Billing NRs)	982800
	Collection Ratio	0.8	Operating Ratio	1.0
	Cost/m^3 of water used	12	Average billing (NRs/M)	150
Water Tariff	Metered Taps	125	Un-metered Taps	500
	Increment (NRS/unit)	15	Community	1600
	Average Tariff (NRs/m3)	10	Connection charge	2500
Water Quality	No of sample tested for physicochemical parameters (% Passed)			0 (0)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			0 (0)

2.6.9a System Descriptions: Malangwa

System Description:

There are three wells of which one is not in use. System collects water from two wells and lift to 450 m^3 OHT. Pumps run for 10 hours one at a time. About 0.9 MLD water in an average is supplied through 1100 taps for about average of 7 hours every day in three shifts. Chlorine is applied but not continuously.

Water Qualities:

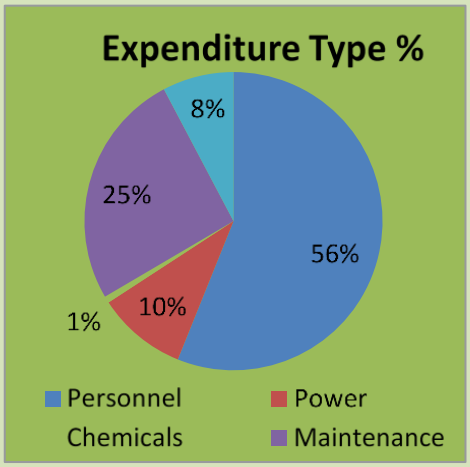
Water in the wells is within standard except presence of E-coli. People felt unclean water time to time. Chlorine is applied but not regular. Trace FRC was found in some taps but E-coli presence in all. There is need of regularizing chlorine and leakage control in the distribution networks. Test kits are available but not in use. There is no system for WQ monitoring that needs to be continued.

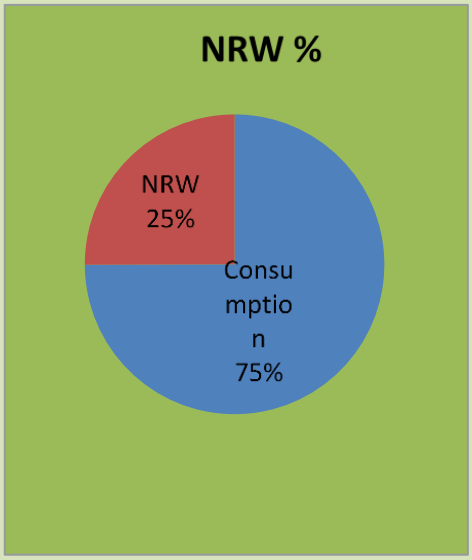
Future Plan:

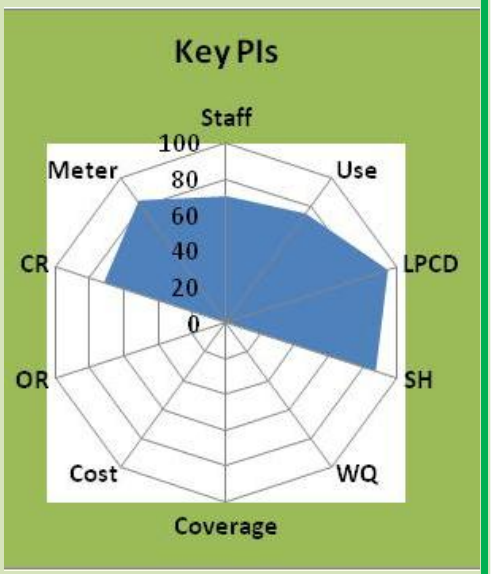
System is in need of replacing about 8 km old pipes (2"-8"), 30 washouts, one flow meter and chlorine dosing units. Similarly, there is need of extending pipes to Palsi ward 4 with one well and 8 km distribution pipes. One system is required for ward 1, 2, 11, 12, 13 with OHT (450 m^3), 8 km pipes. Extension will add about 1800 taps.

Recommendation for performance improvement:

There is a need for maintaining information relating to production, consumption and documenting standard operation procedures. Water supply is sufficient, but cost of production is very high and staff ratio is also high. Collection ratio is very low. There is need of increasing the number of connections and reduce leakage to improve operating ratio. WQ monitoring needs to be initiated. Current coverage by water supply is very low. Users satisfaction level is very low. This can be enhanced by improving continuity of supply, increasing supply hours, timely supply and flow distribution.







2.6.9b Data Profile: Malangwa

Water Utility	WSP	NWSC-Malangwa (Malangwa)		
	Telephone	046-520450	Email: None	
	Head	Buddha Ram Pal		
	Service Area (Wards)	Malangwa (2-10) out of 13 wards		
	No of staff	14	Staff per(1000) Taps	13
	Popupation covered	7122	WS Coverage (%)	24
Mission Statement				
Service Connections	Total Taps	1079	Private Taps	1020
	Public Taps	12	Metered Taps	906
	New connections in FY	60	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	8.2	Users satisfied (%)	57
	No of break/Km/Yr	12	Supply hours	7
Water Production	Production(m3/day)	900	NRW(%)	25
	Consumption(LPCD)	95	Production (LPCD)	126
Revenue and Expenses	Annual O&M Cost (NRs)	7241334	Annual Billing NRs)	2831351
	Collection Ratio	0.7	Operating Ratio	2.6
	Cost/m^3 of water used	29	Average billing (NRs/M)	221
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	8	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			0 (0)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			0 (0)

2.6.10a System Descriptions: Gaur

System Description:

The system has one OHT with capacity 225 m^3, which receives water from two tube wells with discharge 25 and 35 lps and 8 hours pumping. One well in Sirsia is ready to use, but not connected to distribution. The system has one manual chlorination unit in which chlorine solution is prepared and lifted to the OHT. System provides 0.75 MLD water through 1108 taps for 7 hours per day in three shifts.

Water Qualities:

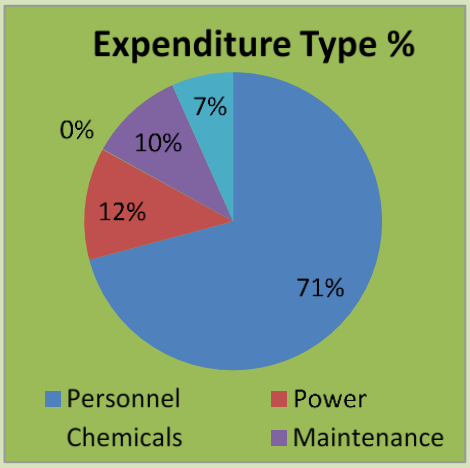
Water quality of the well is generally clean. Due to the old pipes and leakages people in some areas notice turbidity sometimes. There is a system of chlorination in the tank. There is no system for WQ monitoring. Test indicated that one well is contaminated with E-coli. Test in taps indicated FRC nil and E-coli also nil WQ can be improved by regularizing the chlorination and leakage control. There is a need of water quality testing facilities on site for regular monitoring. Flow from the taps varies from 0.04-0.2 lps.

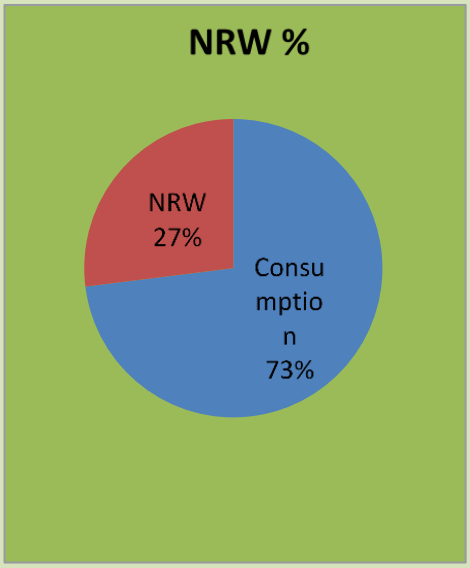
Future Plan:

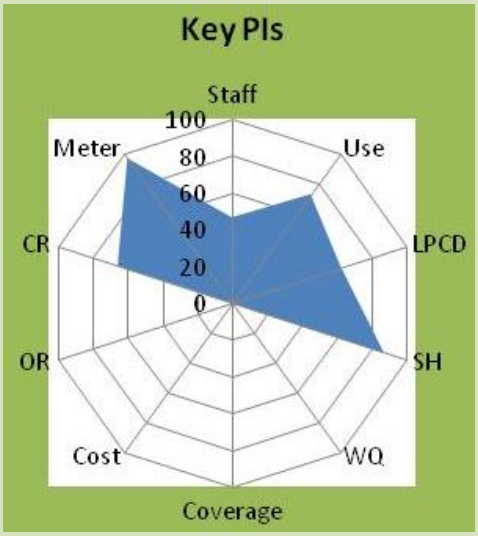
There is a need of replacing existing old pipes (1.5"-4") for about 9 km, installing about 500 numbers of wash out valves for cleaning pipes and separating the zones for maintenance and equitable water distribution purpose and installing systematic chlorination system. This will add about 2000 new taps. Similarly, there is also need of construction of 450 m^3 tank at ward 7 and 10km pipes (1.5"-4") for ward 6,7,10 and 11. There is a need of 450 m^3 tank and 12 km pipe (1.5-4") extension in ward 12, 13. Both systems will add about 4000 taps.

Recommendation for performance improvement:

Information related to production, consumption need to be maintained and operating process to be documented. Operating ratio is not good and leakage high. There is a need for controlling leakage and regular water quality monitoring. Cost needs to be minimized or new number of connections increased. Users satisfaction level is very low which can be improved by improving continuity of supply, supply hours, flow distribution and water qualities.







2.6.10b Data Profile: Gaur

Water Utility	WSP	NWSC- Gaur (Rautahat)		
	Telephone	055-520611	Email: None	
	Head	Krit Bhushan Lal		
	Service Area (Wards)	Gaur (1-9) out of 13 wards		
	No of staff	17	Staff per(1000) Taps	15
	Popupation covered	8735	WS Coverage (%)	25
Mission Statement				
Service Connections	Total Taps	1108	Private Taps	1064
	Public Taps	10	Metered Taps	1076
	New connections in FY	28	Disconnections in FY	10
Costumer service	Complains/100 Taps/Yr	4.2	Users satisfied (%)	64
	No of break/Km/Yr	24	Supply hours	7
Water Production	Production(m3/day)	750	NRW(%)	27
	Consumption(LPCD)	63	Production (LPCD)	86
Revenue and Expenses	Annual O&M Cost (NRs)	6453909	Annual Billing NRs)	3003921
	Collection Ratio	0.7	Operating Ratio	2.1
	Cost/m^3 of water used	32	Average billing (NRs/M)	228
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	10	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			0 (0)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			0 (0)

2.6.11a System Descriptions: Kalaiya

System Description:

Water is collected from two wells located at Motibahal and supplied through 450 m^3 OHT. About 1.5 MLD water is supplied through 1500 taps for about an average of 8 hours every day in two shifts. Chlorine is applied: mixed and lifted in the OHT one time @ 1kg.

Water Qualities:

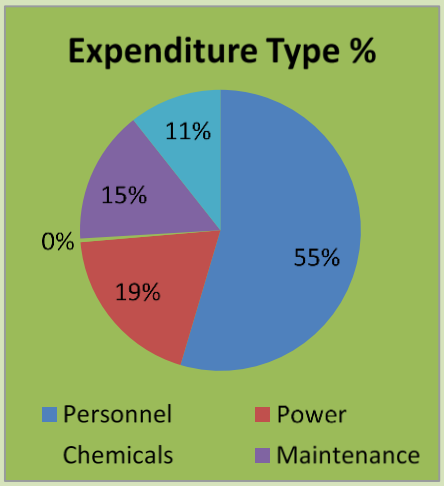
Water from the wells is normally clean and free from contamination. Fe was little higher level in one well, but normal in taps. Chlorine is applied regularly, but at time of visit it was nil in all taps and E-coli present in some taps. There is no system for WQ monitoring. There is need of establishing mini lab and regularizing chlorine use. Flows in the taps vary from 0.07-0.67 lps.

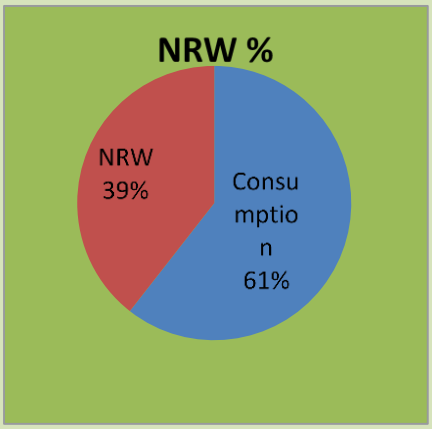
Future Plan:

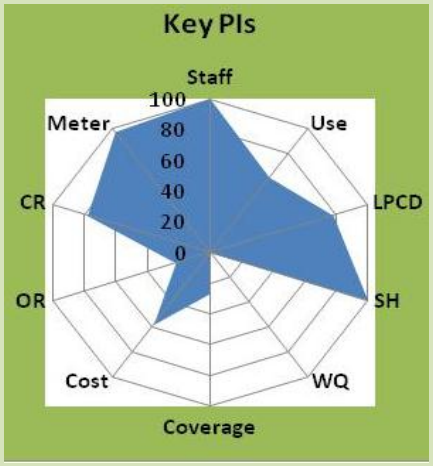
System is facing problem of leakages due to old pipes. It is in need of replacing about 15 km pipes in Devkota chowk, Birjung road, Barai road, cinema road with pipes ranging from 4"-6". There is need of about 20 valve chambers, chlorine dosing units, flow meter, mini lab. Similarly, there is need of extending system in wards 2, 5, 8, 11, 19 and 25. About 22 km pipes and three wells are needed. This will add about 2500 new connections.

Recommendation for performance improvement:

Staff ratio is already at a minimum. System map and network map need to be updated, SOP documented. Production data need to be maintained and leakage minimized. Operating ratio is not good which can be improved by minimizing cost and increasing connections. WQ needs to be monitored. Staff satisfaction level is very good mainly because of the quantity and pressure. This can be further improved by ensuring continuity of the supply.







2.6.11b Data Profile: Kalaiya

Water Utility	WSP	NWSC-Kalaiya (Bara)		
	Telephone	053-550428	Email:	
	Head	Chandeswar Sah/Ram Chandra Sahani		
	Service Area (Wards)	Kalaya (1-9,11,) Total 25		
	No of staff	14	Staff per(1000) Taps	10
	Popupation covered	11165	WS Coverage (%)	27
Mission Statement				
Service Connections	Total Taps	1447	Private Taps	1395
	Public Taps	20	Metered Taps	1403
	New connections in FY	34	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	8.0	Users satisfied (%)	90
	No of break/Km/Yr	11	Supply hours	8
Water Production	Production(m3/day)	1440	NRW(%)	39
	Consumption(LPCD)	78	Production (LPCD)	129
Revenue and Expenses	Annual O&M Cost (NRs)	7477506	Annual Billing NRs)	4462586
	Collection Ratio	0.8	Operating Ratio	1.7
	Cost/m^3 of water used	795937	Average billing (NRs/M)	3461468
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	1	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			90 (0)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			0 (0)

2.6.12a System Descriptions: Birgunj

System Description:

There are four production units located at Sripur, Adarshanagar, Nagwa and Padampura. Sripur collects water from two wells and supply from 450 m^3 OHT. Adarshanagar collects water from two wells and supplies through 450 m^3 OHT. Nagwa and Padampur supply water directly into the line. About 6 MLD water is supplied through 8000 taps for about average of 11 hours every day in three shifts. Chlorine is applied in all four units directly on the line after wells.

Water Qualities:

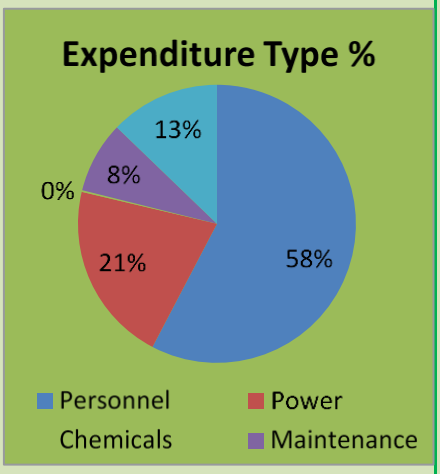
Water from the wells is normally clean and free from contamination. Chlorine is mostly applied but appeared in nearby tanks only. Test indicated that FRC is nil in most of the taps and E-coli present. Flow varies from 0.04-0.67 lps. WQ test kits including Wagtec is available but not in use at present. Chlorine needs to be regulated and water quality regularly monitored.

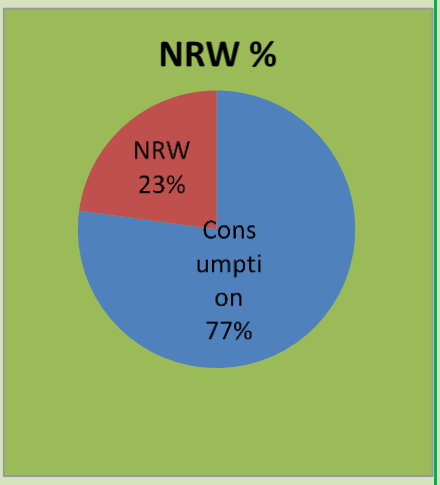
Future Plan:

System is in need of replacing 100 km pipes, adding 20 washouts, three flow meters for supply and eight for wells, chlorine dosing equipment for four station and four points in networks and updating minilab. Similarly, there is need of r extending system for power house, Gandak and Pragati nagar: 20 km. Well 4, OHT at Pratima. This can be also extended to Bidabasani: This will add 1000 taps. Similarly, system existing and operated by users committee at Pokharia and Simara can be taken over and improved.

Recommendation for performance improvement:

Staff ratio is already in minimum. System map and network map need to be updated and taps to be located in the GIS. SOP should be documented. Production data need to be maintained and leakage minimized. Production needs to be recorded and leakage control to be planned. Collection ratio is minimum. Operating ratio is good which can be further improved by increasing taps and minimizing operation cost. Users satisfaction level is low which can be improved by improving water flow, timely supply and improving water qualities.





2.6.12b Data Profile: Birgunj

Water Utility	WSP	NWSC- Birgunj (Parsa)		
	Telephone	051-522874	Email: kun_dahal@yahoo.com	
	Head	Chandeswor Sah		
	Service Area (Wards)	Birgunj (1-19) out of 30		
	No of staff	31	Staff per(1000) Taps	4
	Popupation covered	52395	WS Coverage (%)	26
Mission Statement				
Service Connections	Total Taps	7242	Private Taps	7035
	Public Taps	45	Metered Taps	6931
	New connections in FY	57	Disconnections in FY	41
Costumer service	Complains/100 Taps/Yr	2.6	Users satisfied (%)	80
	No of break/Km/Yr	139	Supply hours	11
Water Production	Production(m3/day)	5546	NRW(%)	23
	Consumption(LPCD)	82	Production (LPCD)	106
Revenue and Expenses	Annual O&M Cost (NRs)	20681820	Annual Billing NRs)	22210572
	Collection Ratio	0.7	Operating Ratio	0.9
	Cost/m^3 of water used	13	Average billing (NRs/M)	257
Water Tariff	Metered Taps	10	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	10	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			24 (100)
	No of samples tested for biological parameters (%Passed)			12 (100)
	No of sample tested for FRC (%Passed)			10 (100)

2.6.13a System Descriptions: Hetauda

System Description:

There are 19 sources, including 2 springs, 5 sump well and 12 tubewells. There are six water supply systems and eight production units, including four wells which supply directly into the pipeline. Six systems are: Chaugada (Gauritar, Chhuchekhola), Harikunj (Bundol, Samari1&2, Chaukitol1&2), Huprachaur (Hupra1&2, Karra1&2), Lamsure (Kukhereni1&2), Kamane (Kamane1&2), Mayurdhap (Mahurdhap). Huprachaur, Lamsure and Gauritar unit supply water through OHT and others through ground tank totaling 3350 m^3 capacity. About 9.2 MLD water is supplied through 11000 taps for about an average of 5 hours every day in two shifts. Chlorine is applied in five locations (Harikunj-3, Ratmate, Mayurdhap).

Water Qualities:

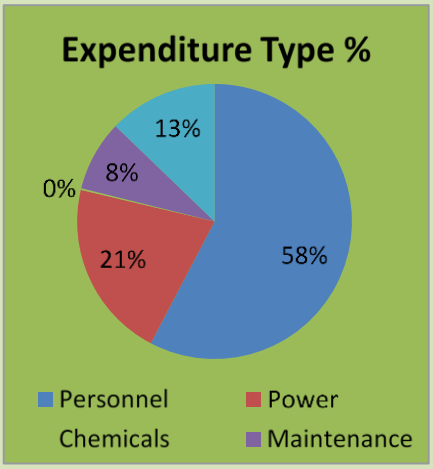
Water from the wells are normally clean, but nitrate exceeded in some wells and E-coli detected. Chlorine was applied, but FRC was absent in most of the taps where E-coli was present. WQ monitoring has been stopped nowadays. There is a need for regularizing chlorine and WQ monitoring. Flow in the taps varies from 0.05-0.43 lps.

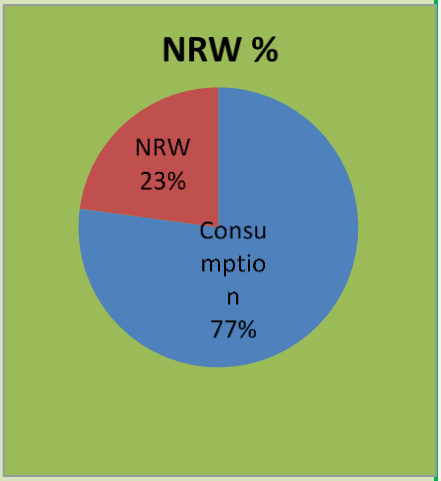
Future Plan:

System is in need of replacing 15 km pipes, adding 20 km pipes for double line layout where the roads are extending and 5 km for fetching additional water of 30 lps from Bundol source. There is need of establishing minilab, 20 washouts, 2250 m^3 of additional tanks. Similarly, there is need of extending system in wards 19,20,21,22 with 40 km pipes, 600 m^3 ground tank for adding 2500 taps. Similarly, there is need of adding new system in wards 16, 17, 18, 19 with 70km pipes, 3 wells, four 300m^3 tanks with lifting 3 stages. This will add 2500 and 2000 taps.

Recommendation for performance improvement:

Staff ratio is already at a minimum. System map and network map need to be updated and Taps be located in the GIS. SOP should be documented. Production data need to be maintained and leakage minimized. Operating ratio can be further improved by minimizing leakages and increasing water tariff which is very less compared to other towns. WQ needs to be regularly monitored. Users satisfaction level is not very good which can be improved by increasing supply hours, continuity, pressure distribution and water qualities.





2.6.13b Data Profile: Hetauda

Water Utility	WSP	WSMB-Hetauda (Makawanpur)		
	Telephone	057-523708	Email: hwsmboard@gmail.com	
	Head	Sudarshan Dhakal/ Chair: Pratap Bist		
	Service Area (Wards)	Hetauda (1-10, 16, 17, 18 ,19, 20 (total 29)		
	No of staff	45	Staff per(1000) Taps	4
	Popupation covered	78337	WS Coverage (%)	96
Mission Statement				
Service Connections	Total Taps	11184	Private Taps	11015
	Public Taps	22	Metered Taps	10975
	New connections in FY	533	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	4.9	Users satisfied (%)	60
	No of break/Km/Yr	210	Supply hours	6
Water Production	Production(m3/day)	9214	NRW(%)	28
	Consumption(LPCD)	85	Production (LPCD)	118
Revenue and Expenses	Annual O&M Cost (NRs)	24378680	Annual Billing NRs)	27813973
	Collection Ratio	1.0	Operating Ratio	0.9
	Cost/m^3 of water used	10	Average billing (NRs/M)	208
Water Tariff	Metered Taps	50	Un-metered Taps	360
	Increment (NRS/unit)	15	Community	0
	Average Tariff (NRs/m3)	11	Connection charge	15000
Water Quality	No of sample tested for physicochemical parameters (% Passed)			1 (100)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			231 (100)

2.6.14a System Descriptions: Bharatpur

System Description:

There are mainly four production units. First, office unit which collects water from four wells in a 1200 m^3 ground tank and then lifted to 400 m^3 OHT. Second is Municipality unit which collects water from three wells in a 1000 m^3 ground tank and distribute mainly to Narayanghat areas. Third is Krishnapur unit which collects water from three wells in a 900 m^3 ground tank and lifted to 450 m^3 OHT. Fourth is Prembasti unit which collects water from a well and lifted to 450 m^3 OHT. There are other 13 wells which injects water directly into the networks. About 23 MLD water is supplied to 17000 taps for about an average of 11 hours every day in two to three shifts. Chlorine is applied in five locations

Water Qualities:

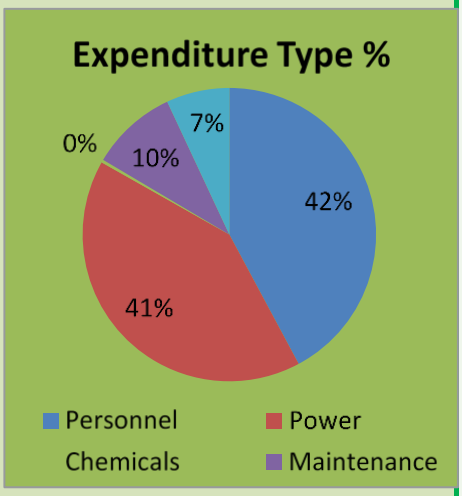
Water from the wells are normally clean and free from contamination. Chlorine is mostly applied @ 0.3 ppm. In two locations, (Aptari and Malpot) locally designed sand separator has been used. There is minilab established in the office. Randomly selected samples are tested @ 30 samples each month for Tu, pH, EC, E-coli and FRC. E-coli was detected in some of the wells and taps and FRC nil in all taps. Needs to regulate chlorine use. Flow in taps varies from 0.07 to 0.4 lps

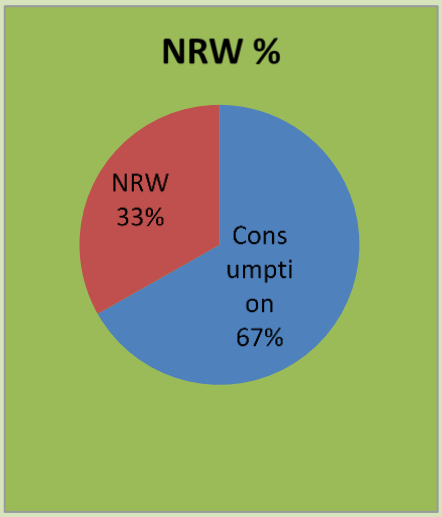
Future Plan:

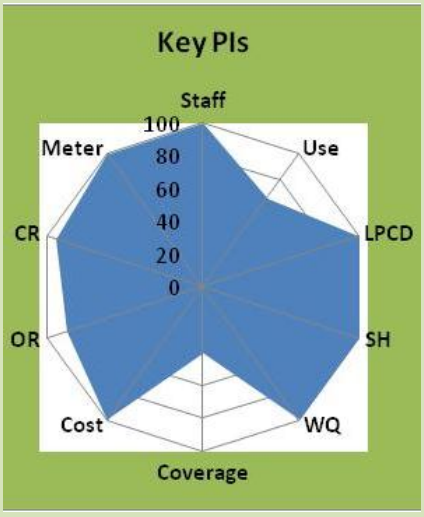
System is in need of replacing about 100 km old pipes (3"-8") for controlling leakage and flow. About 20 valve chambers are needed for zoning and washouts. There is a need for a system for chlorination and upgrading minilabs. Similarly, system is in need to extending services in new areas of municipality mainly in the Jhakhadimai area, Mangalpur, Fulbari, Patihani, Gitaqanagar and Shivanagar. The project has been initiated by WSSDO. This will add about 30000 taps.

Recommendation for performance improvement:

Staff ratio is already at a minimum. System map and network map need to be updated and Taps located in the GIS. SOP should be documented. Production data need to be maintained and leakage minimized. Operating ratio can be further improved by minimizing leakage and increasing water tariff. User's satisfaction can be further improved by timely flow and continuity and consumer relation.







2.6.14b Data Profile: Bharatpur

Water Utility	WSP	WSMB-Bharatpur (Chitwan)		
	Telephone	056-524916	Email: bharatpurwatersupplymb@gmail.com	
	Head	Shalik Ram Paudel		
	Service Area (Wards)	Bharatpur (1-29)		
	No of staff	49	Staff per(1000) Taps	3
	Popupation covered	96360	WS Coverage (%)	40
Mission Statement				
Service Connections	Total Taps	17493	Private Taps	16990
	Public Taps	3	Metered Taps	17490
	New connections in FY	1550	Disconnections in FY	18
Costumer service	Complains/100 Taps/Yr	1.7	Users satisfied (%)	95
	No of break/Km/Yr	445	Supply hours	12
Water Production	Production(m3/day)	15548	NRW(%)	33
	Consumption(LPCD)	108	Production (LPCD)	161
Revenue and Expenses	Annual O&M Cost (NRs)	38900000	Annual Billing NRs)	56376000
	Collection Ratio	0.9	Operating Ratio	0.7
	Cost/m^3 of water used	10	Average billing (NRs/M)	269
Water Tariff	Metered Taps	100 (135)*	Un-metered Taps	810
	Increment (NRS/unit)	18 (20)*	Community	1080
	Average Tariff (NRs/m3)	14	Connection charge	4000
Water Quality	No of sample tested for physicochemical parameters (% Passed)			360 (100)
	No of samples tested for biological parameters (%Passed)			360 (100)
	No of sample tested for FRC (%Passed)			360 (100)

2.6.15a System Descriptions: Bhairahawa

System Description:

There are four production units. Unit one located in Lumbini line with one OHT (450 m^3) and two wells. Unit two located in Barmeli tole with one OHT (225 m^3) and two wells. Two wells located in Belaya and Paglihawa supply directly to the network. Water is extracted from six wells with capacity of 13-25 lps for about 8 hours in a day. About 35 MLD water is supplied through 3626 taps for about an average of 8 hours every day in three shifts.

Water Qualities:

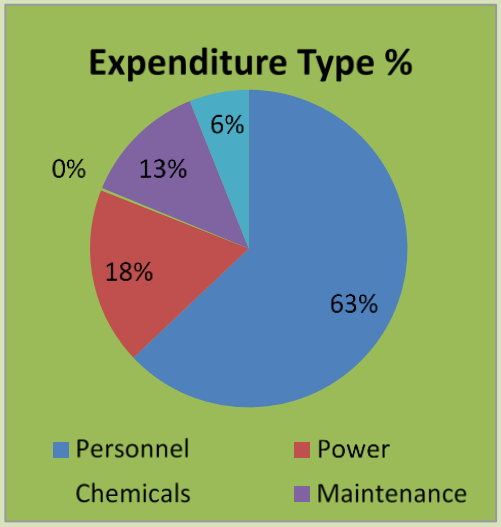
Water from the well is clean. People noted unclean water sometime in the taps. There is a system for testing two tanks and two taps every day for pH, Ammonia and FRC and post in the office. The result indicated safe. Chlorine is applied regularly in two tanks and well 5. Field tests indicated the presence of FRC and E-coli nill except in one tap. Flow distribution varies from 0.09-0.27 lps.

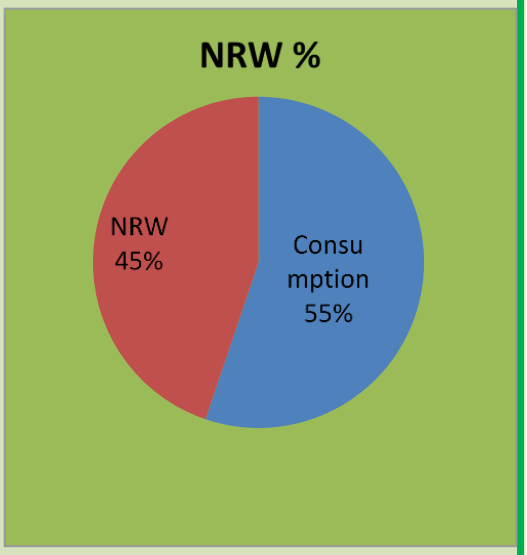
Future Plan:

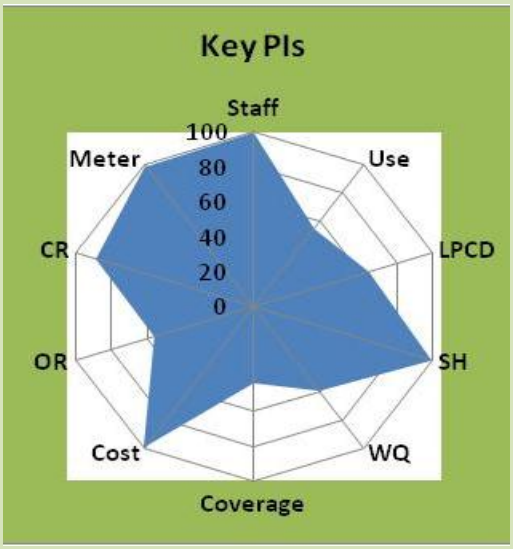
There is need of replacing old pipes and upgrade size in about 7 kms in ward 6, 7 and 9. About 20 numbers of valve chambers are needed to be able to control the flow. One generator is needed to be able to continue supply during load shedding of electricity. Similarly, there is need of pipe extension in the ward 8 (bank area), Ward 9 (Goligard), ward 7 (Janapath). About 24 km pipeline is required with pipe size ranging from 2-6". One well is required for the ward 9 for direct pumping. This will add about 2500 new connections.

Recommendation for performance improvement:

Staff ratio is very good. System map, network map need to be prepared and SOP needs to be documented. Production data need to be maintained and leakage minimized. Chlorination needs to be regularized. Operating ratio is not good which can be improved by reducing leakage, increasing taps or by reducing operating cost. Users satisfaction level is very low which can be enhanced by improving continuity, timely supply and water quality instead of supplying for more hours. Need to improve relationships with consumers.







2.6.15b Data Profile: Bhairahawa

Water Utility	WSP	NWSC-Bhairahawa (Parsa)		
	Telephone	071-520628	Email: dpk.shakya8@gmail.com	
	Head	Deepak jyoti Shakya		
	Service Area (Wards)	Shidaarthanagar 1-3,5-9,12,13		
	No of staff	25	Staff per(1000) Taps	7
	Popupation covered	30056	WS Coverage (%)	44
Mission Statement				
Service Connections	Total Taps	3626	Private Taps	3527
	Public Taps	23	Metered Taps	3595
	New connections in FY	97	Disconnections in FY	1
Costumer service	Complains/100 Taps/Yr	3.4	Users satisfied (%)	47
	No of break/Km/Yr	70	Supply hours	8
Water Production	Production(m3/day)	3528	NRW(%)	45
	Consumption(LPCD)	65	Production (LPCD)	117
Revenue and Expenses	Annual O&M Cost (NRs)	12543553	Annual Billing NRs)	10780850
	Collection Ratio	0.9	Operating Ratio	1.2
	Cost/m^3 of water used	18	Average billing (NRs/M)	249
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	13	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			480 (99)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			480 (80)

2.6.16a System Descriptions: Butwal

System Description:

The main sources of water are Tinau river and Chidia stream which feed water in 1000 m^3 tank after coagulation, flocculation and sedimentation and supply water in West of highway. Part of the treated water is transferred to two RT (500 m^3) located at Laxminager. One tank supplies to Laxminagar and Chanpur and other to the west of highway. Second production unit is in Milan Chowk where water is collected from three wells in a ground tank (200 m^3) and lifted to OHT (450 m^3). There are other 10 wells which supply water into the network directly. About 22 MLD water is supplied through 14000 taps for about an average of 5 hours per day in each location.

Water Qualities:

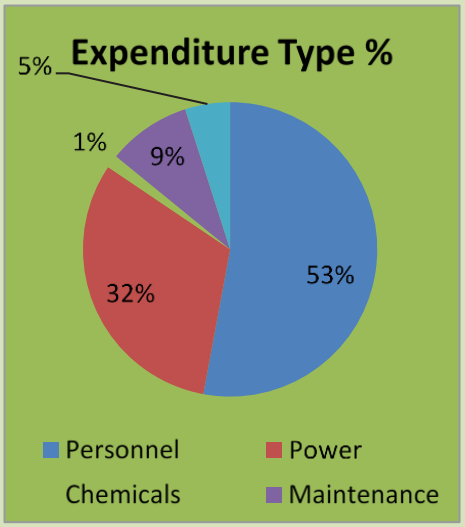
Water from the Tinau river is not clean. ST is unable to remove turbidity and flocculation is used only during main rainy season. Well water is mostly clean, but nitrate exceeded in some well water and E-coli appeared. There is a system for testing two tanks and two taps every day for pH, Ammonia and FRC and post in the office. The result indicated safe. Chlorine is applied regularly in ST and other tanks. FRC was detected in only one tap and E-coli detected in most. There is a need for using chlorine regularly and operating WTP properly. Water flow is very low (0.07-0.13 lps).

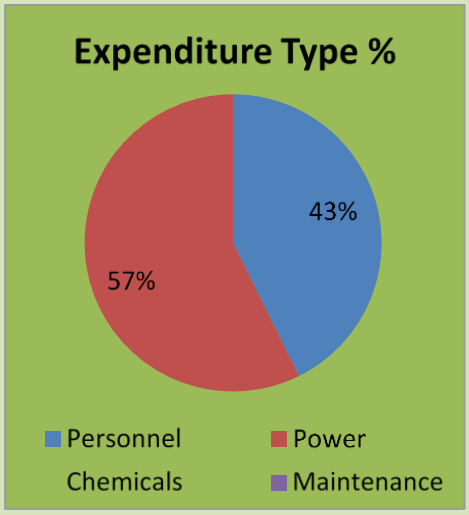
Future Plan:

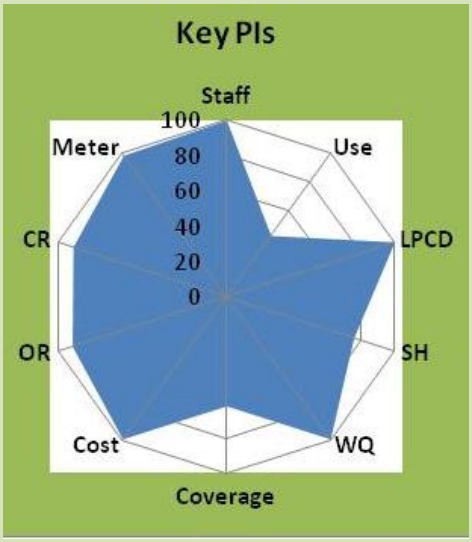
System is in need of replacing about 39 km old pipes (2"-10") laid in both side of the main roads for controlling leakage and flow. About 50 valve chamber is needed for zoning and washouts. There is a need for a system for chlorination and test kits for water quality testing mainly bacteriological. Similarly, system is in need of extending service pipelines for the newly extended area of the municipalities and merging all systems managed by the users committees. This will add about 10000 new taps.

Recommendation for performance improvement:

Performance is already good in terms of CR, OR and supply. Can be further improved in terms of supply hours and use by minimizing water loss. System map and network map need to be updated. SOP should be documented. Production data need to be maintained and leakage minimized. WQ monitoring and FRC control is ok but needs systematic process for dosing. Relationship with consumers need to be improved by timely supply, continuity, pressure and cleanliness.







2.6.16b Data Profile: Butwal

Water Utility	WSP	NWSC-Butwal (Rupendehi)		
	Telephone	071-540781	Email: nwscbutwal@gmail.com	
	Head	Mohan Dutta Bhatta		
	Service Area (Wards)	Butwal (1-13, 15) Total 22		
	No of staff	65	Staff per(1000) Taps	4
	Popupation covered	86213	WS Coverage (%)	62
Mission Statement				
Service Connections	Total Taps	14464	Private Taps	14130
	Public Taps	103	Metered Taps	14319
	New connections in FY	326	Disconnections in FY	7
Costumer service	Complains/100 Taps/Yr	2.1	Users satisfied (%)	75
	No of break/Km/Yr	112	Supply hours	6
Water Production	Production(m3/day)	21960	NRW(%)	57
	Consumption(LPCD)	109	Production (LPCD)	255
Revenue and Expenses	Annual O&M Cost (NRs)	36661047	Annual Billing NRs)	58732002
	Collection Ratio	0.9	Operating Ratio	0.6
	Cost/m^3 of water used	11	Average billing (NRs/M)	341
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	16	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			720 (100)
	No of samples tested for biological parameters (%Passed)			360 (100)
	No of sample tested for FRC (%Passed)			720 (100)

2.6.17a System Descriptions: Taulihawa

System Description:

There are three wells with 16-20 lps flow. Water is extracted from one to two wells at a time and each wells run for about 6 hours. Water is lifted to 450 m^3 OHT and 1 MLD water is supplied through 800 taps for about average of 6 hours every day in two shifts. Chlorine is mixed at ground and solution lifted to the OHT by one HP pump.

Water Qualities:

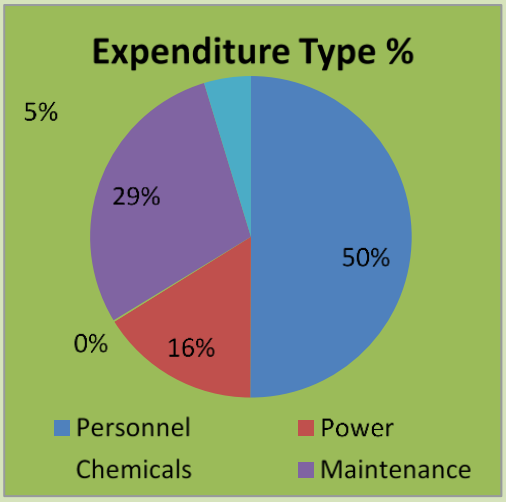
Water from the well is clean but E-coli was detected. Chlorine solution is prepared in a 500 liter tank and lifted to OHT by one HP pump. About 2 kg BLP is applied every day. Water qualities are tested for pH, Ammonia, Color, and FRC using ENPHO kit. One sample after OHT and one from taps at different location each day is tested. Test indicated that FRC is nil and E-coli present in all taps. Chlorine need to be regular. Flow in taps varies from 0.07-0.2 lps.

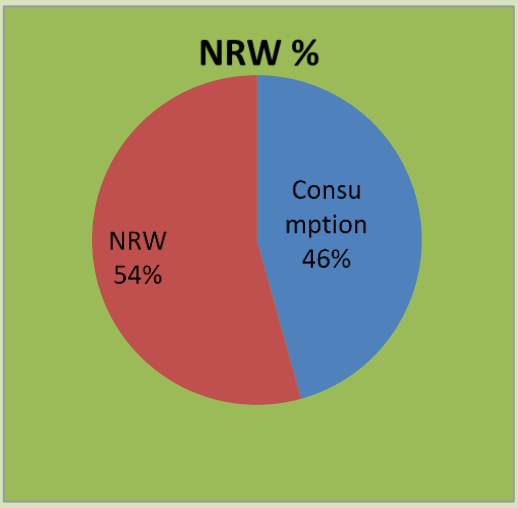
Future Plan:

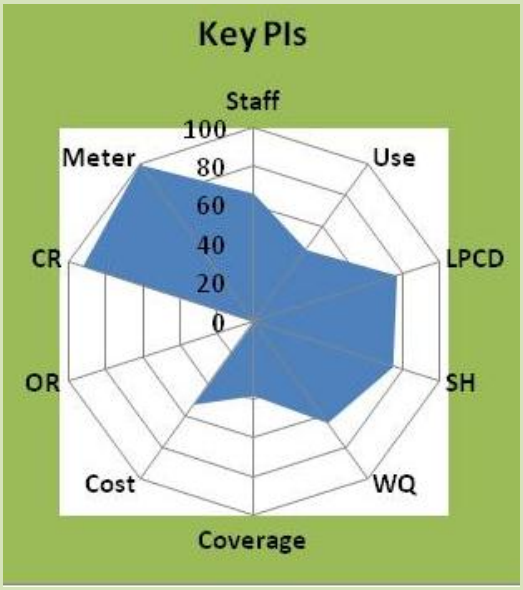
System is in need of replacing about 5 km old pipes (1.5"-3"). About 5 valve chamber is needed for zoning and washouts. Similarly, system is in need of extending services in campus, Tilaurakot, Chotki Taulihawa, and hospital area which requires about 8.5 km pipes (1.5"-3") and one well in campus area for direct pumping. This will add about 200 new taps.

Recommendation for performance improvement:

System map and network map need to be updated. SOP should be documented. Production data need to be maintained and leakage minimized. Operating ratio is very high and can be reduced by increasing taps and reducing water losses. Relationship with users need to be enhanced by improving continuity, timely supply, flow pressure and water qualities.







2.6.17b Data Profile: Taulihawa

Water Utility	WSP	NWSC-Taulihawa (Kapilbastu)		
	Telephone	076-560535	Email: skhsantoshdot@gmail.com	
	Head	Santosh Sah		
	Service Area (Wards)	1-7,8-10 Total wards 23		
	No of staff	11	Staff per(1000) Taps	13
	Popupation covered	5712	WS Coverage (%)	38
Mission Statement				
Service Connections	Total Taps	820	Private Taps	786
	Public Taps	2	Metered Taps	818
	New connections in FY	30	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	2.8	Users satisfied (%)	70
	No of break/Km/Yr	17	Supply hours	6
Water Production	Production(m3/day)	964	NRW(%)	54
	Consumption(LPCD)	77	Production (LPCD)	169
Revenue and Expenses	Annual O&M Cost (NRs)	5185580	Annual Billing NRs)	2348920
	Collection Ratio	0.9	Operating Ratio	2.2
	Cost/m^3 of water used	32	Average billing (NRs/M)	239
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	13	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			360 (100)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			360 (93)

2.6.18a System Descriptions: Bahadurgunj

System Description:

Water is extracted from one well with a capacity of 25 lps for about 8 hours in a day and lifted to 450 m^3 OHT. About 0.5 MLD water is supplied through 500 taps for about an average of 4.5 hours every day in three shifts.

Water Qualities:

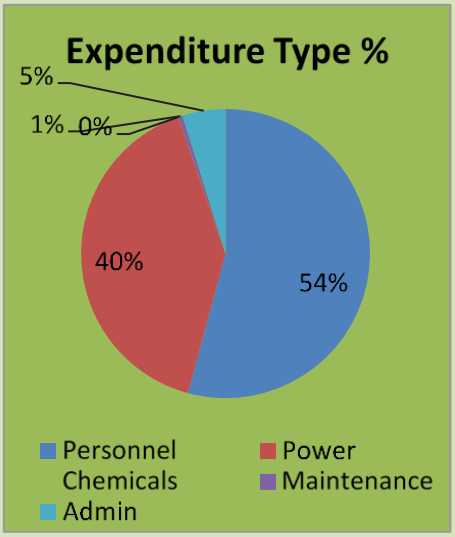
Water from the well is clean and meets the standard. People mostly noted clean water. DWSS tested three samples one from tank and two from taps for As, Tu, pH and E-coli and found normal. Chlorine is occasionally applied. Sample collected indicated that FRC is nil and E-coli is present in all taps indicating contamination in the networks. EC increased in taps than in the wells. There is a need of leakage control, chlorine use and monitoring WQ. Flow is very good ranging from 0.17-0.22 lps.

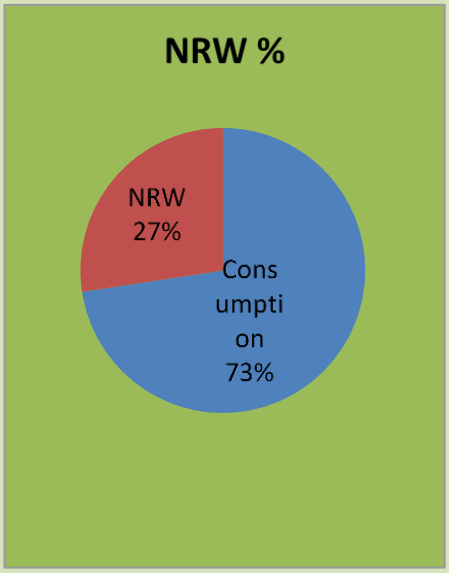
Future Plan:

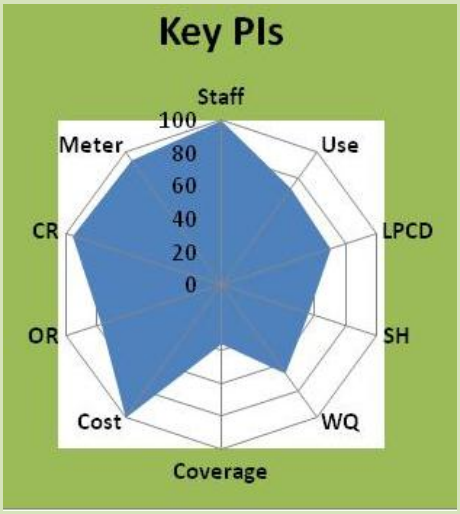
System is in need of replacing about 4 km old pipes (2"-5"). About 10 valve chambers are needed for zoning and washouts. There is a need for a system for chlorination and test kits for water quality testing. Similarly, system is in need of extending service pipe line for the Babanpur, Jumla, Ganeshpur, Raharaula, Bijayanagar and Dagarmarua. This needs about 15 km pipes. This will add about 200 new taps.

Recommendation for performance improvement:

Staff ratio is very good. A system map, network map need to be prepared and SOP needs to be documented. Production data need to be maintained and leakage minimized. Chlorination needs to be regularized. Collection ratio very good, operating ratio can be further improved. Users satisfaction level is very low which can be enhanced by improving continuity, supply hours and quality improvement.







2.6.18b Data Profile: Bahadurgunj

Water Utility	WSP	NWSC-Bahadurgunj (Kapilbastu)		
	Telephone	0	Email:	
	Head	Santosh Sah (UC chair Akbal Ahmed Khan)		
	Service Area (Wards)	Bahadurgunj(1,2,5-), Purushotapur (3-5), Ajgara(7-9)		
	No of staff	4	Staff per(1000) Taps	9
	Popupation covered	3848	WS Coverage (%)	36
Mission Statement				
Service Connections	Total Taps	433	Private Taps	407
	Public Taps	15	Metered Taps	406
	New connections in FY	3	Disconnections in FY	35
Costumer service	Complains/100 Taps/Yr	0.6	Users satisfied (%)	0
	No of break/Km/Yr	20	Supply hours	4.5
Water Production	Production(m3/day)	374	NRW(%)	27
	Consumption(LPCD)	71	Production (LPCD)	97
Revenue and Expenses	Annual O&M Cost (NRs)	587894	Annual Billing NRs)	702420
	Collection Ratio	1.0	Operating Ratio	0.8
	Cost/m^3 of water used	6	Average billing (NRs/M)	140
Water Tariff	Metered Taps	80	Un-metered Taps	500
	Increment (NRS/unit)	15	Community	0
	Average Tariff (NRs/m3)	7	Connection charge	1595
Water Quality	No of sample tested for physicochemical parameters (% Passed)			2 (100)
	No of samples tested for biological parameters (%Passed)			2 (100)
	No of sample tested for FRC (%Passed)			0 (0)

2.6.19a System Descriptions: Krishnanagar

System Description:

There are two wells with 25 lps flow. Water is extracted from one to two wells at a time and each wells run for about 6 hours. Water is lifted to 450 m^3 OHT. About 1.00 MLD water is supplied through 936 taps for about an average of 6 hours every day in two shifts. Chlorine is mixed at ground and solution lifted to the OHT by one HP pump.

Water Qualities:

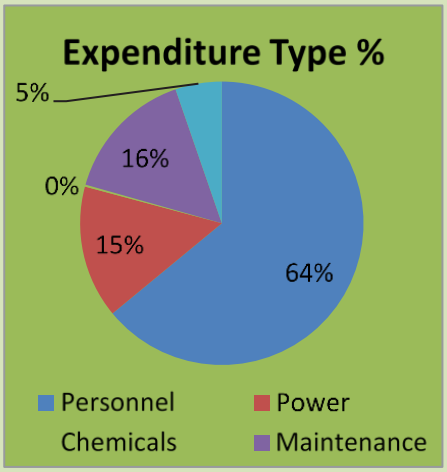
Water from one well produce turbid water in the beginning. Water in well two is clean. Chlorine solution is prepared in a two stage tank and lifted to OHT by one HP pump. About 2 kg bleaching powders applied every day. Water qualities are tested for pH, Tu, Color, and FRC using ENPHO kit. One sample is taken after OHT and one from taps at different locations each day. Test indicated that one well in contaminated with E-coli. Chlorine detected in one tap where FRC was nil. There is need for protecting the well head.

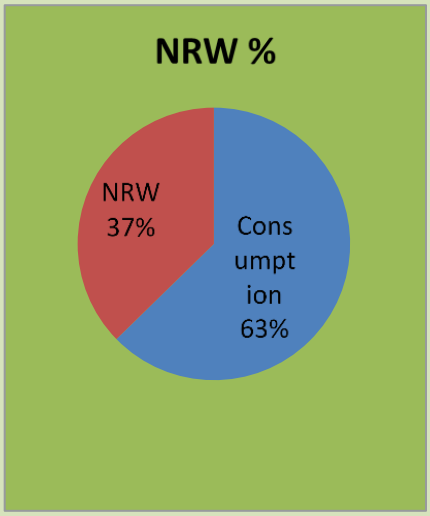
Future Plan:

System is in need of replacing about 4 km old pipes (2"-3"). About 15 valve chamber is needed for zoning and washouts. Similarly, system is in need of extending services in Laxminager, Chaipurawa, Semera and Baraham with 6 km pipes (2"-3"), Baraha area with one well and 10 km pipes and one OHT (250 m^3) in Jhandenagar. This will add about 200 new taps.

Recommendation for performance improvement:

Information related to production, consumption need to be maintained and operating process be documented. Operating ratio is not good and leakage high. Water is sufficient, all taps metered but leakage is high and staff ratio also is high. Cost need to be minimized or new number of connection to be increased and water quality to be monitored regularly. Users satisfaction level is very low which can be enhanced by improving continuity of supply, supply hours, flow distribution and water qualities.





2.6.19b Data Profile: Krishnanagar

Water Utility	WSP	NWSC-Krishnanagar (Kapilbastu)		
	Telephone	052-0514076	Email: skhsantoshdot@gmail.com	
	Head	Santosh Sah/Tikaram Kuwar		
	Service Area (Wards)	Krishnanagar 1-7, 9-14		
	No of staff	15	Staff per(1000) Taps	15
	Popupation covered	6060	WS Coverage (%)	20
Mission Statement				
Service Connections	Total Taps	990	Private Taps	955
	Public Taps	11	Metered Taps	936
	New connections in FY	27	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	2.1	Users satisfied (%)	80
	No of break/Km/Yr	25	Supply hours	5
Water Production	Production(m3/day)	1026	NRW(%)	37
	Consumption(LPCD)	106	Production (LPCD)	169
Revenue and Expenses	Annual O&M Cost (NRs)	6538727	Annual Billing NRs)	3753235
	Collection Ratio	0.9	Operating Ratio	1.7
	Cost/m^3 of water used	28	Average billing (NRs/M)	319
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	14	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			720 (100)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			720 (100)

2.6.20a System Descriptions: Pokhara

System Description:

Main source of water is Mardi Khola which feeds water to Bindebasini tank and Amala Bisauni tank. Amala Bisauni also collects water from Bhotekhola and other three springs: Ghatte Khola, Maj Kuna and Kalimuda. Water is also collected from five wells and injected into line. Water is supplied from Bindebasini, Amalabesi, Bhote Khola, Baldhara and OHT located at Matepani. Baldhara also supplies locally. Daily production is about 44 MLD from surface source and 5 MLD from ground source. Total reservoir capacity is about 6 MLD. About 49 MLD water is supplied through 35000 taps. Supply is generally 24 hours but needs to be controlled in some area from alternate day to once in several days. Average supply is 4 hours.

Water Qualities:

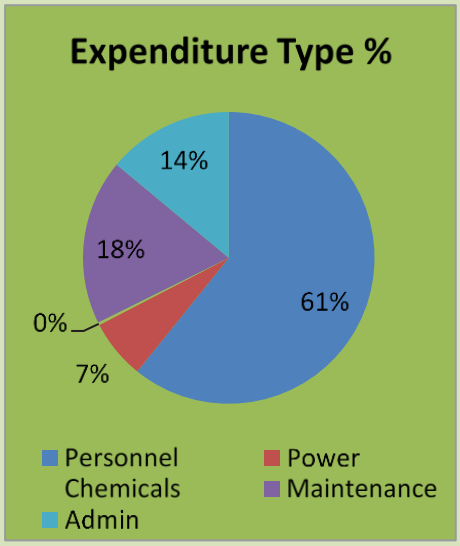
Water becomes turbid during rainy season from Mardi rivers which get settled in the reservoir tank. There is no system for water quality monitoring. Test indicated that water qualities in the sources are within standard. There is a very good system for chlorination at tanks. Test indicated that FRC is nil in all taps and E-coli present. People generally filter the drinking water. There is need for WTP, regular chlorination and WQ monitoring. Flow in the taps varies from 0.07-0.11 lps

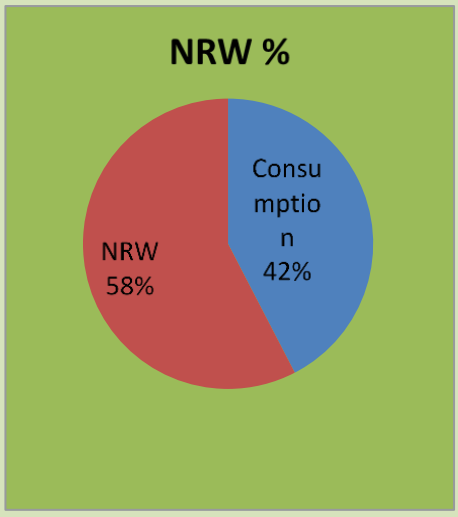
Future Plan:

Water treatment plant for 41 MLD, transmission pipe for 8 km, 3 OHT and distribution reservoir, distribution pipes (2"-10") for 100 km, 9000 water meters and mini labo will be installed through JICA grant aid project by 2020. There is further need for extending pipe lines in newly added 11 wards @ 50 Km/wards and need to explore local sources.

Recommendation for performance improvement:

System map, network map need to be prepared and SOP needs to be documented. Production data need to be maintained and leakage minimized. Chlorination need to be regularized. Operating ratio is excellent however, there are needs of improving supply hours, reducing water loss and monitoring water quality regularly. User's satisfaction level is very good and can be improved further by taking care of water qualities and supply times.





2.6.20b Data Profile: Pokhara

Water Utility	WSP	NWSC-Pokhara (Kaski)		
	Telephone	061-465091	Email: nirandemocratic@gmail.com	
	Head	Niran Maharjan		
	Service Area (Wards)	Pokhara (1-19)		
	No of staff	100	Staff per(1000) Taps	3
	Popupation covered	208026	WS Coverage (%)	69
Mission Statement				
Service Connections	Total Taps	35260	Private Taps	34671
	Public Taps	2	Metered Taps	34630
	New connections in FY	1680	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	14.8	Users satisfied (%)	60
	No of break/Km/Yr	243	Supply hours	4
Water Production	Production(m3/day)	49606	NRW(%)	58
	Consumption(LPCD)	101	Production (LPCD)	238
Revenue and Expenses	Annual O&M Cost (NRs)	44696765	Annual Billing NRs)	183095336
	Collection Ratio	0.9	Operating Ratio	0.2
	Cost/m^3 of water used	6	Average billing (NRs/M)	433
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	21	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			24 (75)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			24 (83)

2.6.21a System Descriptions: Nepalgunj

System Description:

There is one main production unit which collects water from two wells located in Gurudwara and industrial area in a 450 m^3 OHT and distributes after chlorination. There are three outlets from tank going east, south and north. About 3.8 MLD water is produced by running three wells for about 18 hours and supplied through 4000 taps for about an average of 6 hours every day in two to three shifts. Chlorine is applied in the OHT.

Water Qualities:

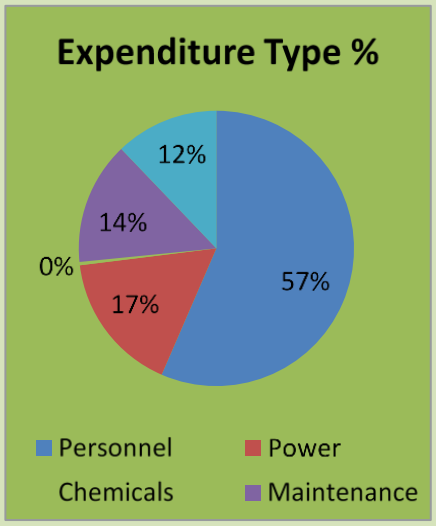
Water from the wells is normally clean and free from contamination. There is a practice to use chlorine at tank, two times per day. Field test indicated that water is clean (Tu<2) at taps, FRC nil and E-coli detected in some taps. Nitrate increased. Water flow is sufficient (0.13-0.27lps). System needs of regularizing chlorine use, establishing mini lab, WQ monitoring and leakage control.

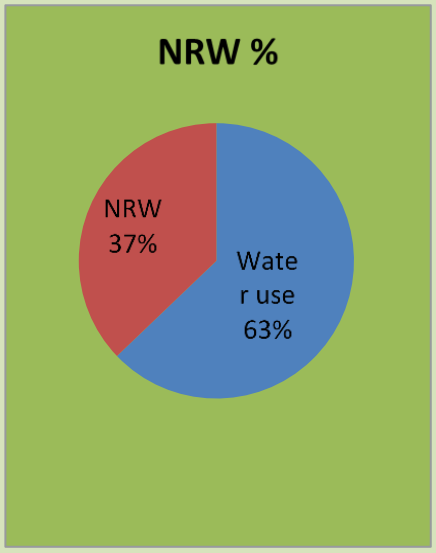
Future Plan:

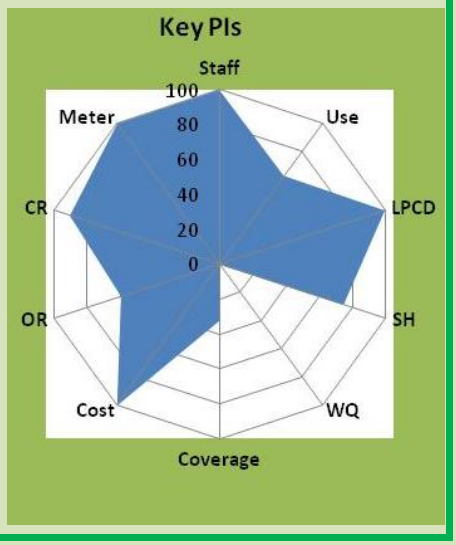
System is in need of replacing about 25 km old pipes (1.5"-3") and shifting 2000 taps, adding 30 valve chambers for controlling leakage and flow and washouts. Similarly, system is in need to extending pipes about 38 km in Karkando (ward 24), Muktipur (ward 16), Baspark (ward 5), Adarsha nagar (ward 13), Belashpur (ward 16), Tejnagar (ward 24), Surjegaw (ward 25), Ladawa (ward 24). Two wells are needed in Karkando and Campus. One OHT of 400 m^3 is under construction in the Karkando. This will add about 2500 taps.

Recommendation for performance improvement:

Staff ratio can be further reduced by increasing connections. System map, network map need to be prepared and SOP documented. Production/consumption data need to be maintained and leakage minimized. Chlorination needs to be regularized. Operating ratio needs to be improved, supply hour increased. Users' satisfaction level needs to be increased by continuity and timely supply.







2.6.21b Data Profile: Nepalgunj

Water Utility	WSP	NWSC-Nepalgunj (Bake)		
	Telephone	081-520592	Email: oasis_ses@hotmail.com	
	Head	Asis Karki		
	Service Area (Wards)	Nepalgunj (1-17) of 28		
	No of staff	29	Staff per(1000) Taps	7
	Popupation covered	24234	WS Coverage (%)	32
Mission Statement				
Service Connections	Total Taps	4054	Private Taps	3939
	Public Taps	10	Metered Taps	4044
	New connections in FY	48	Disconnections in FY	16
Costumer service	Complains/100 Taps/Yr	3.5	Users satisfied (%)	25
	No of break/Km/Yr	105	Supply hours	6
Water Production	Production(m3/day)	3888	NRW(%)	37
	Consumption(LPCD)	101	Production (LPCD)	160
Revenue and Expenses	Annual O&M Cost (NRs)	12865000	Annual Billing NRs)	11611123
	Collection Ratio	0.9	Operating Ratio	1.1
	Cost/m^3 of water used	14	Average billing (NRs/M)	239
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	12	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			0 (0)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			0 (0)

2.6.22a System Descriptions: Dhangadi

System Description:

There are three production units. One is an office unit which collects water from two wells and distributes through 180 m^3 OHT. The other is Hanspur unit which collects water from two wells and distribute through 200 m^3 steel OHT. There are other four wells contributing online supply mostly artesian but yields turbid water when the pump is operated. About 2.8 MLD water is produced by running four wells for about 12 hours and is supplied through 4000 taps from 5:00-19:00 till the power supply does not get interrupted.

Water Qualities:

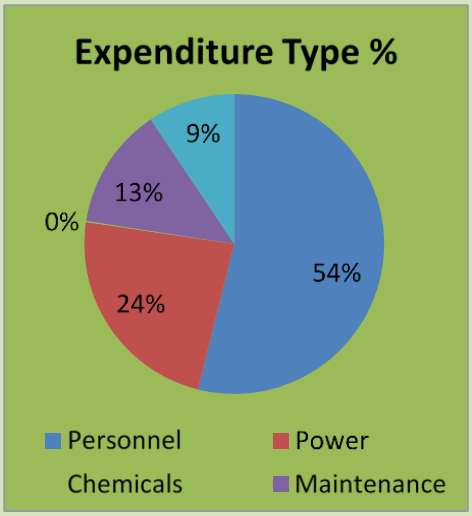
Water from the main wells is normally clean, but one well is heavily contaminated. Chlorine is applied in both units, two times per day in office and Hanspur units but not regular. There are test kits to test pH, Tu, FRC, ammonia and E-coli but not in use. Field test indicated that chlorine is nil in all taps and E-coli presence in some taps. Water pressure is very low in all taps with discharge less than 0.1 lps. System is in need of regularizing chlorine use and WQ monitoring with mini lab.

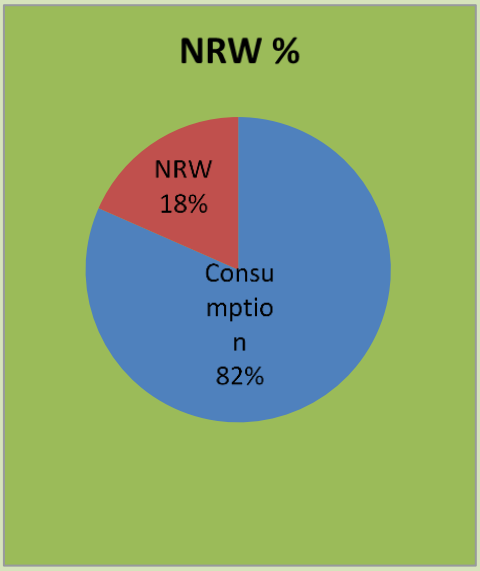
Future Plan:

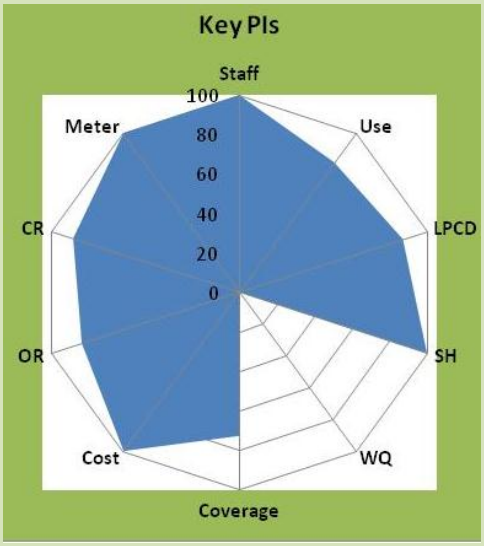
System is in need of changing old and small pipes for 10 km main lines and 30 km distribution lines for equal distribution of flow and controlling leakage and contamination. Pressure filters are needed for two units and four wells serving supplying water directly to the distribution line. Chlorine dosing is needed in six. About 5 numbers of washout are needed. Similarly, there is a need of extending a system for Jugeda (W13): Two wells, one 450 m^3 OHT and 10 km pipes and Bishalnagar (W3): One wells, one 450 m^3 OHT and 5 km pipes. Improvement adds 3000 taps and extension adds 3000 taps.

Recommendation for performance improvement:

Staff ratio is good, NRW minimum (18%), and operating ratio is very acceptable (0.7) and supply hours are good but needs to control supply timing and pressure. Water quality test needs to be continued. User's satisfaction level is very low (45%) which can be increased by improving supply timing, pressure, cleanliness and ensuring the flow in all areas instead of all time supply. Office needs to maintain information relating to production, water sales, leakage control, water quality test and prepare a standard process for key operations.







2.6.22b Data Profile: Dhangadi

Water Utility	WSP	NWSC- Dhangadi (Kailali)		
	Telephone	091-524471	Email: nwscdh.info@gmail.com	
	Head	Arbinda Kumar Lal Karna		
	Service Area (Wards)	Dhangadi (1-8) out of 14 wards		
	No of staff	26	Staff per(1000) Taps	6
	Popupation covered	26220	WS Coverage (%)	73
Mission Statement				
Service Connections	Total Taps	4469	Private Taps	4305
	Public Taps	13	Metered Taps	4456
	New connections in FY	106	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	6.0	Users satisfied (%)	90
	No of break/Km/Yr	50	Supply hours	12
Water Production	Production(m3/day)	2800	NRW(%)	18
	Consumption(LPCD)	87	Production (LPCD)	107
Revenue and Expenses	Annual O&M Cost (NRs)	10270189	Annual Billing NRs)	13817518
	Collection Ratio	0.9	Operating Ratio	0.7
	Cost/m^3 of water used	12	Average billing (NRs/M)	258
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	15	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			0 (0)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			0 (0)

2.6.23a System Descriptions: Mahendranagar

System Description:

There are three production units. One is Steel Tank unit in which water is collected in a clear water reservoir tank after rapid sand filtration and lifted in 200 m^3 OHT. The other is an office unit which collects water from one well and lift into 180 m^3 OHT. One well located at the Nayakatan supplies water directly to the Nayakatan area. About 2 MLD water is produced by running three wells for about 9 hours and supplied through 2000 taps for about an average of 9 hours every day in three shifts.

Water Qualities:

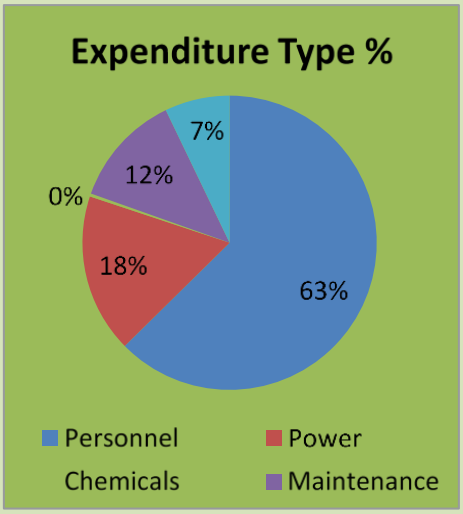
Water from the wells is normally clean and free from contamination. Chlorine is mostly applied @ 1.5 kg (BLP) two times per day. There are test kits to test pH, Tu, FRC and E-coli but not in use. Field test indicated that chlorine applied, but not detected in the taps. E-coli present in some taps. Water pressure is medium and discharge is 0.1-0.15 lps. System needs of regularizing chlorine use and taking care of higher level of hardness in all wells.

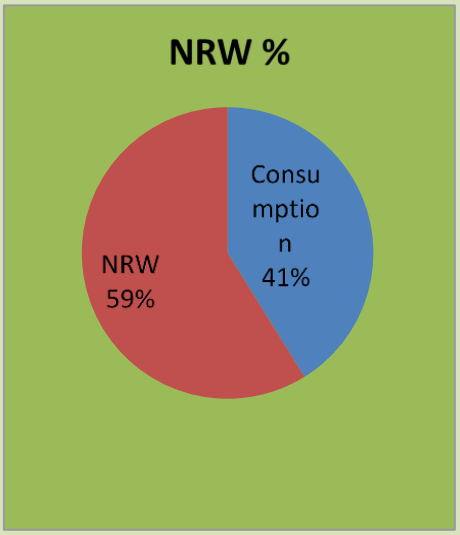
Future Plan:

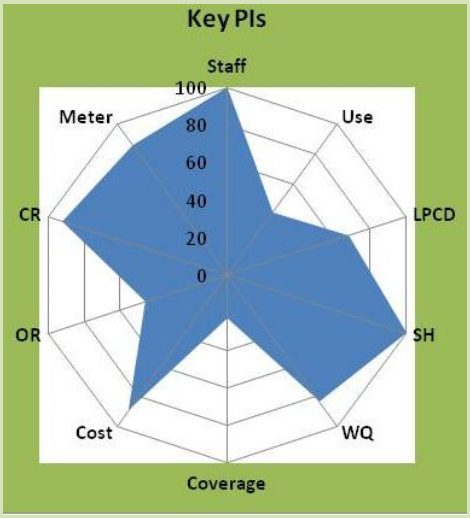
System is in need of changing sand media in RSF filter. Out of three booster pump two pumps are not functioning. About 3 km pipes (3-4") needs to be replaced in main line and 5 km pipes (6-8") needs to be replaced in the distribution line. About 5 numbers of washout is needed. There is calcium deposition in the water vessels at HH which need to be examined. Similarly, there is need for extending system for Bangau (One well, One OHT and 12 km pipes), Airport (One well, One OHT and 15 km pipes one OHT) and Nayakatan (One OHT and 5 Km pipes).

Recommendation for performance improvement:

Staff ratio can be further reduced by increasing connections. System map, network map need to be prepared and SOP needs to be documented. Production data need to be maintained and leakage minimized. Chlorination needs to be regularized. Operating ratio is very not good which can be improved by taking care of water use and cost efficiency. Users satisfaction level is very good which can be further improved by maintaining flow and water qualities.







2.6.23b Data Profile: Mahendranagar

Water Utility	WSP	NWSC-Mahendranagar (Kanchanpur)		
	Telephone	099-521133	Email: harishrestha211@gmail.com	
	Head	Hari Kumar Shrestha		
	Service Area (Wards)	Bhimdutta (3, 4, 6, 18) Out of 19 wards		
	No of staff	17	Staff per(1000) Taps	8
	Popupation covered	11298	WS Coverage (%)	23
Mission Statement				
Service Connections	Total Taps	2002	Private Taps	1883
	Public Taps	6	Metered Taps	1711
	New connections in FY	156	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	4.3	Users satisfied (%)	90
	No of break/Km/Yr	31	Supply hours	9
Water Production	Production(m3/day)	1860	NRW(%)	59
	Consumption(LPCD)	68	Production (LPCD)	165
Revenue and Expenses	Annual O&M Cost (NRs)	7520116	Annual Billing NRs)	5728290
	Collection Ratio	0.9	Operating Ratio	1.3
	Cost/m^3 of water used	27	Average billing (NRs/M)	239
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	19	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			72 (100)
	No of samples tested for biological parameters (%Passed)			72 (100)
	No of sample tested for FRC (%Passed)			72 (50)

2.6.24a System Descriptions: Banepa

System Description:

There are three systems namely, Banepa, Panauti and Nala. Banepa receives water from two sources Shasipani and Dhaneswor and supplies water in Banepa Municipality. Panauti system receives water from three sources Mulkhola, Haridol and Kalate and supplies water in Panauti Municipality. Nala System receives water from single source Nala and supplies water in Nala VDC. Panauti system has flocculation and plain sedimentation as treatment units and there are chlorination units in all three systems. About 0.9 mld water is supplied through 3309 tap connections. Water supply hour is 2 hours in Panauti system and 1hour in every 4 days in Banepa system.

Water Qualities:

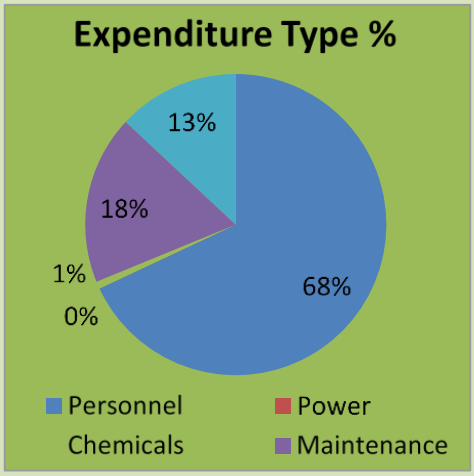
Water in the sources is turbid and remains the same in the tap also. Chlorine is applied but not controlled. FRC in the taps are nill and E-coli appeared in all taps. There is no system for WQ monitoring. Flow from tap varies form 0.04-0.2 lps. WQ can be maintained by upgrading and operating WTP and regularizing chlorine use.

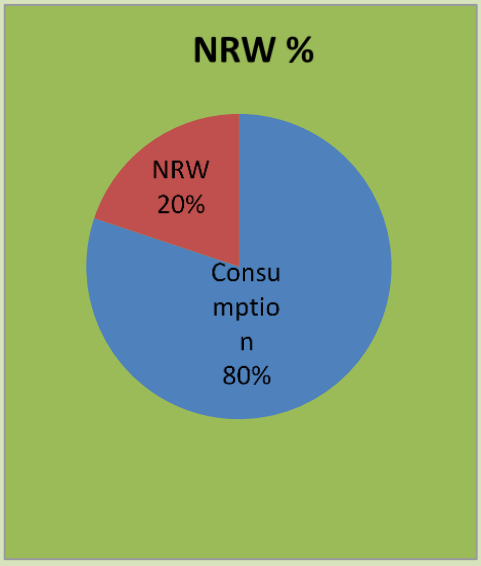
Future Plan:

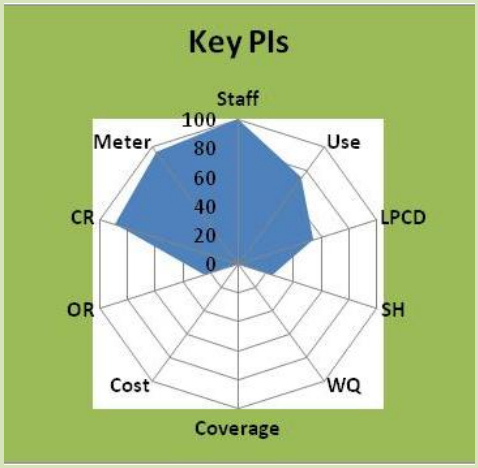
DUDBC under STIUEIP project is developing new system for Kavre valley. In the new system existing three systems Banepa, Panauti and Dhulikhel will be managed in an integrated way by a management board. Hence, NWSC Banepa has no improvement plan in its own. But there is the need of increasing sources and replacing old pipes and upgrading. There is need for establishing mini water quality lab.

Recommendation for performance improvement:

Information related to production, consumption need to be maintained and operating process documented. Operating ratio is not good and leakage high. There is need for controlling leakage and regular water quality monitoring. Cost needs to be minimized or new number of connection be increased. Users satisfaction level is very low which can be improved by improving quantity of water supply, continuity of supply, supply hours, flow distribution and water qualities.







2.6.24b Data Profile: Banepa

Water Utility	WSP	NWSC-Banepa (Kavre)		
	Telephone	011-661220	Email: buddharatna@gmail.com	
	Head	Budddha Ratna Maharjan		
	Service Area (Wards)	Banepa(1-11), Panauti(3-11), Nala (3,4), Hokse		
	No of staff	30	Staff per(1000) Taps	9
	Popupation covered	23397	WS Coverage (%)	33
Mission Statement				
Service Connections	Total Taps	3309	Private Taps	3204
	Public Taps	105	Metered Taps	3164
	New connections in FY	115	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	4.9	Users satisfied (%)	57
	No of break/Km/Yr	62	Supply hours	2
Water Production	Production(m3/day)	1728	NRW(%)	27
	Consumption(LPCD)	54	Production (LPCD)	74
Revenue and Expenses	Annual O&M Cost (NRs)	13260094	Annual Billing NRs)	8106009
	Collection Ratio	0.9	Operating Ratio	1.6
	Cost/m^3 of water used	29	Average billing (NRs/M)	211
Water Tariff	Metered Taps	110	Un-metered Taps	560
	Increment (NRS/unit)	25	Community	1600
	Average Tariff (NRs/m3)	16	Connection charge	1980
Water Quality	No of sample tested for physicochemical parameters (% Passed)			0 (0)
	No of samples tested for biological parameters (%Passed)			0 (0)
	No of sample tested for FRC (%Passed)			1 (0)

2.6.25a System Descriptions: KUKL-Kathmandu

System Description:

KUKL has altogether 10 distribution branches (Mahakal Chaur, Maharajgunj, Tripureswor, Baneswor, Chhetrapati, Lalitpur, Kirtipur, Kamaladi, Madhapur Thimi, Bhaktapur) in the valley and head office at Tripureswor. Its service area includes 23 municipalities around the valley covering 232 wards. Total production is about 126 MLD (average) with seasonal variation ranging from 91-147 MLD. About 26% of production is assumed to be loses in the distribution networks. Hence net average supply is 81mld. There are 35 surface sources, 59 tube wells, 24 reservoirs and 29 pumping stations. Ground water sources contribute about 18 MLD. Water networks include 313 km transmission and 1315 km distribution mains with 199416 connections, including 1196 public stand posts. Water is supplied intermittently in the interval of 3-6 days for one to 4 hours based on locations.

Water Qualities:

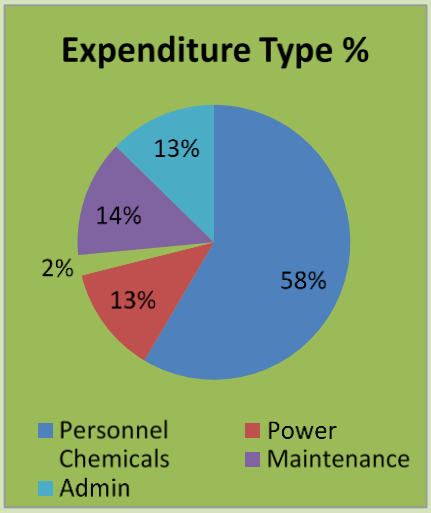
KUKL possesses mini laboratories in large branches (Mahakal, Bansbari, Bode and Lalitpur) and central laboratory at Kirtipur. Surface waters are mostly treated from 24 WTP including 6 large sizes. Central lab in Kirtipur tested 16 for raw water, treated water and taps. About 8 samples in average were tested in 2072 (2015). About 90% samples meet standard for the physical parameter 65% biological parameters and 68% meet FRC. Parameters exceeding standard at sources are: Tu, EC, Fe, Ammonia and Total coliform. Sample tested in 103 samples from taps during this assessment indicated that 67% samples met standard in overall parameters, 44% samples met standard in E-coli and 18% samples met standard in FRC.

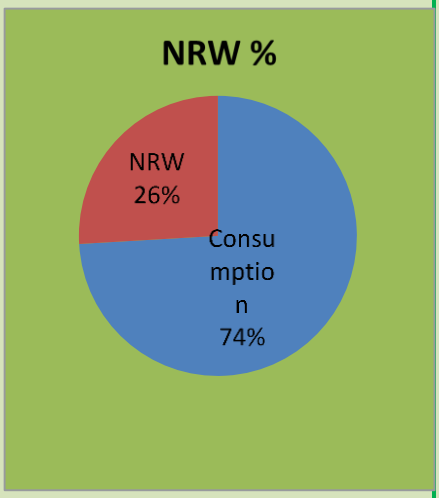
Future Plan:

Melamchi Water Supply adds about 170 MLD by 1st phase, 340 MLD by 2nd and 3rd phases treated water and MWSDB and PID constructs water treatment plant and major bulk and distribution networks through ADB and JICA projects.

Recommendation for performance improvement:

There is need of reorganization of KUKL in view of essential services. Staff ratio is good, NRW (26%) needs to be minimized through leakage control. Operating ratio is almost 1.0 including 20% expenses going KVWSMB and WSTFC. Water supply, WQ and supply hour need improvement. Consumer satisfaction level is very low. There is need for separate unit for consumer management.





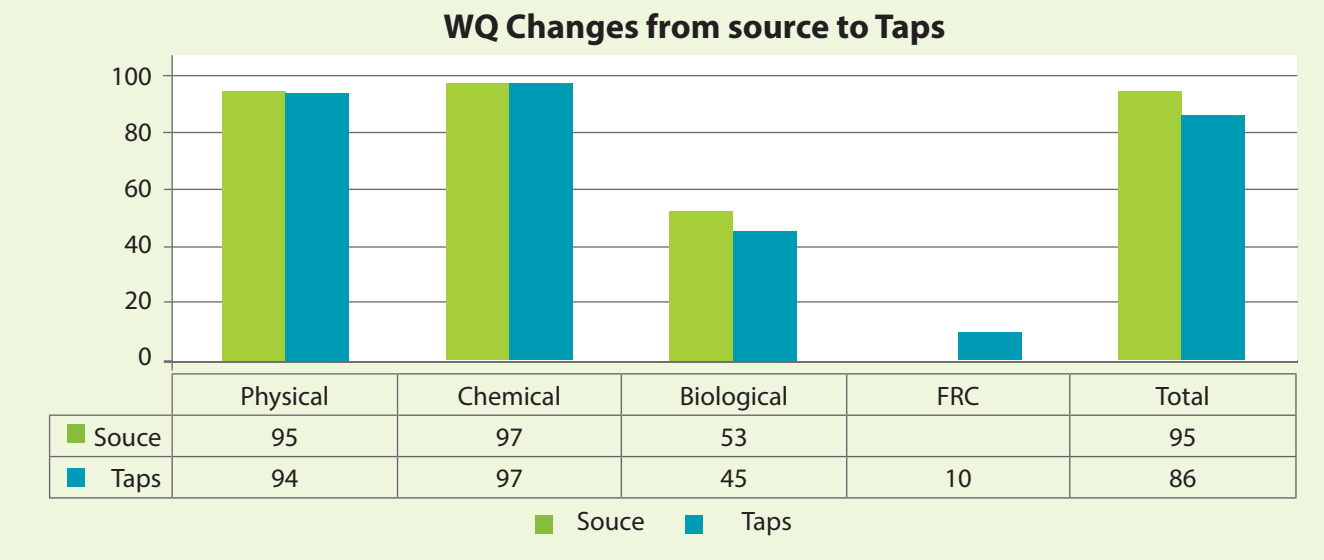
2.6.25b Data Profile: KUKL-Kathmandu

Water Utility	WSP	KVWSMB-KUKL (Kathmandu)		
	Telephone	4262202	Email: info@kathmanduwater.org	
	Head	Dr. Mahesh Prashad Battarai		
	Service Area (Wards)	Kathmandu Upatyaka		
	No of staff	1067	Staff per(1000) Taps	5
	Popupation covered	2059940	WS Coverage (%)	80
Mission Statement				
Service Connections	Total Taps	199416	Private Taps	197201
	Public Taps	1196	Metered Taps	184687
	New connections in FY	4698	Disconnections in FY	0
Costumer service	Complains/100 Taps/Yr	4.9	Users satisfied (%)	0
	No of break/Km/Yr	1629	Supply hours	2
Water Production	Production(m3/day)	116266	NRW(%)	25
	Consumption(LPCD)	43	Production (LPCD)	56
Revenue and Expenses	Annual O&M Cost (NRs)	747036783	Annual Billing NRs)	781525701
	Collection Ratio	0.7	Operating Ratio	1.0
	Cost/m^3 of water used	23	Average billing (NRs/M)	329
Water Tariff	Metered Taps	100	Un-metered Taps	785
	Increment (NRS/unit)	32	Community	1600
	Average Tariff (NRs/m3)	17	Connection charge	0
Water Quality	No of sample tested for physicochemical parameters (% Passed)			1469 (90)
	No of samples tested for biological parameters (%Passed)			1274 (65)
	No of sample tested for FRC (%Passed)			1262 (68)

CHAPTER 3: WATER QUALITY ASSESSMENT

3.1(a) Assessment and Key Findings (25 Towns)

During assessment visit, water sample was collected from all sources in operation and selected five taps in 25 towns other than Kathmandu valley. Some parameters like pH, Turbidity, FRC, E-coli, EC and Temperature were tested on site and sample transferred to Laboratory in Kathmandu for remaining test. Result indicated that that overall most of WSPs have chlorination units in place but use of chlorine is not regular and controlled. Samples meeting Physical, chemical and E-coli standard at source are 95, 97 and 53 % respectively. Similarly samples meeting Physical, chemical and E-coli standard at tap are 94, 97 and 45 % respectively. FRC met NDWQS (0.1mg/L-0,2mg/L) in 10 % of tap samples only. FRC more than 0.1mg/L was detected in 14% taps and in 4% of that was detected more than 0.2mg/L. Trace amount of FRC was detected to other 4% taps. Test indicated that there is further degradation of WQ from source to taps. Water quality can be improved by regular monitoring, protecting sources, regulating use of chlorine and leakage control and cleaning pipe networks.

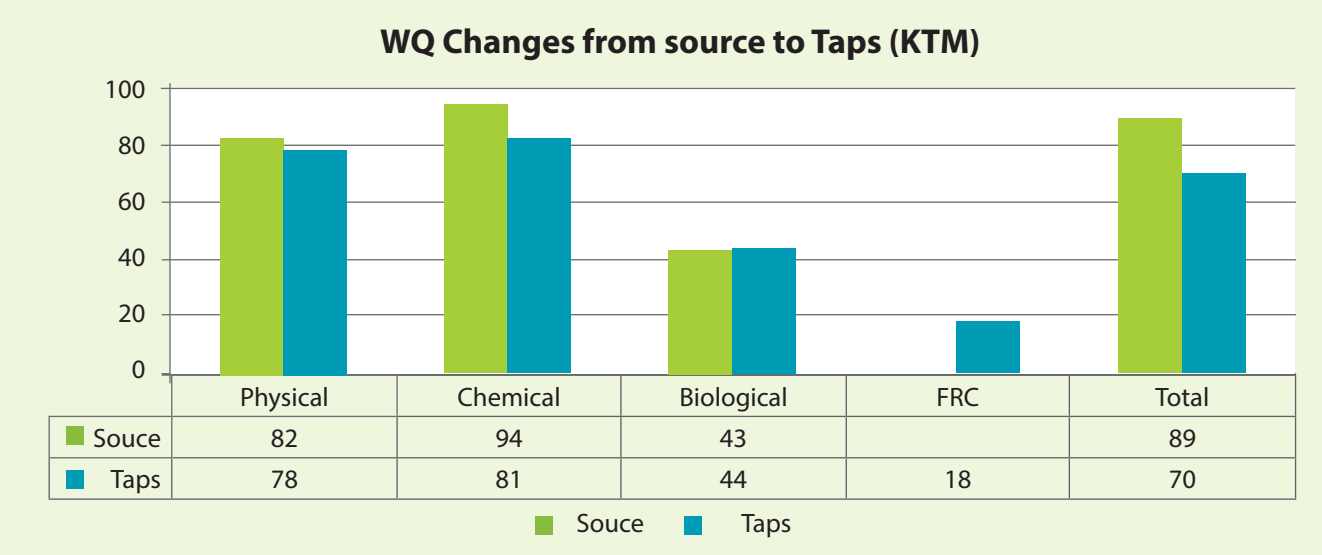


	Physical	Chemical	Biological	FRC	Total
Souce	95	97	53		95
Taps	94	97	45	10	86

Water quality at source and taps are mostly in same level. This is partly due to absent of treatment or incomplete treatment and partly due to regeneration of contaminates in the pipes. It is possible to control the E-coli by regulating chlorination which is in place in all towns.

3.1(b) Assessment and Key Findings (Kathmandu Valley)

Selected 21 sources were tested for full parameters and selected 103 taps (representing grid of 1/15km) were selected for 10 parameters in Kathmandu valley. Among tested sample at source, 87% met standard for all parameters and 43% sample met standard for bacteriological parameters. Parameters exceeding standard at sources are Color, Turbidity, ammonia, odour, pH, Iron, Manganese and E-coli. Sample in taps indicated that about 67% samples met standard in overall parameters, 44% samples met standard in E-coli and 18.4% samples met standard in FRC and more than 0.2mg/L was detected in 15% taps. Main objection in the tap water is high Turbidity (38%), low pH (40%), absent or exceed of FRC (82%), high iron (27%) and presence of E-coli (66%). Water qualities at taps can be maintained by operating treatment units following standard process, controlling chlorine and leakage control.



	Physical	Chemical	Biological	FRC	Total
Souce	82	94	43		89
Taps	78	81	44	18	70

3.2 Water Quality Data Summary (All 26 Towns)

Summary of Water Quality Test Result of Source Water in 25 Towns (n=148)

S. No.	Parameters	Units	NDWQS	% Pass NWQDS	Min	Max	Average
1	Color	Hazen	5	98	<5	35	5.4 *
2	Turbidity	NTU	5	81	<1	1842	22.0 *
3	Conductivity	µS/cm	1500	100	15	1066	411.7
4	TDS	mg/L	1000	100	9	632	245.6
5	Taste	-	N.O.	100	Normal	Normal	Normal
6	Odor	-	N.O.	100	Normal	Normal	Normal
7	pH	-	6.5-8.5	92	5.2	7.9	7.0
8	Temperature	^{O}C	-	-	20.5	27.6	25.5
9	Ammonia	mg/l	1.5	100	<0.01	0.58	0.09 *
10	Nitrite	mg/l	3	100	<0.02	0.57	0.03 *
11	Nitrate	mg/l	50	93	<0.02	106.5	11.7 *
12	Chloride	mg/l	250	100	<1	56.4	9.3 *
13	Cyanide	mg/l	0.07	100	<0.05	<0.05	-
14	Fluoride	mg/l	1.5	100	<0.02	1.3	0.24 *
15	Sulphate	mg/l	250	100	<5	26	5.6 *
16	Total Hardness	mg/l as CaCO3	500	100	4	488	177.4
17	Calcium	mg/l	200	100	0.8	123	44.9
18	Iron	mg/l	0.3	79	<0.01	8.89	0.41 *
19	Manganese	mg/l	0.2	86	<0.01	1.26	0.10*
20	Copper	mg/l	1	100	<0.01	0.07	0.01*
21	Zinc	mg/l	3	100	<0.01	2.8	0.05*
22	Chromium	mg/l	0.05	100	<0.05	<0.05	-
23	Cadmium	mg/l	0.003	100	<0.002	<0.002	-
24	Lead	mg/l	0.01	100	<0.01	<0.01	-
25	Aluminum	mg/l	0.2	96	<0.01	6.28	0.08*
26	Arsenic	mg/l	0.05	100	<0.005	0.013	0.005*
27	Mercury	mg/l	0.001	100	<0.001	<0.001	-
28	E. Coli	CFU/100ml	Nil	53	Nil	300	19.6

** The value includes below or above quantification limit*

Summary of Water Quality Test Result of Tap Water in 25 Towns (n=125)

S. No.	Parameters	Units	NDWQS	% Pass NWQDS	Min	Max	Average
1	Color	Hazen	5	99	<5	10	5.0*
2	Turbidity	NTU	5	84	<1	50	3.9*
3	pH	-	6.5-8.5	97	5.6	8.3	7.2
4	Temperature	^{0}C	-	-	20.5	31.6	25.8
5	FRC	mg/l	0.1-0.2	10	0	1.0	0.04
6	Ammonia	mg/l	1.5	98	<0.02	8.1	0.2*
7	Nitrite	mg/l	3	99	<0.02	5.02	0.06*
8	Nitrate	mg/l	50	98	<0.02	63.4	4.08*
9	Iron	mg/l	0.3	90	<0.01	2.2	0.16*
10	Arsenic	mg/l	0.05	100	<0.005	<0.005	-
11	Fluoride	mg/l	0.5	100	<0.02	1.35	0.36*
12	E. Coli	CFU/100ml	Nil	45	Nil	>300	28.9*

** The value includes below or above quantification limit*

The critical parameters in the result of water quality test of tap water in 25 towns are E. Coli and FRC which met NDWQS only 45% and 10% respectively. Turbidity is relatively lower than other parameters as 84% met NDWQS.

Summary of Water Quality Test Result of Source Water in Kathmandu Valley (n=21)

S. No.	Parameters	Units	NDWQS	% Pass NWQDS	Min	Max	Average
1	Color	Hazen	5	52	<5	70	15.0*
2	Turbidity	NTU	5	33	<1	124	24.3*
3	Conductivity	µS/cm	1500	100	10	1061	209.7
4	TDS	mg/L	1000	100	6	647	127.7
5	Taste	-	N.O.	100	Normal	Normal	Normal
6	Odor	-	N.O.	100	Normal	Normal	Normal
7	pH	-	6.5-8.5	67	6.1	6.9	6.6
8	Temperature	^{O}C	-	100	16.8	24.6	22.8
9	Ammonia	mg/l	1.5	62	<0.02	52.8	4.63*
10	Nitrite	mg/l	3	100	<0.02	0.07	0.02
11	Nitrate	mg/l	50	100	<0.02	2.5	0.6
12	Chloride	mg/l	250	100	<1	10.9	3.2
13	Cyanide	mg/l	0.07	100	<0.05	<0.05	-
14	Fluoride	mg/l	1.5	100	<0.02	0.96	0.21
15	Sulphate	mg/l	250	100	<5	<5	-
16	Total Hardness	mg/l as CaCO3	500	100	8	246	79.8
17	Calcium	mg/l	200	100	1.6	59.2	20.8
18	Iron	mg/l	0.3	43	<0.01	9.9	1.67
19	Manganese	mg/l	0.2	86	<0.01	0.89	0.11
20	Copper	mg/l	1	100	<0.01	0.09	0.02
21	Zinc	mg/l	3	100	<0.01	0.3	0.03
22	Chromium	mg/l	0.05	100	<0.05	0.05	0.05
23	Cadmium	mg/l	0.003	100	<0.002	<0.002	-
24	Lead	mg/l	0.01	100	<0.01	<0.01	-
25	Aluminum	mg/l	0.2	100	<0.01	0.13	0.02
26	Arsenic	mg/l	0.05	95	<0.005	0.075	0.008
27	Mercury	mg/l	0.001	100	<0.001	<0.001	-
28	E. Coli	CFU/100ml	Nil	43	Nil	300	69.5

** The value includes below or above quantification limit*

Summary of Water Quality Test Result of Tap Water in Kathmandu Valley (N=103)

S. No.	Parameters	Units	NDWQS	% Pass NWQDS	Min	Max	Average
1	Color	Hazen	5	91	<5	50	6.3*
2	Turbidity	NTU	5	62	<1	112	10.8*
3	pH	-	6.5-8.5	60	5.8	7.6	6.6
4	Temperature	^{0}C	-	100	19.7	27.8	23.5
5	FRC	mg/l	0.1-0.2	18	0	1.2	0.1
6	Ammonia	mg/l	1.5	89	<0.02	45.8	1.30*
7	Nitrite	mg/l	3	98	<0.02	15	0.34*
8	Nitrate	mg/l	50	99	<0.02	176.5	4.24*
9	Iron	mg/l	0.3	73	<0.01	9.7	0.49*
10	E. Coli	CFU/100ml	Nil	44	Nil	300	61.7

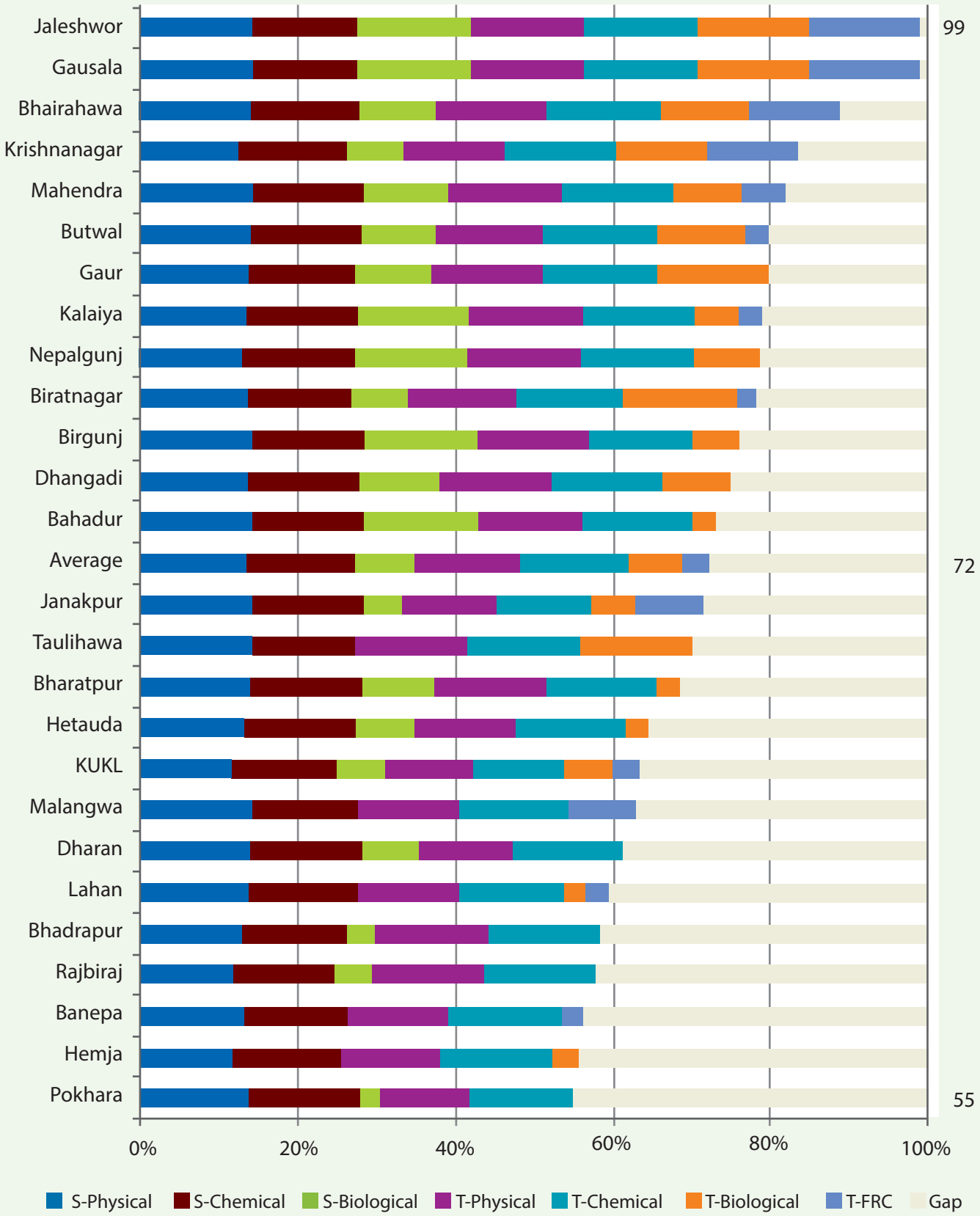
** The value includes below or above quantification limit*

The critical parameters in the result of water quality test of tap water in Kathmandu valley is clearly found in above table that E. Coli and FRC met NDWQS only 44% and 18% respectively. Turbidity is relatively higher as 62% met NDWSQ and pH is found lower in Kathmandu valley. Iron is also higher in Kathmandu valley as 73% met NDWSQ while 90% of sample met NDWQS in 25 towns.

Water Quality test result and sources and taps Data indicated % of sample passing standard

S.N	Towns	Source samples					Tap samples					
		No.	Physical	Chemical	Biological	All	No.	Physical	Chemical	Biological	FRC	All
1	Bhadrapur	4	91	93	25	90	5	100	100	0	0	83
2	Biratnagar	10	96	93	50	92	5	95	97	100	20	90
3	Dharan	8	98	99	50	97	5	85	97	0	0	77
4	Rajbiraj	3	83	89	33	86	5	100	100	0	0	83
5	Lahan	5	98	96	0	93	5	90	93	20	20	80
6	Janakpur	3	100	100	33	98	5	85	83	40	20	78
7	Jaleswor	2	100	95	100	96	5	100	100	100	0	100
8	Gausala	1	100	95	100	96	5	100	100	100	40	100
9	Malangwa	2	100	95	0	93	5	90	97	0	0	83
10	Gaur	3	96	96	67	95	5	100	100	100	0	92
11	Kalaiya	2	94	100	100	98	5	100	100	60	0	88
12	Birgunj	6	100	100	100	100	5	100	93	40	0	83
13	Hetauda	17	93	99	53	96	5	90	97	20	0	80
14	Bharatpur	24	98	98	67	97	5	100	97	20	0	83
15	Pokhara	11	97	100	18	96	6	79	92	0	0	72
16	Hemja	2	81	97	0	89	4	88	100	25	0	81
17	Bhairahawa	6	98	98	67	97	5	100	100	80	60	97
18	Butwal	15	99	98	67	97	5	95	100	80	20	90
19	Taulihawa	2	100	92	0	91	5	100	100	100	0	92
20	Bahadur	1	100	100	100	100	5	95	97	0	0	82
21	Krishnanagar	2	88	97	50	93	5	90	100	80	60	93
22	Nepalgunj	3	92	100	100	98	5	100	100	60	0	88
23	Dhangadi	7	96	98	71	97	5	100	100	60	0	88
24	Mahendra	4	100	100	75	99	5	100	100	60	20	92
25	Banepa	5	93	93	0	89	5	90	100	0	0	82
26	Kathmandu	21	82	94	43	89	103	78	81	44	18	70
	Total/Average	**169**	**95**	**97**	**53**	**95**	**228**	**94**	**97**	**46**	**11**	**86**

WQ changes from source to taps



In overall number of parameters meeting standard in all sources and all taps varies from 55% to 99% with average value of 72%

3.3 Parameters not met standard at sources and taps (All 26 towns)

Result on 25 towns

S.N	Towns	Source No (S/G)	Parameter not meeting standard					WQ Monitoring
			Physical, Chemical (Sources)	Physical, Chemical (Taps)	E-Coli (S)	E-Coli (T)	FRC	
1	Bhadrapur	0/4	C(1), Tu(2),Fe(4),Mn(1)		3	5	5	Yes
2	Biratnagar	0/10	Tu(3),Fe(5),Mn(9)	Tu(1),Fe(1)	5	0	4	Yes
3	Dharan	3/5	Tu(1),Fe(1)	Tu(3),Fe(1)	4	5	5	Yes
4	Rajbiraj	0/3	C(1),Tu(3),Fe(3), Mn(3)		2	5	5	Yes
5	Lahan	0/5	Tu(1), Fe(1),Mn(3)	Tu(2), Fe(1)	5	4	4	
6	Janakpur	0/3		NH3(2), NO2(1), Fe(1)	2	3	4	
7	Jaleswor	0/2	Fe(2)		0	0	5	
8	Gaushala	0/1	Al(1)		0	0	3	
9	Malangwa	0/2	Fe(2)	Tu(2), Fe(1)	2	5	5	
10	Gaur	0/3	Fe(1), Mn(1)		1	0	5	
11	Kalaiya	0/2	Tu(1)		0	2	5	
12	Birgunj	0/6		Fe(2)	0	3	5	
13	Hetauda	4/13		pH(2), NO3(1)	8	4	5	Yes
14	Bharatpur	0/24	Tu(1),pH(1), No3(1), Fe(2)	NO3(1)	8	4	5	Yes
15	Pokhara	6/5	Tu(3), Fe(1)	Tu(5),Fe(3)	9	6	6	Yes
16	Hemja	2/0	Tu(1),PH(2),Fe(1)	pH(2)	2	3	4	
17	Bhairahawa	0/6	Tu(1),Fe(1), Al(1)		2	1	2	Yes
18	Butwal	2/13	Tu(1),Fe(1)	Tu(1)	5	1	4	Yes
19	Taulihawa	0/2	Fe(1),Mn(1), As(1)		2	0	5	Yes
20	Bahadurgunj	0/1			0	5	5	Yes
21	Krishnanagar	0/2	Tu(2)Fe(1)	Tu(2)	1	1	2	Yes
22	Nepalgunj	0/3	Tu(1)		0	2	5	
23	Dhangadi	0/7	C(1),Tu(1),Fe(1), Mn(1		2	2	5	Yes
24	Mahendranagar	0/4			1	2	4	Yes
25	Banepa	5/0	Tu(3), Fe(2), Mn(1), Al(4)	Tu(2)	5	5	5	
	Total	**22/126**	**89**	**37**	**69**	**68**	**112**	**14**

Note: S=source, T=Taps

Result on Kathmandu Valley

S.N	Towns	Source No (S/G)	Tap No	Parameter not meeting standard					WQ Monitoring
				Physical, Chemical (Sources)	Physical, Chemical (Taps)	E-Coli (S)	E-Coli (T)	FRC	
26	Kathmandu	9/12	103	Color(10), Tu(14), pH(7), NH3(8) Fe(12), Mn(3), As(1) and E-coli(12)	Color(9), Tu(39), pH(41), FRC(84),NH3(11), NO2(2), NO3(1), Fe(28)	12	58	84	Yes

3.4 Strategic plan for improving water qualities

- Test all sources for full parameters mentioned in NDWQS and identify potential parameters exceeding national standards
- Design appropriate source conservation, protection of surface sources to reduce potential hazards
- Install appropriate protective platform in all tube wells.
- Install appropriate water treatment plant for controlling parameters exceeding national standards after conservation and protection.
- Maintain water distribution networks; reduce leakages and cross contamination to stop further contamination in the networks.
- Apply chlorine in an appropriate dosing based on demand and maintain FRC within limits (0.1-0.3ppm) in all area of networks. Make a plan for reducing chlorine loss at network by cleaning the pipes, zoning and reducing water age or injecting chlorine on line as required.
- Monitor water qualities in various zones regularly to reduce water quality parameters meeting standard at all taps.
- Design sampling points at various points of the distribution area
- Establish mini laboratories for necessary water quality monitoring.
- Verify the sample test for the samples which exceeds the standard regularly.
- Establish WSP team and apply WSP for continuous safety of water supply with support of diverse groups of users.

CHAPTER 4: CONSUMER SURVEY

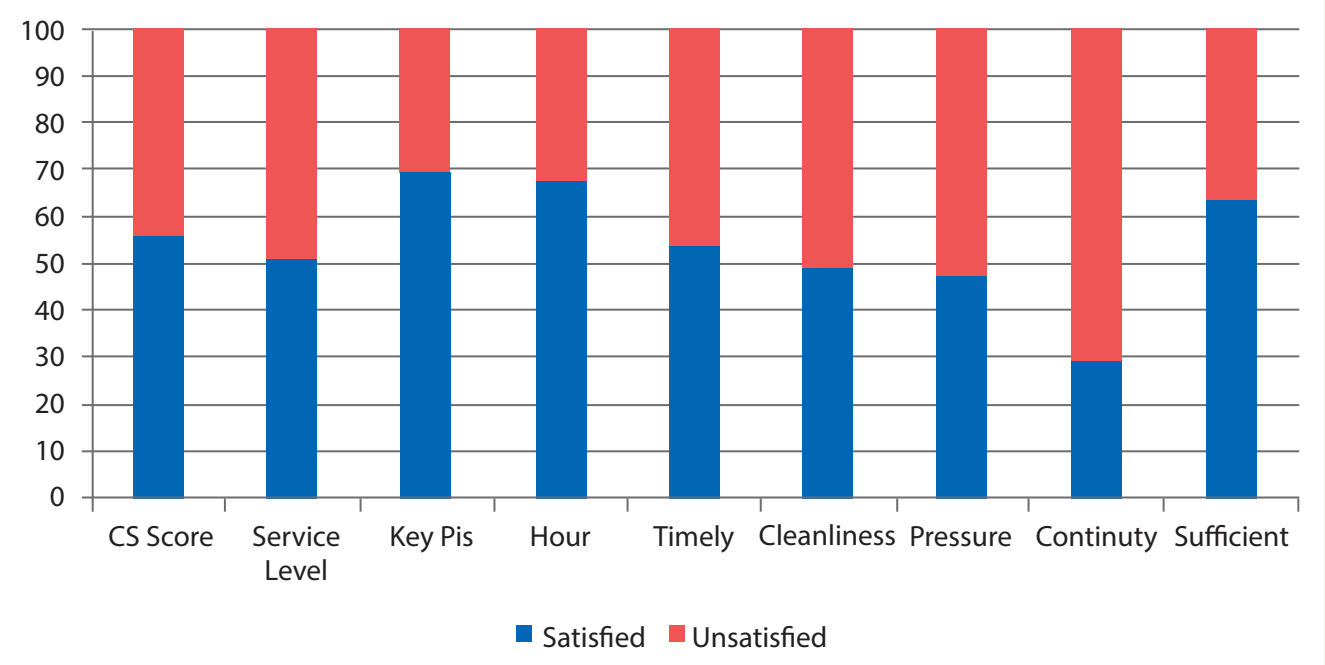
4.1 Key Findings

Users satisfaction survey was carried out during the assessment visit considering 12 questions relating to service level realized by users and the responses of WSPs. Data collection work was done by local people studying in local college. Service area divided into five clusters and 10 households covered in each cluster. There is no system for any kind of consumer survey in the area covered by this assessment. WSPs found the result of the survey very informative and good to conduct on a regular basis. The users satisfaction score was given based on percentage of users

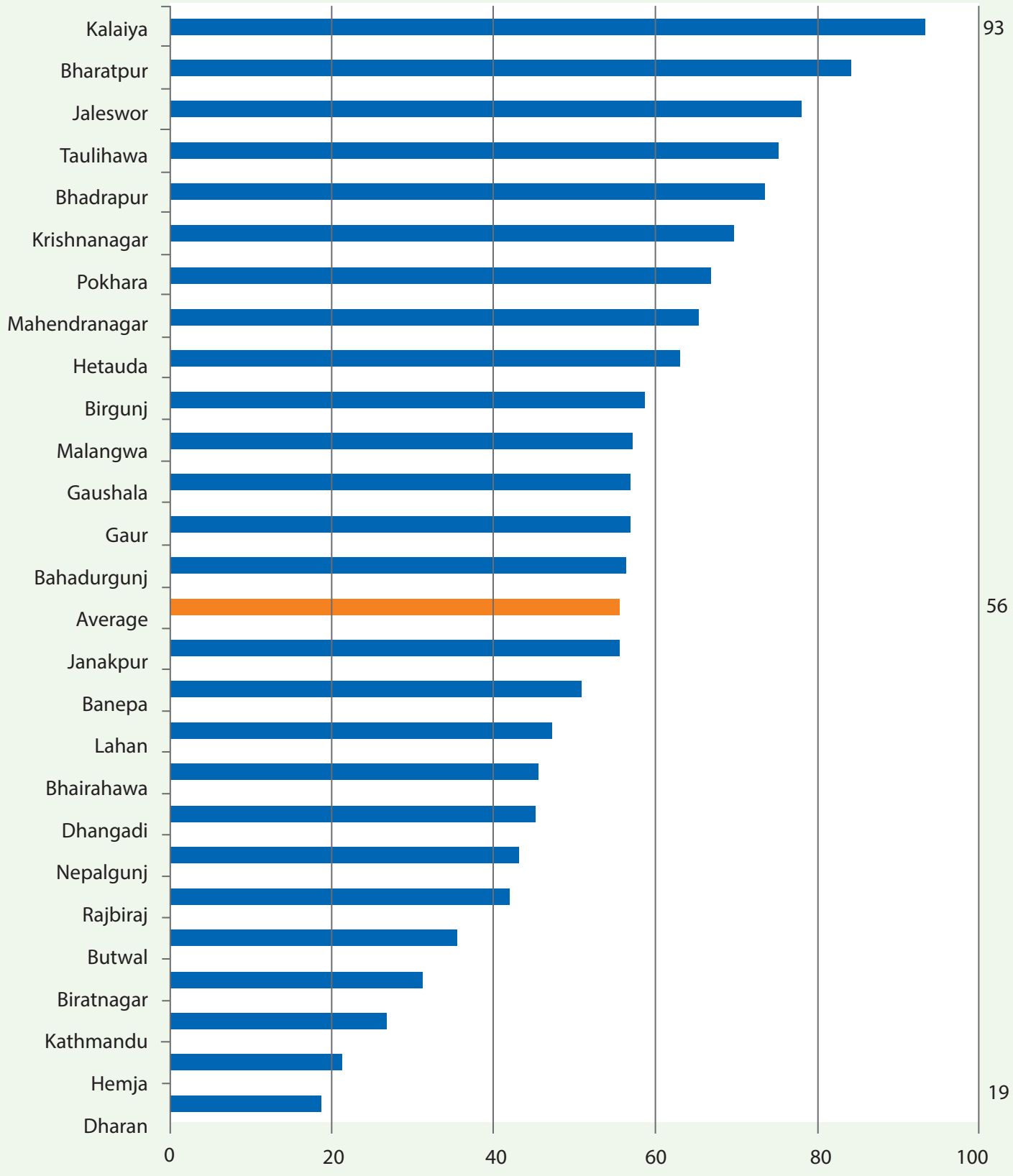
Consumer survey (CS) score: based on Timely supply, Cleanliness, fit for direct use, Address to complaints, sufficiency. Maximum satisfaction is 93% and minimum 19 % with average 56 %.

Service level: based on supply hours (at least 8 hours), Timely (always on time), Cleanliness (always), Pressure (up to first floor), Continuity (every day), Sufficient (always). Maximum service level is 90% and minimum 19 % with average 51 %.

Generally, scores for key PIs exceeded the one for service level. WSP with higher PIs could not satisfy the users. Larger WSPs have lower service level.



4.2 Town Wise Comparison of Consumer Satisfaction



4.3 Strategy for improving consumer satisfaction or service level

For improving consumers satisfaction or service level WSP can adopt the following strategy as one of its regular functions.

1.1 Conduct consumer survey regularly at least two times in a year covering various clusters. Analyze the result and view the situation cluster wise and make plans for improvement.

2.1 Form a users group in the various clusters as a medium to communicate and take their support.

3.1 Carry out a regular field investigation survey and identify a situation relating to pressure, cleanliness, supply time flow and link with supply time, source water quality and problems is networks. Link result of consumer survey with finding of investigation.

4.1 Keep water supply hours up to 8 hours.

5.1 Regulate water supply time. Take care of area where water supply time varies with supply schedule. Adopt a zoning system if necessary.

6.1 Continue WQ monitoring and control chlorine use so that water in all taps flow clean and safe.

7.1 Conduct leakage detection and control mechanism based on standard process and solve leakage problems based on priority.

8.1 Maintain consumer complaint management systematically and address critical problem on time. Inform the people for the problem which is beyond the capacity of the WSP of need support of users.

9.1 Make sure that required flow is maintained in all taps, water sufficient (about 100 LPCD).

10.1 Make sure that the water pressure is sufficient to flow water up to the first floor or higher level.

11.1 Make sure that interruption in the water supply is minimum even less than five days in a year.

12.1 Establish consumer education unit. Educate the people for water conservation, water reuse and help WSP for conservation of sources and networks.

13.1 Make sure that people have no or minimum level of diarrheal cases and water is not the reason for the diarrhea. Inform people to adopt alternate methods of treatment in case system is unable to provide safe water for the time being.

Annex A: Benchmarking data form

1. Institutional Information

	Name of Water Service Provider (WSP)		Type	
	Data year			
	Short Name		Telephone Number	
	District		Municipality	
	Office location: Municipality(Ward)			
	Service Area (Wards)			
	URL Address (Website)			
	E-mail Address			
	Name of Manager			
	Office Establishment Year		Operation Year	
	Utility Registration Year		Source Registration Year	
	Reports and documents available: * (0) None (1) Non Recorded (2) Recorded (3) Computerized			
	Revenue Expenses statement*		SOP*	
	Production*		WSP*	
	Water Sales*		Tap*	
	Billing*		System Map*	
	Complaints*		Network*	
	Water Qualities*		Leakage*	
	Office: Latitude		Longitude	
	Financial sources			
	Remarks:			

Note: Type of WSP: WSMB, NWSC, WUSC, Others

2. Staff Information

	Staff category	***Permanent***	***Contract/Temp***	***Total***
1	Management (Manager, Admin, A/C)			
2	Revenue collection/Ledger			
3	Office assistance			
4	Operators (Source)			
5	Operators (WTP)			
6	Operators at networks			
7	Meter readers			
	Total administrative (1-3)			
	Total Technical (4-7)			
	Total			
	Remarks:			

Key contact persons

	Name	*Position Title*	*Mobile No.*
1		Manager	
2		A/C	
3		Admin	
4		Production	
5		Distribution	

3. System Descriptions

A	**Water Sources (functioning only)**			
	Source Name	***Type (Spring, Stream, GW)***	***Flow (LPS)***	***Pump Operation hour***
B	**Water Treatment Units**			
	Type	***No. of Units***		***Capacity LPS (LPD)***
	Aeration			
	Plain Sedimentation			
	Roughing Filter			
	Flocculation			
	Slow Sand Filter			
	Rapid Sand filter			
	Pressure filter			
	Chlorination units			
C	**Storage**			
	Type	***No. of Units***	***Type***	***Capacity CUM***
D	**Pipe network**			
	Segment	***Length(KM)***	***Sizes(mm)***	***Material(DI,GI,CI,HDPE)***
	Transmission line			
	Primary distribution			
	Distribution networks			
	Total			
E	**Others (Generator)**			
	System improved the FY			

Note: Add rows for additional sources.

4. Coverage and Service Connections

	Service area(Km2)		Area covered by waste water (%)	
	Population served by WS		Population of service area	
	No. of Connections		Coverage (%)	
	Public		Private	
	Institutional		Commercial	
	Bulk connections		No of HH served	
	Metered connections		Unmetered connections	
	No of Connection in FY		No of disconnection in FY	
	Optional water sources			
	Total taps before 5 years		Total taps before 10 years	
	Remarks (Basis for data relating to the connections, HH served, service area and plan for extension)			

5. Customer Service

	Wet season supply hours		Dry season Supply hours	
	Supply time			
	Minimum pressure (m)		Maximum pressure (m)	
	Ground(0 m) %		First floor (5) %	
	Second floor (10 m) %		Third or above (15 m) %	
	Satisfied users based on survey (%)		Number of leaks per year	
	Number of complaints/ year		Number of "No water day"	
	Cases of diarrhea (%)			
	Remarks *(Process to receive complaints and corrections and plan for users satisfaction)*			

6. Water Production, Consumption and Loss

	Production unit		***Type (SW,GW)***	***Production (m3/day)****
	Total production			
	Consumption (Metered)		Population served	
	Consumption (unmetered)		Percentage metered	
	Total Consumption (sold)		NRW %	
	LPCD produced		LPCD Consumed	
Remarks (Basis for estimation of production, consumption and water loss)				
*Note: *Production can be measured based on pumping/ tank or bulk meter in outflow from tank or WTP*				

7. Water Qualities

No of sample tested (source)		No of Test after WTP	
No of sample tested at Taps (Physicochemical)		No meeting Standard	
No of sample tested at Taps (Bacteriological)		No meeting Standard	
No of sample tested at Taps (FRC)		No meeting standard	
Type of laboratories and available WQ test facilities on site			
Parameters exceeding standard at source			
Parameters exceeding standard after treatment			
Is WSP in place(Yes/No/In process)			
Chlorine use(regular, mostly, sometimes, no)			
Remarks (plan to control water qualities. How chlorine is applied)			

8. Revenue and expenses

	Expense type	Annual expense (NRs.)	%
	Personnel (salary, allowance, bonus etc)		
	Power/Fuel (for WS system)		
	Chemicals and materials		
	Repair and maintenance		
	Administrative (Office running)		
	Others		
	Total operation cost		
	Capital development cost		

	Revenue type	Annual Revenue (NRs.)	%
	Water sales (Billing)		
	Collections from water sales		
	Connections		
	Others		
	Total (Revenue collected)		
	Collection Ratio (Water sales/water billing)		

Water Tariff Structure/Rate for ½" connection

SN	Units ('000 liters)	Metered Connection (NRs/unit)	Un-metered Connection (NRs	Community taps (NRs/unit)
	Connection charge			

Annex B: Data calculation methods

1. Water Coverage

1.1. Definition

Water Coverage = Population with access to water services /Total population under service area of utility)*100

1.2. Method of calculation

Population with access to water services:

Households covered by water services* Household size (Average number of family number)

Household covered by water services:

Household covered by private taps (same as number of private taps) + Number of Household covered by public tap (Number of public taps*Households covered by one public taps in average)

(If the Household size is different in different zones/wards weighted average size should be calculated.

Total population under service area:

This is total population of the all wards (of VDC and Municipalities) where pipe networks are available for the connections or WSP is mandated to provide services.

1.3. Example

Example: Coverage calculation

Coverage data can be calculated by population as well as household

Collected data:

Area covered by a water supply system: ward no 1-3, 6 and 7 out of 9 wards of a VDC

Total households in the service area= 5000

Number of connections (Private)= 3900Number of connections (Public)= 10

Average Household covered by one public tap=10

Calculation:

Total Household covered by public and private taps= 3900+10*10= 4000

Coverage=4000/5000*100=80%

If the average Household size=6

Population with access to water services= No of Household* Household size= 4000*6=24000

2. Staff Ratio

2.1. Definition of Staff Ratio

(Total number of staff/(number of water connections)*1000

2.2. Method of calculations

Total number of staff:

Total number of staff may vary from beginning to end of the year. Number of staff that is in place at the end of the year is taken. Number of staff under various categories is divided according to their assignment till end of the year.

Number of water connections:

Number of connections varies from beginning of end of the year. Number of connections that is in place at the end of the year is taken. Hence, number of connection for any data year is number of connections at the beginning of the year plus number of new connections minus number of disconnections.

2.3. Example

Example: Staff ratio

Collected data:

Number of recorded connections at the beginning of the data year = 3510

Number new connections in the data year= 500

Number of disconnection in the data year= 10

Calculation:

Hence, number of connections for data year= 3510+500-10=4000

Number staff for data year=30

Staff Ratio= 30/4000*1000=7.

3. Metered Ratio

3.1. Definition of metered ratio

(Total number of connections with an operating meter/total number of connections)*100

3.2. Method of calculation

Total number of connections with meter:

Total number of Private, Institution or public taps with operating meters and charged as metered tap. If the meters are not functioning temporarily or unmetered charge has not been applied it is stilled counted as connection with meter.

Unmetered taps:

Private public or other taps without meter and charged as unmetered (fix rate) charge

Example: Metered ratio

Collected data:

Total connections=4000

Metered connections=3800

Unmetered connections=4000-3800=200

Calculation:

Metered Ratio= Metered connections/Total connections= 3800/4000= 0.95

4(a). Water Production Rate

4(a).1. Definition of Water Production Rate

Average daily water supplied to the distribution system/total population covered by water service (Note: Production is the water collected and supplied to the system with or without treatment)

4(a).2. Method of calculation

Population with access to water services: *As defined before*

Average daily production:

Production based on supply form the source: Production may vary over the year. Average daily production can be derived from average of 12 months. Production can be measured based on flow from the source indicated by flow meter. If there is no flow meter or not function then production can be derived based established flow rate and pumping hours supported by log book.

Production based on supply: Supply can be measured based on reading of bulk meter. If there is no flow meter at supply line then production can be based on established flow rate, supply hours or variation in tank level supported by log book or schedule.

Average daily production of one year = (P1+P2+----P12)/30/12 (Pi= average monthly production)

4(a).3. Example

Example1: Three wells in operation with different flow rate and pumping time production			
Source	**Rate(lpm)**	**Pumping hours**	**Flow(m3/day) (Rate*hours*60)/1000**
Well1	1200	12	864
Well2	1080	10	648
Well3	900	4	216
Total production(m3/day)			**1728**

Example2: if there are six surface sources with varied flow during dry and wet seasons. Assuming dry and wet period is 6 months.			
Source	**Wet season flow (m3/day)**	**Dry season flow (m3/day)**	**Average flow (Dry+Wet)/2 (m3/day)**
Stream 1	432	259.2	345.6
Stream 2	432	216	324
Stream 3	259.2	129.6	194.4
Stream 4	259.2	172.8	216
Stream 5	216	229.6	222.8
Stream 6	518.4	432	475.2
Total (m3/day)	**2116.8**	**1439.2**	**1778**

Assume Population with access to water services is 24000
Water production rate=average daily production/Population served=1778*1000/24000= 74 LPCD (Liter per capita per day)

4(b).Water consumption Rate

4(b).1. Definition of Water Consumption (Use) Rate

Average daily water used /Population with access to water services

4(b).2. Method of calculation

Population with access to water services: *As defined before*

Average daily water consumption or water used:

Water consumption of metered tap can be derived from meter ledger. If meter reading data has not been compiled then average monthly unit consumption can be derived based on data of randomly selected pages of various ledger books. Alternately average unit of consumption can be derived based on tariff billed. This may give higher value than actual consumed because unit consumption below minimum unit also charged tariff for minimum units. Dividing monthly units by 30 gives daily average consumption.

If there are none meter taps and public taps with none meter certain factors can be assumed based on study and situation for calculating consumptions from these taps.

4(b).3. Example

Example1: Water consumption based on meter reading
Collected data and assumptions:

Average unit consumption=11 units/month/taps
Consumption in unmetered taps =1.5 times (assumption)
Consumption in public tap=2 times (assumption)
Number of total taps= 4010 (including 10 public taps)
Number of metered taps= 3800
Number of unmetered taps= 4010-3800- 10=200
New taps connected in the data year= 500

Calculation:

Average metered tap= total metered –new taps/2= 3800-500/2=3550

Consumption from metered tap= 3550*11/30=1302m3/day

Estimated consumption from unmetered taps=200*11*1.5/30=110m3/day

Estimated consumption from public taps= 10*11*2/30=7.3 m3/day

Total consumption= 1302+110+7.3=1420m3/day (1,420MLD)

Consumption Rate= Daily average consumption/total population served= 1420*1000/24000= 59 LPCD

Example2: Water consumption based on tariff (Billing)

Consumption of water can be indirectly derived from water billing.

Collected data:

Total water billing of the year= Rs 9,100,000

Tariff billing from non-meter=Rs 560/month

Revenue billing from 200non-meter taps= 560*200*12=Rs1,344,000

Revenue billing from public tap=0

Calculation:

Revenue billing from metered tap=9,100,000-1,344,000=Rs 7,756,000

Revenue billing from one tap(metered) per month=7,756,000/3800/12=Rs 170

If minimum tariff is Rs 100 for 10 units and Rs 25/unit, then equivalent units for monthly average tariff of Rs 170= 10+(170-100)/25= 12.8 m3/month/taps(connection)

Daily consumption/capita = monthly consumption per connection/30 days/size of household =12.8*1000/30/6=71 LPCD

Here average units based on tariff billing is more than average units based on unit consumptions because some taps consuming less than minimum units (10) is also considered also pay for 10 units.

5. Non-revenue Water (NRW)

5.1. Definition of NRW

(Average daily water production - average daily water consumption (billing))/average daily water production*100

5.2. Method of calculation

NRW represents difference between productions and consumptions. Accuracy of NRW depends on accuracy of production and consumption data. NRW mainly represents water loss at pipes and illegal use at user's level.

5.3. Example

Example: NRW calculation

Collected data:

Production=1778 m3/day

Consumption=1420 m3/day

Calculation:

NRW=(1778-1420)/1778*100=20%

6. Production Cost

6.1. Definition of Production Cost

Annual operational cost/average daily water production (m3)/365

6.2. Method of calculation

Annual operation cost:

Operating cost includes actual expenses of operation budget in one year of the system. System development cost does not include. Operating cost can be divided into six parts: Personnel, Chemicals, Energy, maintenance, Admin and others

Average daily water production:

As defined before

6.3. Example

Example: *Production cost*

Collected data:

Average daily production= 1778 m3/day

Example operation cost

Personnel: 5,000,000

Chemicals: 500,000

Energy: 500,000

Maintenance: 1,000,000

Admin: 500,000

Other costs: 0

Total Operation Cost= Rs 7,500,000

Calculation:

Production cost=(Yearly operation cost/ 365)/daily production
=7,500,000/365/ 1778= Rs 11/m3 (Rs 11/unit)

7. Operating Ratio

7.1. Definition of Operating Ratio

Annual operational cost/ Annual sales revenue (water Billing)

7.2. Method of calculation

Annual operation cost:
As defined before
Annual sales revenue (water billing):
For analysis only revenue from water billing is used.

7.3. Example

Example: Operating Ratio:

Operating expenses=Rs7,500,000
Revenue from water (Billing)= 9,100,000
Operating Ratio= 7,500,000/9,100,000=0.82

8. Collection Ratio

8.1. Definition of Collection Ratio

Annual tariff collection/ Annual Billing

8.2. Method of calculation

Annual tariff collection:

Total revenue collected (cash) - revenue other than water billing

Operating cost:

As defined before

8.3. Example

Example: Collection ratio

Collected data:

Revenue from water (Billing)= Rs9,100,000
Revenue collected from connection and other sources: Rs 900,000
Total revenue (cash) collected: Rs9,300,000

Calculation:

Collection from water billing= total revenue collected-other collections
= 9,300,000-900,000=8,600,000
Collection ratio= Collection/water billing= 8,600,000/9,100,000= 0.95 (95%)

9. Service Hours

9.1. Definition of Service Hours

Average hours of service per day from water supply

9.2. Method of calculation

Average service hours:

Service hours may be uniform or different in the various service zones. If it varies, then weighted (by connections) or simple average value should be derived. If water not supplied every day then average supply per day should be calculated

9.3. Example

Example: Service hours

Collected data:

Total taps covered= 4000 (zone A 3200, zone B 800)

Supply hours in zone A= 8 hours/ 7days

Supply in zone 2 is 4 hours/3 days

Calculation:

Average supply hours considering size of zones= (8*3200+4*3/7*800)/4000 = 6.7 hours

Average supply hours without considering size of zones=(8+4*3/7)/2= 4.8

If the supply in the zone B is 4 hours/7 days then simple average= (8+4)/2= 6 hours

10. Water Quality Compliance

10.1. Definition of Water Quality Compliance

(Number of sample meeting standard/ Number of samples tested from supply point)*100

10.2. Method of calculation

Number of samples tested from supply point:

This represents samples taken from taps. Number of samples can vary on size of system.

Number of sample samples meeting standard:

This represents number sample meeting current national standard in all parameters tested.
If the sample has been categorized as Physio-chemical or Biological or FRC average percentage is taken

Annex C: Improvement plan format

(This is format for WSPs for preparing improvement plan)

Mission Statement:

Key performance Indicators

SN	Name	Value in 2071/72	Value in 2072/73	Target 2073/74	Target 2075/76	Current Scores (%)
1	Staff Ratio(Staff/1000 taps)					
2	NRW (%) (Production – Water use (%)					
3	Production Rate (LPCD)					
4	Supply Hours (Hours/day)					
5	Water Quality Passed (%) (Meeting standard at taps)					
6	Coverage by supply (%) Population served /Population in service area/					
7	Production cost (NRs/m3 Produced)					
8	Operating Ratio (Operation cost/ Revenue from water sales)					
9	Collection Ratio (Collection/ Water billing)					
10	Metered Tap, % (Metered Taps/Total Taps)					

Strategic actions for maintaining or improving current PIs

SN	Improvement areas	Strategic actions
1	Plan for reducing staff ration	
2	Plan for reducing NRW	
3	Plan for increasing production rate	
4	Plan for increasing supply hours	
5	Plan for improving water qualities	
6	Plan for increasing service coverage	
7	Plan for reducing production cost	
8	Plan for reducing operating ratio	
9	Plan for increasing collection ratio n	
10	Plan for increasing metered taps	

Annex D: Consumer Survey Forms

Capacity assessment and Benchmarking (Consumer survey questions)

Town: ***Locations:*** ***Surveyor:***

SN	Question / HH No	1	2	3	4	5	6	7	8	9	10
	Municipality/Wards										
1	Hours of supply										
2	Reliability of supply hour (Most of time (1) Some tie (2), Never(3))										
3	Water quality Safe(1), mostly safe(2), mostly unsafe(3), not safe(4))										
4	How to use water for drinking: Direct (1), Boil (2) Filter (3), Chlorination (4) Others (5)										
5	Diarrhea cased in family in Year in one year										
6	Pressure: Ground(0), First(1), Second(2)										
7	Water use (LPCD)										
8	Water reuse (%)										
9	Complain response: timely(1), Late(2), Never(3)										
10	No water day/year										
11	Water Sufficiency: Always(1), Some time(2) Never(3)										
12	Payment : Regular(1), Fine(2), none(3)										

Note: Team will identify one surveyor at local level. Surveyor will make team of 2-3 person.

Consultant team will orient local team and demonstrate the survey

Local team will divide in to several locations and carry out survey up to 50 HH

Local team will summarize the data and provided to the consultant team and present the observation and experiences.

Annex E: Summary of improvement cost for existing facility

S.N.	Name of Town	Pipe Replacement (Million NRs.)	Other improvement cost** (Million NRs.)	Total cost (Million NRs.)
1	Bhadrapur	60.0	1.8	61.8
2	Biratnagar	210.0	22.3	232.3
3	Dharan	180.0	20.8	200.8
4	Rajbiraj	13.0	2.1	15.1
5	Lahan	14.0	0.7	14.7
6	Janakpur	10.0	2.1	12.4
7	Jaleshwar	5.0	1.8	6.8
8	Gaushala	7.5	1.4	8.9
9	Malangwa	12.0	1.9	13.9
10	Gaur	13.5	2.9	16.4
11	Kalaiya	90.0	3.2	93.2
12	Birgunj	600.0	8.0	608.0
13	Hetauda	240.0	97.9	337.9
14	Bharatpur	1,000.0	4.4	1,004.1
15	Hemja	960.0	3.2	963.2
16	Butwal	294.0	21.4	315.4
17	Bhairahwa	42.0	6.4	48.4
18	Taulihawa	30.0	6.3	36.3
19	Bahadurgunj	24.0	4.3	28.3
20	Krishnanagar	24.0	1.1	25.1
21	Nepalgunj	150.0	3.5	153.5
22	Dhangadhi	240.0	25.4	265.4
23	Mahendranagar	18.0	6.0	24.0
Total		**4,237.0**	**248.7**	**4,485.7**