

The Water and Sanitation Millennium Development Targets in Nepal:



What do they mean?
What will they cost?
Can Nepal meet them?



WaterAid/ Jim Holmes

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Acronyms

ADB	Asian Development Bank
BCHIMES	Between Census Household Information, Monitoring and Evaluation System
CBS	Central Bureau of Statistics
DFID	Department for International Development
DWSS	Department of Water Supply and Sewerage
ECOSAN	Ecological Sanitation
GWSSA	Global Water Supply and Sanitation Assessment
HH	House Hold
HMG/N	His Majesty's Government of Nepal
IRDP	Integrated Rural Development Project
IWT	Improved Water Technology
JAKPAS	Janta ko afno Khaney Pani ra Sar-Safai (People's Water and Sanitation Project)
JBIC	Japanese Bank for International Cooperation
MDG(s)	Millennium Development Goal(s)
MDT(s)	Millennium Development Target(s)
MDTR	Millennium Development Target-Rural
MDTU	Millennium Development Target-Urban
MICS	Multiple Indicator Cluster Surveillance
MoF	Ministry of Finance
NDHS	Nepal Demographic and Health Survey
NEWAH	Nepal Water for Health
NFHS	Nepal Family Health Survey
NGO(s)	Non-Governmental Organisation(s)
NLSS	Nepal Living Standards Survey
NMIS	Nepal Multiple Indicator Surveillance
NORAD	Norwegian Agency for Development Cooperation
NWSC	Nepal Water Supply Corporation

OPEC	Organization of Petroleum Exporting Countries
PH	Primary Health
PF	Pour Flush
PRSP	Poverty Reduction Strategy Paper
RWSSFDB	Rural Water Supply and Sanitation Fund Development Board
RWSSSP	Rural Water Supply and Sanitation Fund Development Project
SRDWSP	Support to Rural Drinking water and Sanitation Programme
TA	Technical Assistance
UNICEF	United Nations Children's Fund
VDC	Village Development Committee
WA	WaterAid
WAN	WaterAid Nepal
WATSAN	Water and Sanitation
WECS	Water and Energy Commission Secretariat
WHO	World Health Organisation

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Preface

WaterAid welcomes the global commitment to the realization of Millennium Development Goals (MDGs) in water and sanitation and intends to make it a core element in its fifteen country programmes. This research Report, which explores the detailed implications of the MDGs for Nepal on water and sanitation, is seen as a first step in moving the MDGs from paper to concerted action to enhance improved access on water and sanitation, and to thereby contribute to lasting behaviour change. Progress towards the water supply and sanitation MDGs will contribute to other goals as well. For instance, safe water and good sanitation directly contribute to better health. Good health augments education. And education contributes to better health. In other words, interventions that promote one goal directly/indirectly impact on other goals.

This Report is an attempt to support MDG commitment of Nepal by calculating the additional number of households to be served and resources required to meet the targets, comparing these requirements with available resources and calculating the resource gap. To reach the sanitation target, an additional 14,000 households need to be served per month between 2000 and 2015, and an additional 11,300 households need to be served per month to reach the drinking water target. The total financial requirement to meet these targets is US\$ 1,087 million and the resource availability for 2000 to 2015 is \$755 million, resulting in an annual resource gap of \$23 million.

Realizing MDG targets is primarily a national responsibility. The Government, however, cannot achieve the target alone and, therefore, would need support of donor communities. Role of civil society including NGOs is critically important to foster people's participation, voice and influence.

First drafted in 2001 by Alan Etherington, the then Country Representative and James Wicken, Research Co-ordinator of WaterAid Nepal as a background document while preparing for the WaterAid Nepal Country Strategy, this Report has been further refined with contributions by Rabin Lal Shrestha, Research and Advocacy Manager in 2003-04. Its methodology and findings have been presented and debated at various meetings in Nepal and elsewhere, and inputs and comments have been incorporated.

Water Aid Nepal hopes that this study will be useful for:

- Water and sanitation agencies, both government and non governmental;
- Organisations working on other MDGs, which are directly or indirectly related to the water and sanitation MDGs; and
- Local government organisations and local NGOs.

WaterAid Nepal believes that the report provides an independent and analytical perspective on the water and sanitation coverage, the Millennium Development Targets and the resource gap for Nepal. The targets presented in the Report are not just numbers to be achieved but, more importantly, it is about people who lack basic water and sanitation services. Sector stakeholders, therefore, have both responsibility and obligations towards those people so that they have improved access to safe water and good sanitation services closer to their dwellings and, as result, they also can live a dignified life as citizens of Nepal.

WaterAid Nepal welcomes feedback, discussion and suggestions on this Report.

Sanjaya Adhikary

Country Representative

WaterAid Nepal

Executive Summary

Nepal is a signatory to the Millennium Development Goals, these include:

- The Millennium Development Target of halving by 2015 the proportion of people without access to safe drinking water in 1990 (signed at Stockholm in 2000); and
- The Millennium Development Target of halving by 2015 the proportion of people without access to hygienic sanitation in 1990 (signed at Johannesburg in September 2002).

This paper is an attempt to support this commitment by posing the following questions:

- What was the coverage of water and sanitation in 1990?
- What progress has been made in coverage since 1990?
- What is the coverage required in 2015 to meet the MDTs?
- How many additional households are to be served with drinking water to meet the MDT?
- How many additional toilets are to be constructed to meet the MDT?
- What resources are required to meet the water and sanitation MDTs?
- What resources are available in the water and sanitation sector?
- What is the resource gap?

To answer these questions, we use a methodology which proceeds through the following steps:

1. Division of Nepal into Water Supply and Sanitation technology zones
2. Estimation of population in 1990, 2000 and 2015 divided by WATSAN zones
3. Estimation of coverage in 1990 and 2000 based on data smoothing of multiple estimates
4. Presentation of the MDTs
5. Calculation of the additional number of people to be served to reach the MDTs
6. Estimation of current, planned and required resources
7. Calculation of the resource gap

Answering these questions is a challenging task due to data limitations both in terms of availability and comparability. Problems with available data include:

- Variable trends over time
- Some data on water supply define coverage as use of an improved source, others as an improved source within a reasonable distance and collection time

- Different sampling methodologies and sample sizes.
- MDTs are computed only at the national level but not disaggregated by rural and urban
- Coverage estimated by comparing investment and per capita costs are not consistent with the coverage reported in the national sanitation policy and census

Data smoothing is required to deal with these inconsistencies. After this process, the regression-smoothed data culminates in adjustments to the 1990 base year data and thus the 2015 targets. The adjusted data provides not only a smooth trend but are also consistent with the level of investment and per capita expenditure.

The adjusted figures compared with government figures are as follows:

TABLE I: Drinking Water and Sanitation coverage in percent -HMG and WAN estimates

Drinking Water						
Year	1990 baseline Year		2000		2015 target year	
	HMG/DWSS	WAN estimate	Census	WAN estimate	HMG*	WAN estimate
Rural	33	25	81	42	67	63
Urban	67	70	89	78	84	85
National	36	30	82	48	68	66

Sanitation						
Year	1990 baseline Year		2000		2015 target year	
	HMG/DWSS	WAN estimate	Census	WAN estimate	HMG*	WAN estimate
Rural	3	12	41	19	52	56
Urban	34	60	78	67	67	75
National	6	18	47	27	53	59

Note: * Estimate is based on HMG/DWSS 1990 baseline year coverage

The differences between HMG and WAN data arise largely because WAN's definition of water coverage includes a fifteen minutes time for the return journey (go, wait, collect, return) while most official data use only access to improved technology. If definitions are blended, then the following profile of access to water is obtained.

TABLE II: A profile of water coverage blending Census and WAN estimates for 2000

Area	% coverage of access to Improved Water Technology (IWT)		% coverage of access to IWT	% with no access to IWT
	Within 15 minutes (WAN estimate)	Beyond 15 minutes	Census estimate	
	A	B	C (=A+B)	D(=100-C)
Rural	42	39	81	19
Urban	78	11	89	11
National	48	34	82	18

The above table have following important implications:

1. The national MDG target for water coverage is 66%- requiring a growth of 18 percentage points (66%-48%=18%) additional coverage between the years 2000 to 2015.
2. In order to meet the MDT (to serve another 18% of the population) one or more of the following strategies is required:

- Provide services to the 18% (Table II, column D), who have no access to improved water source
- Provide additional services to the 34% (Table II, column B), who already have access to improved source but beyond the fifteen minutes time
- Identify an appropriate mix of the above two.

Using the WAN estimates, the additional number of households to be served per month between 2000 and 2015 to meet the MDT compared with the performance during the 1990's is as follows:

TABLE III: Additional number of households to be served per month to meet water and sanitation MDT and required % increase over the last decade (WAN estimate)

Area	Additional households to be served per month between 2000 and 2015		Additional households actually served per month between 1990 and 2000		% increase in performance required 2000-2015 compared with performance achieved 1990 - 2000	
	Drinking water	Sanitation	Drinking water	Sanitation	Drinking water	Sanitation
Rural	7,028	9,822	6,236	2,654	13	270
Urban	4,340	3,855	1,655	1,425	162	171
National	11,368	13,677	7,891	4,079	44	235

The MDT for rural drinking water can be achieved with only a small scaling up of activity (13%) while the 3 other targets will require significant expansion (162 - 270%).

Resource Requirement

The total financial resource requirement to meet the drinking water MDT is \$936 million (rural/sub urban = \$360 million and urban = \$576 million). The total resource requirement for the sanitation MDT is \$163 million (\$130 million for rural and \$33 million for urban). Total required resources for both water and sanitation is \$1,099 million

Resource Availability

Total resource availability, for 2000 to 2015 drawing from data in economic surveys and other government sources is estimated \$ 681 million for water and \$ 74 million for sanitation. Total resource availability is \$ 755 million for water and sanitation sector.

Resource Gap

The total resource gap for water is \$255 million and for sanitation \$89 million. Per annum resource gap is \$17 million for water and \$6 million for sanitation. Total annual resource gap for water and sanitation is \$23 million (\$22 million in rural and \$ 1 million in urban). However, if Kathmandu water supply reforms and Melamchi tunnel is excluded, total annual resource gap will be \$55 million (\$ 22 million in rural and \$ 33 million in urban).

From National to Local Level Targets

Nepal faces a big challenge to reach the MDTs both in meeting the number of people to be covered and mobilising the financial resources. However, if the MDTs are localised, water services must be provided to an additional 2 households every month per VDC in rural areas and to 6 households per ward in municipalities. For sanitation the figure is 5 toilets per VDC per month and 6 per ward per month in municipalities.

Next Steps

This study is done in a data-constrained environment requiring the use of "best estimates". We invite professionals and organisations to provide additional information and feed back on our methodology and results for further improvement.

Introduction

Nepal is a signatory to the Millennium Development Goals, these include:

- The Millennium Development Target of halving by 2015 the proportion of people without access to safe drinking water in 1990 (signed at Stockholm in 2000); and
- The Millennium Development Target of halving by 2015 the proportion of people without access to hygienic sanitation in 1990 (signed at Johannesburg in September 2002).

These declarations raise the following questions for Nepal:

- What was water and sanitation coverage in 1990?
- What coverage is needed to meet the Millennium Development Targets in rural and urban areas?
- How many additional households need to be served per annum/month to meet the MDTs in rural and urban area?
- What is the amount of resources required by technology types for rural and urban areas?
- What is the amount of resources available?
- What is the annual resource gap?
- Can MDTs be achieved and what are the implications if MDTs are localised?

This study is a modest attempt to address these issues. It is hoped that the study findings and approaches will be useful for the following audiences:

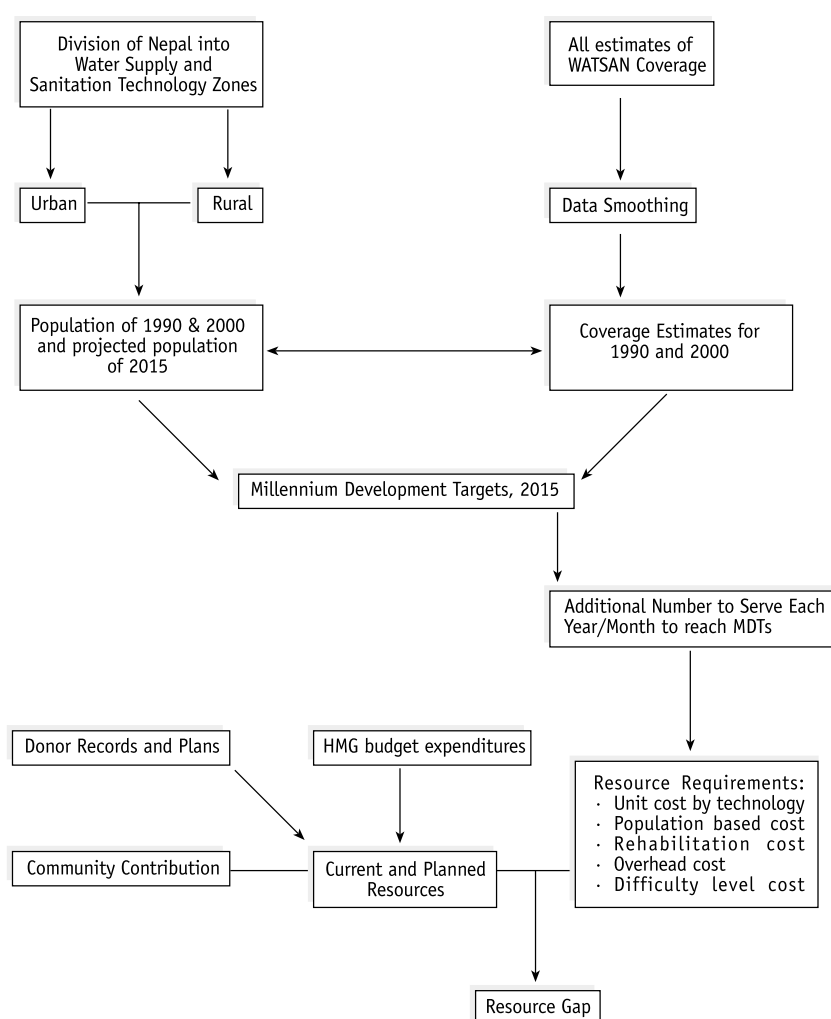
- Water and sanitation agencies, both government and non governments as well as water and sanitation professionals;
- Organisations working on other MDGs which are directly or indirectly related to the water and sanitation MDGs;
- Local level government organisations and local NGOs.



Methodology

2.1 Study Framework:

The various steps involved in this calculation are as follows:



2.2 Methodological Issues:

As the MDG period is from 1990 to 2015, we are now able to assess progress to an approximate mid point and see what changes are required between first and second halves, if the MDTs are to be achieved. We do this by using 2001 Census data and other sources to estimate the rates of change between 1990 and 2001, and comparing these with the rates required for the period to 2015.

Because of the wide variations in estimated coverage, we also include an exercise which compares the total W&S sector investment with these different coverage estimates and present the implied average cost per additional person covered.

2.2.1 Coverage:

National estimates hide a wide discrepancy between rural and urban coverage and hence must be separately computed. Data from different surveys are not comparable due to differences in definition, survey design and estimation processes. This problem is minimised through regression smoothening and adjustment for water coverage within 15 minutes distance using the NMIS data as the basis (Annex 3).

2.2.2 Resource requirement:

Calculation of the resource requirement for rural and urban areas requires the following factors to be considered:

- Population to be served
- Per capita cost
- Population based cost
- Rehabilitation cost
- Overhead cost
- Difficulty level cost
- Community contribution

These factors are computed for each technology type of drinking water and sanitation.

Available data suggest that per capita costs for gravity flow schemes vary wide amongst different organisations and a middle value has been used.

2.2.3 Resource availability:

Expenditure on water and sanitation is compiled from various economic surveys and other financial reports of the 1980's, 1990's, and 2000 to 2003. The surveys also show the share of total external resource expenditure allocated to drinking water and sanitation. There is a huge gap between resource commitment and disbursement from HMG and donors (Table 2.1).

TABLE 2.1: Estimated HMG Budget Versus Actual Expenditure in Drinking Water and Sanitation (NRs in Million)

Year	Budget Allocation to WATSAN	Actual Expenditure on WATSAN	Actual Expenditure as % of allocation
1994/95	1,481	1,112	75
1995/96	1,971	1,217	62
1996/97	2,335	1,338	57
1997/98	2,269	1,681	74
1998/99	2,710	1,879	69
1999/2000	2,792	2,436	87
2000/01	3,864	2,422	63
2001/02	4,004	1,915	48
Total	21,426	14,001	65

Source: HMG Economic Surveys

The availability of external resources for the period 2000 to 2015 is estimated from the Foreign Aided Development Projects in Nepal, 2003.

The following assumptions are used to disaggregate resource availability in water and sanitation and reflect HMGN's policy decision that rural watsan projects should increase the proportion allocated to sanitation from 12% to 20%.

TABLE 2.2: Criteria for Estimate of Resource Availability in Water and Sanitation

	Expenditure on water as % of total water and sanitation expenditure		Expenditure on sanitation as % of total water and sanitation expenditure	
	Rural	Urban	Rural	Urban
Decade 1990's	88	92	12	8
Year 2000 to 2004	88	92	12	8
Year 2005 to 2015	80	92	20	8

2.2.4 Resource gap:

The resource gap is defined as the difference between the resource requirement and available resource at the national level.

2.2.5 Limitations:

The study has following limitations:

- There is only one source (NMIS 1996) for estimating water access within 15 minutes.
- Further allowance for arsenic contamination and increased use of drilled tube wells may be necessary.
- Further adjustments may be required to provide safe and adequate volume of water.



WATSAN Coverage Estimation and Millennium Development Targets

3.1 Total Population:

During the 1990-2015 period, the total population will increase by 70%, and the urban population will increase by 280%. Total population of Nepal was 18.1 million in 1990 and is projected to reach 30.7 million by 2015. In 1990, urban population was nearly 10%, which is expected to rise to 22% by 2015 and to 27% by 2021. (CBS Population Projection, 2004)

TABLE 3.1: Population by Year and Rural/Urban

Year	Population in Millions			% urban population
	National	Rural	Urban	
1990	18.1	16.3	1.8	10.0
2000	22.7	19.7	3.0	13.2
2015	30.7	23.9	6.8	22.1

Source: CBS, 2001

3.2 Population Distribution by Water and Sanitation Technology Zones:

No data exist on population by water and sanitation technology zone. Best estimates of proportion of population in 2015 by water technology zone are made using Hill, Tarai and rural/urban census information (Table 3.2).

TABLE 3.2: WAN Best Estimates of Proportion of Population by Water Technology Zone in 2015

Area	Water Technology Zone	% of Population
Rural	Shallow tube Well	36
	Deep Tube Well	11
Rural/sub Urban	Gravity Flow	54
Rural and sub urban Total		100
Urban	Small Towns	54
	Kathmandu Valley	46
Urban Total		100

Similarly the proportion of population living in different sanitation technology zones is estimated in (Table 3.3).

TABLE 3.3: WAN Best Estimates of Proportion of Population by Sanitation Technology Zone in 2015

Region	Sanitation Technology zone	% of Population
Rural Hill	Single Direct Pit	10
	Single Pit offset latrine	10
	Double Pit offset latrine	10
	VIP Latrine	70
Rural Hill Total		100
Rural Tarai	PF Single Pit	45
	PF Double Pit	45
	ECOSAN	1
	Septic Tank with soak pit	9
Rural Tarai Total		100
Semi Urban	PF Single Pit	44
	PF Double Pit	45
	ECOSAN	1
	Septic Tank with soak pit	10
Semi Urban Total		100
Urban	PF Single Pit	25
	PF Double Pit	25
	Septic Tank with soak pit	35
	Latrine with sewer connection	15
Total		100

3.3 Estimates of Water and Sanitation Coverage:

Estimates of coverage are produced from five different sources:

1. DWSS: Estimates of coverage based on the accumulated totals of design population of water projects funded through DWSS.
2. National Planning Commission (NPC): Central Bureau of Statistics (CBS) estimates coverage on water and sanitation in the Nepal Multiple Indicator Surveillance (NMIS), Nepal Living Standard Survey (NLSS) and BCHIMES 2000. NPC has made it mandatory that any survey under CBS shall incorporate water and sanitation components as an indicator of poverty reduction strategy. Water and Energy Commission Secretariat (WECS) under NPC also estimates water and sanitation coverage based on survey and HMG progress reports. These are not as scientific as those of CBS.
3. Surveys under Ministry of Health: Ministry of Health estimates water and sanitation coverage under Nepal Family Health Survey/Nepal Demographic Health survey based on statistical methods of a household survey.
4. Census Sample Survey: CBS for the first time in 2001 included a water and sanitation coverage estimation using census sampling technique.
5. Local government also reports water and sanitation coverage in their district periodic plans, based on their local experience and reporting.

3.4 Drinking Water Survey Data:

Different approaches by different agencies produce a wide variation of estimates. As an example, in 1990 (the baseline year for MDTs) DWSS estimated national water coverage to be 36%, whereas UNICEF, also using government data, estimated 63% (Table 3.4).

TABLE 3.4: Survey Estimates on % Drinking Water Coverage 1990 - 2000

Year	Source	Rural	Urban	National
1990	Department of Water Supply and Sanitation	33	67	36
1990	The State of World's Children-UNICEF	60	88	63
1991	Nepal Family Health Survey	43	90	46
1991	The State of World's Children-UNICEF	43	90	46
1991	Water Energy Communion Secretariat (WECS)	39.2	66.5	41.7
1992	WECS/NPC	42	64	44
1993	WECS/NPC	44.9	64	46.7
1994	WECS/NPC	48.7	64.3	50.4
1994	COWATER /ADB	-	-	52
1995	WECS/NPC	60	70	61
1996	Demographic Health Survey	61	85	63
1996	Nepal Living Standards Survey	69	96	70
1997	WECS/NPC	63.7	64.2	63.8
1997	World Bank	59	61	59
1997	HMG/N Achievement of 8th Plan by 1997	61	62	61
1998	WECS/NPC	61.1	66.2	66.1
1998	The State of World's Children-UNICEF	68	93	71
1999	WECS/NPC	66	66	66
1999	The State of World's Children-UNICEF	80	85	81
2000	DFID-Addressing the Water Crisis	60	88	63
2000	Global Water Supply and Sanitation Assessment, Assessment Report (GWSSA)	80	85	81
2000	The State of World's Children-UNICEF, 2004	87	94	88
2000	BCHIMES/UNICEF	78	92	80
2001	Census 2001	81	89	82
2001	PRSP/10th Plan-achievement at the end of 9th plan	-	-	72

3.5 Sanitation Survey Data:

The problem of data inconsistency also applies to sanitation. Nepal State of Sanitation report (Colombo resolution) presents sanitation coverage to be only 6% in 1990 against 20% reported by GWSSA/UNICEF/WHO for the same year (Table 3.5)

TABLE 3.5: Survey Estimates of Sanitation Coverage from 1990 - 2001

Year	Source	Rural	Urban	National
1990	Colombo Resolution (Nepal State of Sanitation Report)	3	34	6
1990	GWSSA, Assessment Report	15	68	20
1991	Nepal Family Health Survey	16.3	69.8	21.2
1995	The State of World's Children-UNICEF, 1996 (for the period 1990-95)	16	70	21
1996	Colombo Resolution (Nepal State of Sanitation Report)	16	51	20
1996	Demographic Health Survey	24.7	79.9	30.5
1996	Nepal Living Standards Survey	17.7	73.7	23.8
1996	The State of World's Children-UNICEF, 1997 (for the period 1990-96)	12	58	18
1997	HMG/N Achievement of 8th Plan	16	51	20
1998	The State of World's Children-UNICEF, 2000 (for the period 1990-98)	14	28	16
1999	The State of World's Children-UNICEF, 20001	20	75	27
2000	DFID-Addressing the Water Crisis	18	63	23
2000	GWSSA, Assessment Report	20	75	27
2000	The State of World's Children-UNICEF, 2004	28	73	22
2000	BCHIMES/UNICEF	27.1	74.7	29
2001	Census	40.8	78.1	46.8
2001	PRSP/10th FYP- achievement at the end of 9th plan	21	53	25

There are four different estimates for the year 1996

- In rural areas, UNICEF reports 12 % while the Demographic Health Survey reports 25%.
- In urban areas, Nepal State of Sanitation Report estimates 51% coverage against 80% coverage reported by Demographic Health survey.

3.6 The Impact of Different Estimates

Inconsistencies in data have two results:

1. Poor targeting have been overly ambitious (e.g. 100% water coverage by 2002, set in 1997) and others overly modest (e.g. 85% water coverage by 2007, only a 3% increase over the census estimate of 82% in 2001)
2. A pattern of selecting whichever data suits a particular purpose - probably a low estimate to attract funds and a high value to account for donor support.

3.7 An Explanation of Different Estimates:

3.7.1 Different methods:

Different surveys have used different methodologies and only a few of them are robust, using a proper sampling method and adequate sample size required to estimate water and sanitation coverage. In our view, a proper design for a WATSAN sample survey would need

- " consideration of water supply technology zones and sanitation options
- " stratification by rural/urban and development regions and
- " a minimum sample of approximately 16,000 households. A summary of different surveys together with our comment on the method of each is displayed in Table 3.6

TABLE 3.6: Comments on the Methodologies used for Different Water and Sanitation Coverage Studies

Source	Year Published	Referred Year	Methods used	Definition of Water and Sanitation Coverage Used	WAN Comments
Nepal Family Health Survey	1991	1990	24,475 married women aged 15-49 using three stage in rural and two stage in urban	Not Available (N/A)	<ul style="list-style-type: none"> • Does not define coverage as reasonable access • Sample size is good • Definition not clear
NMIS Third Cycle/UNICEF	1996	1995	36 districts, 144 clusters of size 120 HH and 17,227 households covered	Piped water, hand-pump, borehole or spring water within 10 minutes distance	<ul style="list-style-type: none"> • Cluster formation is a problem • sample size is good
Nepal Living Standard Survey	1996	1995	73 districts, Two stage stratified sampling, 275 wards and 3,388 HHs covered	Piped in or outside house, and covered well	<ul style="list-style-type: none"> • Sample size is too small • Does not include reasonable access
Nepal Family Health Survey	1996	1996	8,086 ever married women of ages 15-49	N/A	<ul style="list-style-type: none"> • Sample size too small
DWSS/WAN	2001	2000	Visits to communities in 22 hills districts	Existing Schemes coverage	<ul style="list-style-type: none"> • Hills only covered
Nepal Demographic Health Survey	2001	2000	8,600 HH Survey	N/A	<ul style="list-style-type: none"> • Sample size too small
BCHIMES/UNICEF	2001	2000	69 districts, cluster sampling with average cluster size 50 HH, 10,500 HH covered	Piped and tube well	<ul style="list-style-type: none"> • Sample size is reasonable • Problem with cluster formation
Census 2001	2001	2001	20% sample survey of the whole Nepalese population (834,891 HH survey)	Piped and tube well	<ul style="list-style-type: none"> • Very good coverage but definition does not specify reasonable access
DFID-Addressing the water crisis	2000	N/A	Based on reports of water point schemes	Existing schemes coverage	<ul style="list-style-type: none"> • Statistical methods not clear
The State of World's Children	1996-2001	1990-2000	Based on various publications	UNICEF/WHO/MICS definition but not clear	<ul style="list-style-type: none"> • Uncritical use of Government data

3.7.2 Different definitions:

Definitions used in Nepal surveys differ by:

1. Reference to a minimum collection time and
2. Definition of improved technologies.

NMIS and the BCHIMES measure water coverage by improved technology and by time to fetch water, others just use of an improved technology without any consideration of the time required to collect water. This is a very significant factor and greatly determines the extent of water stress.

NMIS Third Cycle uses piped water, hand-pump, and borehole or spring water within 15 minutes distance as a protected and improved source. Nepal Living Standard Survey uses piped water in or outside house and covered well as improved water source. Census and BCHIMES on the other hand restricts improved source to piped and tube well. DWSS survey uses existing schemes coverage.

Moreover, none of the surveys refer to the international standard definition of adequate water supply. According to the international standard, piped systems should not be considered functioning unless they were operating at over 50% capacity on daily basis; and that hand pumps should not be considered functioning unless they were operating for at least 70% of the time with a lag between breakdown and repair not exceeding two weeks (GWSSA, 2000). Strictly applying this definition to Kathmandu, for example would mean that coverage would decline from about 90% to less than 20%.

3.8 Making Adjustments for Variation in Estimations:

The implication of these methodological inadequacies is that the drinking water and sanitation coverage estimates reported in various surveys require smoothing. This is done using regression analysis and adjusted for water fetching time and percent coverage as reported in NMIS and BCHIMES (Annex 3). The smoothed values of water and sanitation coverage are as follows and are what WAN uses for subsequent calculations.

TABLE 3.7: Regression Smoothed Estimates of Water and Sanitation Coverage 1990 and 2000 and Adjusted MDT 2015

Year	1990	2000	2015 (MDT)
Drinking water coverage in %			
Rural	25	42	63
Urban	70	78	85
National	30	48	65
Sanitation coverage in %			
Rural	12	19	56
Urban	60	67	80
National	18	27	59

When these data 2000 are blended with official data then this results in the water coverage profile presented in table 3.8.

TABLE 3.8 A: Profile of Water Coverage in year 2000 Blending Census and WAN Estimates

Area	% coverage of Access to Improved Water Technology (IWT)		Total % coverage of Access to Improved Water Technology	% coverage with no access to IWT
	Within 15 minutes time	Beyond 15 minutes time	Census estimate	
	A	B	C (=A+B)	D(=100-C)
Rural	42	39	81	19
Urban	78	11	89	11
National	48	34	82	18

The national MDG target for water is thus 66% - a growth of 18% between the years 2000 to 2015. In order to meet the MDT (to achieve 18% growth), one of the following strategies can be considered:

- Provide services to those 18% (Table 3.8, column D) who have no access to improved water source
- Provide additional service to reduce the water fetching time to 15 minutes for those 34% (column B) who already have access to improved source, but beyond fifteen minutes
- Identify an appropriate mix of these two strategies.

3.9 Coverage and Expenditure:

3.9.1 Comparing increased coverage and expenditure in drinking water:

Data smoothing is also necessary to produce a realistic reconstruction of the increase in coverage and matching this with expenditure (discussed below in section 6).

TABLE 3.9: Per Capita Actual Expenditure Based on HMG Estimates of National Water Coverage

FY	National Water coverage based on DWSS and Census in %	Water expenditure		Actual Pop covered on DWSS/census estimate (Million)	Additional incremental annual population served based on DWSS (Million)	Per capita expenditure based on DWSS estimates	
		(Rs in Million)	(\$ in Million)			Rs	\$
1990/91	36	476	18	6.5	-		
1991/92	40.6	1,178	28	7.5	1	1,157	27
1992/93	45.2	1,607	32	8.6	1.1	1,516	31
1993/94	49.8	948	19	9.7	1.1	860	18
1994/95	54.4	978	19	10.8	1.1	855	17
1995/96	59	1,071	19	12	1.2	903	16
1996/97	63.6	1,177	21	13.3	1.2	958	17
1997/98	68.2	1,480	22	14.5	1.3	1,165	17
1998/99	72.8	1,654	24	15.8	1.3	1,260	18
1999/00	77.4	2,144	30	17.2	1.4	1,583	22
2000/01	82	2,132	28	18.6	1.4	1,527	20
Average cost						1210	17

Using official estimates, average cost per additional person covered during the 1990-2001 period is only Rs.1,210/\$ 17 (Table 3.9)

Using WAN estimates of coverage, the per capita cost is Rs.2750/\$38 for the same period, which seems to be more realistic (Table 3.10)

TABLE 3.10: Per Capita Real Expenditure Based on WAN Estimates of National Water Coverage

FY	National water coverage estimate in % WAN	Water expenditure (Rs in Million)	Pop served on WAN estimate (Million)	Additional incremental annual pop served based on WAN estimate (Million)	Per capita expenditure on WAN estimate	
					Rs	\$
1990/91	30	476	5.4	-		
1991/92	31.7	1,178	5.9	0.5	2,603	61
1992/93	33.4	1,607	6.4	0.5	3,433	69
1993/94	35.1	948	6.8	0.5	1,960	40
1994/95	36.8	978	7.3	0.5	1,959	38
1995/96	38.5	1,071	7.8	0.5	2,081	37
1996/97	40.2	1,177	8.4	0.5	2,220	39
1997/98	41.9	1,480	8.9	0.5	2,712	40
1998/99	43.6	1,654	9.5	0.6	2,947	43
1999/00	45.3	2,144	10.1	0.6	3,717	52
2000/01	47.5	2,132	10.8	0.7	3,021	40
Average cost					2750	38

If it is agreed that this cost is more reasonable, then this provides additional justification for the adjusted coverage data.

3.9.2 Comparing coverage and expenditure in sanitation:

Repeating the same calculation for sanitation, yields per capita cost of only \$ 3 using official data, but \$ 10 using smoothed data (Table 3.11 and 3.12). Again this seems more realistic, and supports the data adjustments.

TABLE 3.11: Per Capita Real Expenditure Budget Based on HMG Estimates of National Sanitation Coverage

FY	Sanitation coverage based on HMG	Sanitation Budget	Pop served on HMG estimate	Additional pop served based on HMG estimate	Per capita expenditure on HMG estimates	
	%	(Million)	(Million)	(Million)	Rs	\$
1990/91	6	65	1.1	-		
1991/92	10.1	161	1.9	0.8	204	5
1992/93	14.2	219	2.7	0.8	265	5
1993/94	18.3	129	3.6	0.9	150	3
1994/95	22.4	133	4.5	0.9	148	3
1995/96	26.5	146	5.4	0.9	156	3
1996/97	30.6	161	6.4	1.0	165	3
1997/98	34.7	202	7.4	1.0	199	3
1998/99	38.8	225	8.4	1.1	215	3
1999/00	42.9	292	9.5	1.1	269	4
2000/01	47.0	291	10.7	1.1	265	4
Average cost					211	3

TABLE 3.12: Per Capita Real Expenditure Budget Based on HMG and WAN Estimates of National Sanitation Coverage

FY	WAN sanitation estimate	Sanitation Budget	Pop served on WAN estimate	Additional pop served based on WAN estimate	Per capita expenditure on WAN estimate	
	%	(Rs. in Million)	(Million)	(Million)	Rs	\$
1990/91	18	65	3.3	-		
1991/92	18.9	161	3.5	0.2	644	15
1992/93	19.8	219	3.8	0.3	851	17
1993/94	20.7	129	4.0	0.3	486	10
1994/95	21.6	133	4.3	0.3	487	10
1995/96	22.5	146	4.6	0.3	518	9
1996/97	23.4	161	4.9	0.3	553	10
1997/98	24.3	202	5.2	0.3	676	10
1998/99	25.2	225	5.5	0.3	735	11
1999/00	26.1	292	5.8	0.3	928	13
2000/01	27	291	6.1	0.3	970	13
Average cost					698	10



Millennium Development Targets

The Millennium Development Target is to halve the proportion of people without access to drinking water and sanitation in 1990 by the year 2015. Based on the smoothed WAN estimates, the MDT will hence be to reach to 63% in rural areas and 85% in urban areas for drinking water within the reasonable distance of 15 minutes. The corresponding figure for sanitation will be 56% in rural areas and 80% in urban areas.

4.1 Population to be Served to Meet the MDTs:

Combining both population growth and the adjusted estimates for coverage in 1990 and 2000 produces the following estimates:

4.1.1. Drinking water:

Nepal needs to serve an additional 11,300 households every month to meet the water MDG (urban = 4,300 and rural = 7,000). The additional number of households served every month between 1990 and 2000 is estimated at 7,891 (1,655 in urban areas and 6,236 in rural areas) (Table 4.1).

TABLE 4.1: Estimation of Monthly MDT in Drinking water

RURAL					
Year	Estimated/ Target served	Total rural population	Total Population served	Average HH Size	Total No. of HHs served/ to be served
	%	(Million)	(Million)		
1990	25	16.3	4.08	5.6	727,679
2000	42	19.68	8.27	5.6	1,476,000
2015 (target)	63	23.93	15.08	5.5	2,741,073
<ul style="list-style-type: none"> Estimated total number of households served between 1990 and 2000 Average number of households served per month between 1990 and 2000 Total Number of households to be served between 2000 and 2015 Average Number of households to be served per month between 2000 and 2015 					748,321 6,236 1,265,073 7,028

URBAN

Year	Estimated/ Target served	Total urban population	Total Population served	Average HH Size	Total No. of HHs served/ to be served
	%	(Million)	(Million)		
1990	70	1.8	1.26	5.4	233,333
2000	78	2.99	2.33	5.4	431,889
2015 (target)	85	6.85	5.82	4.8	1,213,021
<ul style="list-style-type: none"> Total Number of households served between 1990 and 2000 Average Number of HHs served per month between 1990 and 2000 Total Number of HHs to be served between 2000 and 2015 Average Number of HHs to be served per month between 2000 and 2015 					198,556 1,655 781,132 4,340

The implications of these estimates are:

1. The growth in rural water coverage required for 2000-2015 is 13% more than the progress made in the 1990's.
2. The required growth in water coverage in urban areas is 162% more compared to progress in the 1990's.
3. The required national growth in water coverage per month for 2000 - 2015 is 44% more than in the 1990's.

4.1.2 Sanitation:

Nepal needs to construct an additional 14,000 toilets (10,000 in rural areas and 4,000 in urban areas) per month between 2000 and 2015 to meet the sanitation MDT. The number of households to be served to meet the sanitation MDT is 20% higher than the number of households to be served to meet the water MDT. The number of toilets constructed per month in the 1990's decade was 2,650 in rural and 1,420 in urban. This implies that rural areas need to construct 270% and urban areas 170% more toilets per month during 2000 - 2015. (Table 4.2)

TABLE 4.2: Estimation of Monthly MDT in Sanitation

RURAL

Year	Estimated/ Target served	Total rural population	Total Population served	Average HH Size	Total Estimated No of Toilets
	%	(Million)	(Million)		
1990	12	16.3	1.96	5.6	349,286
2000	19	19.68	3.74	5.6	667,714
2015 (target)	56	23.93	13.64	5.5	2,435,732
<ul style="list-style-type: none"> Total number of toilets constructed between 1990 and 2000 Average number of toilets constructed per month between 1990 and 2000 Total number of toilets required to be constructed between 2000 and 2015 Average number of toilets required to construct per month between 2000 & 2015 					318,429 2,654 1,768,018 9,822

URBAN

Year	Estimated/ Target served	Total urban population	Total Population served	Average HH Size	Total Estimated No of Toilets
	%	(Million)	(Million)		
1990	60	1.8	1.08	5.4	200,000
2000	67	2.99	2.00	5.4	370,981
2015 (target)	75	6.85	5.14	4.8	1,070,313
<ul style="list-style-type: none"> Total number of toilets constructed between 1990 and 2000 Average number of toilets constructed per month between 1990 and 2000 Total number of toilets to be constructed between 2000 and 2015 Average number of toilets to be constructed per month between 2000 and 2015 Overall, the required national growth in sanitation for 2000 - 15 is 236% more than achieved in the monthly increases in 1990 - 99. 					170,981 1,425 699,331 3,885

Resource Requirement to Meet the Millennium Development Targets

5.1 Water Supply Technology Zones:

The country is divided into 5 zones based on water supply technologies used in these areas. (Table 5.1)

TABLE 5.1: Water Supply Technology Zones

Zone	Water supply technology	Estimated % of population in 2015
Rural		
Hills and mountains	Gravity flow schemes	54
Terai	Shallow tube well	35
Terai boulder zone	Deep tube well	11
Rural Total		100
Urban		
Kathmandu	Piped system; Melamchi tunnel	54
Small towns	Piped system	46
Urban Total		100

Resource requirements depend on agency, technology, population to be served in 2015, rehabilitation, overhead and difficulty. If the population trend from 1990 to 2000 is considered, population living in shallow tube well zone will be 41% and deep tube well zone will be 5% by 2015.

However, almost all 20 Tarai districts are recorded as Arsenic affected areas. The top ten Arsenic affected districts are Rauthat, Nawalparasi, Kailali, Kapilvastu, Bara, Parsa, Bardiya, Saptari, Rupandehi and Banke, where many shallow tube wells will need to be replaced by deep tube wells.

WAN therefore estimates that additional 6% of Tarai population will require a deep tube well to replace a shallow tube well by the year 2015. Hence, proportion of people living in shallow tube well zone is revised from 41% to 35% and deep tube from 5% to 11%. These figures imply that additional 86,000 households will move from shallow tube well to deep tube well in the period 2000 to 2015 (per annum shift = 5,700 and per annum per district shift =260 households)

5.2 Per Capita Cost of Gravity Flow Schemes by Different Agencies:

In a recent study of gravity flow projects per capita cost ranged from \$42 to \$48. The overall average per capita cost is \$45. (Table 5.2)

TABLE 5.2: Per Capita Cost of Various Gravity Flow Water Projects

	Fourth Rural Water Supply & Sanitation Project	Self-Reliant Drinking Water Support Programme	Rural Water Supply & Sanitation Fund Development Board
Study Period	1996-99	1994-99	1996-2000
Types of Scheme	GF	GF	GF
Total Actual Cost (in NRs'000)	422,606	91,069	417,655
Total Beneficiaries	119,555	26,827	135,061
Per Capita Cost (Rs)	3,535	3,395	3,092
Per capita (\$)	48	46	42

Source: Sharma, Koponen et al, 2004

5.3 Per Capita Cost by Water and Sanitation Technology:

Per capita cost requirements vary by the type of technology used. Per capita costs range from \$10 (rural shallow tube well) to the Kathmandu reforms (including the Melamchi tunnel) at \$312. Other unit costs are derived from the experience of WaterAid Nepal and its partner organisations.

The lowest sanitation cost is \$8 for single direct pit in rural hill and the highest cost is \$119 in urban area for a toilet with a septic tank and soak pit.

TABLE 5.3: Per Capita Cost of Various Water Technologies

Region	Water Technology Zone	Per capita technology cost in \$
Rural	Shallow tube well	10
	Deep Tube Well	45
Rural/Sub Urban	Gravity Flow	45
Urban	Small Towns	40
	Kathmandu	312

TABLE 5.4: Per Capita Cost by Sanitation Technology and Zone

Region	Sanitation Technology Zone	Per capita technology cost in \$
Rural Hill	Single Direct Pit	8
	Single Pit offset latrine	16
	Double Pit offset latrine	19
	VIP Latrine	10
Rural Tarai	PF Single Pit	36
	PF Double Pit	42
	ECOSAN	36
	Septic Tank with soak pit	97
Semi Urban	PF Single Pit	40
	PF Double Pit	46
	ECOSAN	40
	Septic Tank with soak pit	107
Urban	PF Single Pit	44
	PF Double Pit	51
	Septic Tank with soak pit	119
	Latrine with sewer connection	95

5.4 Population Based Cost:

Total cost for the population is the product of estimated additional population to be served multiplied by per capita technology cost. The total population based cost is estimated at \$813 million for drinking water and \$486 million for sanitation (Table 5.5 and 5.6 Column C).

5.5 Rehabilitation Cost in Drinking Water:

The majority of gravity flow drinking water schemes require rehabilitation. The rehabilitation cost is estimated at 7% of the population based cost. This estimate is based on analysis of data on rehabilitation requirements contained in profiles of 22 hill districts. No rehabilitation cost is included in the Melamchi project, since it already includes a distribution network improvement programme. The total rehabilitation cost is estimated at \$24 million (Table 5.5 column D).

5.6 Overhead Cost:

Per capita technology cost estimates usually exclude organisational overheads and thus these must be added. We use a figure of 12%, which is the level used by HMG in guidelines for INGO support to NGOs. Overhead cost in drinking water is estimated at 12% of the total population based and rehabilitation cost. No overhead cost is included for the Kathmandu reforms project, since this is already included. Total overhead cost for drinking water is estimated to be \$43 million. For sanitation, overhead cost is estimated at 12% for rural and 5% for semi urban and urban areas. The total overhead cost for sanitation is estimated at \$44 million (Table 5.5 column E and table 5.6 column D).

5.7 Difficulty Level Cost:

About one-third of districts (24 of 75) have sanitation and water coverage below the national average (Annex 1). The majority of these districts are in the Far West and Mid West development regions-the regions which have poor infrastructure, some of which are not even connected by the road network. The challenge for Nepal is not only to meet the MDTs but also to improve equity. Programmes have to reach these relatively inaccessible districts, which mean the cost of service delivery will increase. This is termed as "difficulty level cost." Difficulty level cost is estimated at 15% for Shallow and Deep Tube Well projects covering the plain Terai areas. The figure is estimated at 20% for Gravity Flow schemes of remote hill and mountain districts. Similarly for small towns, difficulty level cost is fixed at 5%. The total difficulty level cost is estimated at \$55 million for water. For sanitation difficulty level is fixed at 5% for remote areas, which gives a total difficulty level cost of \$16 million (Table 5.5 column F and table 5.6 column E).

5.8 Community Contributions:

Communities contribute between 10 - 20% of the capital costs of rural water supply schemes, most of which is provided in voluntary labour. Communities make significant contributions to the capital costs of sanitation ranging from 21% to 100% depending on the technology type. Communities contribute 100% for single direct pit latrines in rural hill areas, rural hill VIP latrine, and semi urban toilet with septic tank and soak pit and urban latrine with sewer connection. The lowest contribution is made for

double pit offset latrine in rural hill areas. The total expected community contribution is \$383 millions (Table 5.6 column J).

5.9 Total Resource Requirement:

The total resource requirement is the cumulative sum of population based cost, rehabilitation cost, overhead cost and difficulty level cost and is estimated at \$936 million for drinking water. Urban sector requires 63% of total investment and rural area 37%. Most of the urban resources are required for Kathmandu reforms, which constitutes 83% of urban total (equivalent to 51% of total resource requirement). (Table 5.5 column G)

The figure for sanitation is \$546 million. However, communities are expected to contribute \$383 millions. The total required external support for sanitation will be only \$163 millions (Table 5.6 column J). Water and sanitation together thus require around \$1,099 million to meet the water and sanitation MDTs in the period 2000 to 2015.

TABLE 5.5: Calculation of Resource Requirement to Meet the Drinking Water MDT

Region	Water Technology Zone	% of total population in 2015	A	B	C= A*B	D	E = (C+D)*.12	F= 15% for STW +20% for GF + 5% for small towns	G= C+D+E+F
			Additional Population to be served by 2015	Per capita technology cost in \$	Population based Cost required in million \$	Rehab Cost in million \$	Overhead cost @12% in million \$	Difficulty level cost in million \$	Total cost required in million \$
Rural	Shallow tube well	35	2,759,401	10	27.6	1.9	3.5	4	37
	Deep Tube Well	11	867,240	45	39.0	2.7	5.0	7.0	54
Rural/SU	Gravity Flow	54	4,257,361	45	191.6	13.4	24.6	39	269
Rural and Sub Urban Total		100	7,884,002		258.2	18.0	33.1	50.0	360
Urban	Small Towns	54	1,978,795	40	79.2	5.5	10.2	4.7	100
	Kathmandu reforms	46	1,685,640	312	476				476
Urban Total		100	3,664,435		555.2	5.5	10.2	4.7	576
National			11,548,437		813.4	23.5	43.3	54.7	936

TABLE 5.6: Calculation of Resource Requirements to Meet Sanitation MDT

Region	Sanitation Technology zone	% of total population in 2015	A	B	C= A*B	D=C*.12 for Rural and C*.05 for others	E=(C+D) *.05 for Rural hill	F=C+D+E	G	H = (F*G)/100	J =F-H
			Additional Population to be served by 2015	Per capita technology cost in \$	Population Cost required in million \$	Overhead cost in millions \$	Difficulty level cost in million \$	Total cost required in million \$	Community Contribution %	Community contribution in millions \$	Total External Resource to be supported in million \$
Rural Hill	Single Direct Pit	10	569,540	8	4.6	0.5	0.3	5.4	100	5.4	0
	Single Pit offset latrine	10	569,540	16	9.1	1.1	0.5	10.7	26	2.8	7.9
	Double Pit offset latrine	10	569,540	19	10.8	1.3	0.6	12.7	21	2.6	10.1
	VIP Latrine	70	3,986,780	10	39.9	4.8	2.2	46.9	100	46.9	0
Rural Hill Total		100	5,695,400		64.4	7.7	3.6	75.7		57.7	18
Rural Tarai	PF Single Pit	45	2,183,237	36	78.6	9.4	4.4	92.4	73	67.5	25
	PF Double Pit	45	2,183,237	42	91.7	11	5.1	107.8	67	72.3	35.6
	ECOSAN	1	48,516	36	1.7	0.2	0.1	2.1	43	0.9	1.2
	Septic Tank with soak pit	9	436,647	97	42.4	5.1	2.4	49.8	0	0	49.8
Rural Tarai Total		100	4,851,637		214.4	25.7	12	252.1		140.6	111.5
Semi Urban	PF Single Pit	44	779,753	40	31.2	1.6	0	32.7	73	23.9	8.8
	PF Double Pit	45	797,475	46	36.7	1.8	0	38.5	67	25.8	12.7
	ECOSAN	1	17,722	40	0.7	0	0	0.7	43	0.3	0.4
	Septic Tank with soak pit	10	177,217	107	19	0.9	0	19.9	100	19.9	0
Semi Urban Total		100	1,772,166		87.5	4.4	0	91.9		69.9	22
Urban	PF Single Pit	25	377,406	44	16.6	0.8	0	17.4	73	12.7	4.7
	PF Double Pit	25	377,406	51	19.2	1	0	20.2	67	13.5	6.7
	Septic Tank with soak pit	35	528,368	119	62.9	3.1	0	66	100	66	0
	Latrine with sewer line	15	226,443	95	21.5	1.1	0	22.6	100	22.6	0
	Total	100	1,509,623		120.2	6	0	126.3		114.9	11.4
National			13,828,825		486.5	43.8	15.6	546		383.1	162.9

Resource Availability in Drinking Water and Sanitation

6.1 Resource Allocations:

During the past five decades, expenditure on water and sanitation has increased both absolutely and proportionally. The share of the water and sanitation expenditure was below 2% of the total government expenditure before 1980. The government expenditure includes HMG, bilateral and multi lateral grants but not Technical Assistance. It goes to 2.6% by the end of 80's and to around 3% during late 1990's and early 2000's (Table 6.1). The detailed annual cost is given in Annex 4:

TABLE 6.1: Government Expenditure in Drinking Water and Sanitation

FY	Total Government Expenditure (Rs Million)	Total expenditure on Drinking Water and Sanitation (Rs Million)	% of total allocated to drinking water and sanitation
1950's	629.5	2.9	0.5
1960's	4,138.2	0.0	0.0
1970's	18,791.7	327.6	1.7
1980's	105,355.0	2,755.0	2.6
1990's	432,759.0	14,445.0	3.3
2000/01	79,835.1	2,422.2	3.0
2001/02	80,072.3	1,914.9	2.4
2002/03	84,572.3	2,418.7	2.9
2003/04	102,400.0	3,470.7	3.4
Total of 2000 to 2004	346,879.7	10,226.5	2.9

Source: MoF Economic surveys

The share of foreign aid in drinking water and sanitation has also increased. During 1980's foreign aid contributed 39% of the total WATSAN expenditure which rose to 49% in the 1990's. It is estimated that foreign aid will contribute 67% of the total WATSAN expenditure in the fiscal year 2003/04 (Table 6.2).

TABLE 6.2: Foreign Aid in Water and Sanitation Actual Expenditure (Rs Millions)

FY	Total Expenditure on Drinking Water and Sanitation in Million		Foreign Aid on Drinking Water and Sanitation Rs. Million						Foreign Aid
			Grant		Loan		Total Aid		
	Rs.	\$	Rs.	\$	Rs.	\$	Rs.	\$	%
1974/75	26	2.2	-		-		-		-
1975/76	30	2.5	0	0	5.7	0.5	5.7	0.5	19
1976/77	62	5.2	4.5	0.4	18	1.5	22.5	1.9	36
1977/78	48	4.0	0	0.0	19	1.6	19	1.6	39
1978/79	66	5.5	3.4	0.3	31.8	2.7	35.2	2.9	53
1979/80	61	5.1	2	0.2	36.5	3.0	38.5	3.2	63
1970's	295	24.5	9.9	0.8	111	9.3	120.9	10.1	41%
1980/81	76	3.6	0	0.0	31.4	1.5	31.4	1.5	41
1981/82	111	5.3	1	0.0	48.1	2.3	49.1	2.3	44
1982/83	248	11.8	6.2	0.3	110.4	5.3	116.6	5.6	47
1983/84	227	10.8	2.8	0.1	75.4	3.6	78.2	3.7	34
1984/85	210	10.0	17.6	0.8	38.5	1.8	56.1	2.7	27
1985/86	239	11.4	20.3	1.0	122.4	5.8	142.7	6.8	60
1986/87	287	13.6	7.4	0.4	162.2	7.7	169.6	8.1	59
1987/88	251	11.9	11.9	0.6	64.6	3.1	76.5	3.6	30
1988/89	486	23.1	62.2	3.0	55.4	2.6	117.6	5.6	24
1989/90	620	29.5	90.7	4.3	149.9	7.1	240.6	11.5	39
1980's	2755	131.2	220.1	10.5	858.3	40.9	1,078.4	51.4	39%
1990/91	541	12.6	50.4	1.2	131.5	3.1	181.9	4.2	34
1991/92	1338	31.1	417.9	9.7	215.1	5.0	633	14.7	47
1992/93	1826	36.5	925.9	18.5	275.7	5.5	1,201.60	24.0	66
1993/94	1077	21.5	25.5	0.5	299.9	6.0	325.4	6.5	30
1994/95	1112	21.8	182.3	3.6	191.9	3.8	374.2	7.3	34
1995/96	1217	21.4	126.9	2.2	586.7	10.3	713.6	12.5	59
1996/97	1338	23.5	121.2	2.1	376.1	6.6	497.3	8.7	37
1997/98	1681	24.7	181.8	2.7	695.7	10.2	877.5	12.9	52
1998/99	1879	27.2	217.2	3.1	623.2	9.0	840.4	12.2	45
1999/00	2436	34.3	532.3	7.5	839.8	11.8	1,372.10	19.3	56
1990's	14445	258.0	2,781.4	49.7	4,235.6	75.6	7,017.0	125.3	49%
2000/01	2422	32.3	523.1	7.0	782.6	10.4	1,305.70	17.4	54
2001/02	1915	25.5	398.2	5.3	575.4	7.7	973.6	13.0	51
2002/03	2419	32.2	n.a	n.a	n.a	n.a	n.a	n.a	n.a
2003/04	3471	47.5	1,030.70	14.1	1,287.60	17.6	2,318.3	31.8	67

Source: HMG's Economic Surveys

6.2 External Resources Availability:

Total available external resource during the 1990's was \$296 million. This is expected to increase to \$489 million between 2000 and 2015. The increment can be attributed to support for the Kathmandu reforms, which alone comprise \$329 millions. External support to other projects is likely to decrease during 2000 to 2015 to about \$160 million, possibly because of the significant aid investments allocated for the Kathmandu reforms).

TABLE 6.3: Summary of Available External Resources in Water and Sanitation (\$ Million)

Total External Resources	Period		% change
	1990-1999	2000-2015	
Rural	153	108	-29
Urban (including Melamchi and Kathmandu Reform)	143	381	166
National (including Melamchi and Kathmadnu Reforms)	296	489	65
Urban (excluding Melamchi and Kathmandu Reform)	143	52	-64
National (excluding Melamchi and Kathmadnu Reforms)	296	160	-46
Total external Resources for drinking water (Urban and Rural)	266	441	66
Total external Resources for Sanitation (Urban and Rural)	30	48	60

Source: Annex 2

Comparing the 1990's with the period 2000-2015, external resources in the rural areas will drop by 29% (\$153 to \$108 million) and urban areas will decline by 65% (\$143 to \$52 million), excluding the Kathmandu reforms.

Total external resource available for drinking water from 2000 to 2015 is \$441 million against \$266 millions in the 1990's.

Total external resource available for sanitation from 2000 to 2015 is \$48 millions against \$30 million in the 1990's.

TABLE 6.3 A: External Resource Commitments of Various Projects/Programmes by Donor and by Year (\$ Million) for Rural Areas

SN	Programmes Name	Type of Assistance	Donor	Start Year	End Year	Total available Amount (\$ million)	Duration (years)	Average Amount per year in \$ million	Estimated available Resource in 1990's	Estimated Available Resource from 2000 to 2015
	Rural Programmes									
1.	1 st RWSSSP	Loan	ADB	1985	1993	9.6	9	1.07	4.27	0
2.	CINSS/WI MPO 88-92	Grant	UNICEF	1987	1992	9.5	6	1.58	4.75	0
3.	2 nd RWSSSP	Loan	ADB	1989	1995	14.2	7	2.03	12.17	0
4.	RWSSP Lumbini Phase I	Grant	FINNIDA	1990	1996	11.9	7	1.70	11.9	0
5.	CWSS/WI MPO 1992-96	Grant	UNICEF	1992	1996	16	5	3.20	16.00	0
6.	3 rd RWSSSP	Loan	ADB	1992	1997	21.2	6	3.53	21.20	0
7.	Mechi Hills Development Programme	Grant	SNV	1992	1997	0.5	6	0.08	0.50	0
8.	Karnali Hills Development Programme	Grant	SNV	1992	1997	0.5	6	0.08	0.50	0
9.	JAKPAS	Grant	JGF	1994	1996	1.5	3	0.50	1.50	0
10.	RWSS	Grant	WaterAid	1990	1999	6	10	0.60	6	0
11.	SRDWSP	Grant	SDC Helvetas	1995	1997	1.2	3	0.40	1.20	0
12.	Support to Water and Sanitation Services	Grant	WHO	1996	1997	0.7	2	0.35	0.70	0
13.	RWSSP Lumbini Phase II	Grant	FINNIDA	1996	1999	4.4	4	1.10	4.40	0
14.	RWSSFDB – Phase I	Loan	WB-IDA	1996	2000	17	5	3.40	13.60	3.4
15.	4 th RWSSSP	Loan	ADB	1997	2001	27	5	5.40	16.2	10.8
16.	Family Environmental Condition MPO	Grant	UNICEF	1997	2001	13.2	5	2.64	7.92	5.28
17.	IRDP Gulmi- Arghakhanchi – Phase 11	Grant	EU	1997	2002	12.5	6	2.08	6.25	6.25
18.	CWSS/WI MPO 1997-2002	Grant	UNICEF	1997	2002	2.6	6	0.43	1.3	1.3
19.	CWSS/WI in Hills	Grant	JRCS	1998	1999	1.4	2	0.70	1.4	0
20.	RWSSP Lumbini Phase III	Grant	FINNIDA	1999	2003	6.5	5	1.30	1.3	5.2
21.	Mid and Far West Rural Water Supply and Sanitation (NEWAH)	Grant	DFID	1999	2005	4.5	7	0.64	0.64	3.86
22.	Gurkha Welfare Scheme Phase I – III	Grant	DFID	1989	2005	14.9	17	0.88	8.76	5.26
23.	RWSS	Grant	Water Aid	2000	2009	7.6	10	0.76	0	7.60
24.	RWSSFDB	Grant	DFID	2003	2004	4.48	2	2.24	0	4.48
25.	RWWSS FDB PHASE II	Loan	WB-IDA	2004	2010	20	7	2.86	0	20
26.	Rural Water Supply and Sanitation Project-Phase 5	Loan	ADB	2004	2009	24	6	4.00	0	24
27.	Miscellaneous (Bilateral / INGOs)	Grant	Various	1990	2015	25	25	1.00	10	15
	Rural Total					228.9			152.47	112.43
	Rural Average per Annum								15.25	9.86

TABLE 6.3 B: Available External Resources of Various Projects/Programmes by Donor and by Year (\$ Million) for Urban Area

S N	Programmes Name	Type of Assistance	Donor	Start Year	End Year	Total available Amount (\$ million)	Duration (years)	Average Amount per year in \$ million	Estimated available Resource in 1990's	Estimated Available Resource from 2000 to 2015
	Urban Programmes									
28.	Kodkhu Water Supply Project – TA	Grant	Thailand	1991	1994	0.8	4	0.20	0.8	0
29.	Urban WSS Rehab Project	Loan	WB-IDA	1991	1999	60	9	6.67	60	0
30.	Kathmandu WSFIP Phase I and II	Grant	JICA	1992	1995	28	4	7.00	28	0
31.	Terai Water Supply Project	Grant	ODA	1992	1995	0.3	4	0.08	0.3	0
32.	Consumer Education	Grant	UNDP	1992	1995	0.3	4	0.08	0.3	0
33.	Management Support to NWSC	Grant	UNDP	1992	1996	3.4	5	0.68	3.4	0
34.	Leak detection and Water Control Programme	Grant	Norway	1993	1995	2.4	3	0.80	2.4	0
35.	Swayambhunath Conservation and Development	Grant	GTZ	1993	1996	0.3	4	0.08	0.3	0
36.	Human Resource Development	Grant	UNDP	1994	1996	0.5	3	0.17	0.5	0
37.	Bhaktapur Sewerage System	Grant	GTZ	1995	1996	0.1	2	0.05	0.1	0
38.	Melamchi Scheme – Feasibility Study	Grant	UNDP	1995	1996	0.9	2	0.45	0.9	0
39.	Central Terai Urban Project	Grant	ODA	1995	1999	5.3	5	1.06	5.3	0
40.	Ten Towns Water Supply Improvement	Grant	JICA	1996	2000	51	5	10.20	40.8	10.2
41.	Urban Water and Sanitation	Grant	WaterAid	2000	2009	1.4	10	0.14	0	1.4
42.	Small Towns Water Supply and Sanitation Sector Project	Loan	ADB	2001	2006	40	6	6.67	0	40
43.	Melamchi Water Supply Project & Kathmandu reforms	Loan/ Grant	ADB, NORAD, OPEC, JBIC and JICA	2000	2011	329	12	27.42	0	329
	Urban Total								143.1	380.6
	Urban average per annum								14.3	25.4

6.3 Total Resources Availability by Internal and External Sources:

The share of external resources in water and sanitation is likely to increase in the coming years, possibly up to 70%. However, for this study a conservative estimate of 65% is taken as external resource in water and sanitation programmes for the period 2000 to 2015. Based on this ratio (65 % external resource and 35% HMG resource), total internal resources mobilisation of HMG is estimated for water and sanitation sector. This estimate takes total internal resources from HMG be \$239 million in drinking water and \$26 million in sanitation. Total available resources will be as follows:

TABLE 6.4: Available External and Internal Resources for Water and Sanitation in the Period 2000-2015

Source	Available Resources in million \$		Total
	Drinking Water	Sanitation	
External resources	441	48	489
HMG resources	239	26	265
Total	682	74	754

6.4 Total Resources Availability by Rural and Urban Areas:

Total resources available in drinking water and sanitation for rural areas is \$167 million (22% of total) and \$587 million for urban, largely due to an expensive Kathmandu reform and Melamchi Tunnel project (Table 6.5).

TABLE 6.5: Resources Commitment for Water and Sanitation in the Period 2000 -2015

Rural/Urban	Total Resources commitment in million \$	
	Amount	%
Rural	167	22
Urban	587	78
National	754	100

Resource Gap in Drinking Water and Sanitation

7.1 Drinking Water:

The estimate of the resource gap is \$243 million for the period 2000 to 2015. This equates to an annual resource gap of \$17 million.

TABLE 7.1: Drinking Water Resource Gap 2000-2015 in Million \$

Resource Available	681
Resource required	936
Total resource gap	255
Per annum resource gap	17

7.2 Sanitation:

The total resource availability is \$74 million. The total resource requirement to meet sanitation MDT is \$163 million. The Gap is thus \$89 millions for the period 2000 to 2015, equating to an annual gap of \$6 million.

TABLE 7.2: Sanitation Resource Gap 2000-2015 in Million \$

Resource Available	74
Resource required	163
Total resource gap	89
Per annum resource gap	6

7.3 Water and Sanitation Combined:

Total resource availability is \$754 million. Total resource requirement is \$1,099 million. The Gap is thus \$345 million for the period 2000 to 2015, equating to an annual resource gap of \$23 million. In other words, Nepal needs to mobilise 46% more resources in addition to those currently available to meet the MDTs.

TABLE 7.3: Total Resource Gap in Rural and Urban Areas in the Period 2000 -2015 in Million \$

	Required	Available	Total Resource Gap	Per Annum Gap
Rural	491	167	324	21.6
Urban	608	587	21	1.4
National	1099	754	333	23

7.4 Rural and Urban:

Total resource gap is \$22 million for rural and \$ 1 million for urban.

Localising MDTs - Making the MDTs Achievable

Achieving national level MDTs in water and sanitation appears to be a difficult task. However, if MDTs are localised then these targets appear achievable.

In Nepal, there are 58 urban municipalities and 3,915 rural VDCs. Each VDC has nine wards and the total number of wards in municipalities is 806.

MDTs for the local government level would hence be as follow:

TABLE 8.1: No. of Additional Households to Serve each Month per VDC and Municipal Ward to Meet the MDTs

	No. of households to cover per month to meet MDT	No. of rural VDCs / Municipal Wards	No. of additional households per VDC/municipal ward per month to meet MDTs
Rural Drinking Water	7,028	3,915	2
Rural Sanitation	9,822	3,915	3
Urban Drinking Water	4,340	806	5
Urban Sanitation	3,855	806	5

The number of additional households to be served with water per month per VDC is thus 1.8 which equates to nine additional households to be served per five months.

In Urban areas an additional 5 households per ward need to be served each month.

To meet the sanitation MDT 2.5 toilets in each VDC and 5 toilets in each municipal ward need to be constructed each month to meet the MDT.

TABLE 8.2: Beneficiaries by Agencies

	Fourth Rural Water Supply & Sanitation Project	Self-Reliant Drinking Water Support Programme	Rural Water Supply & Sanitation Project Phase II	Nepal Water for Health (NEWAH)	Total
Total Beneficiaries	119,555	135,061	26,827	139,192	420,635
Total Taps	2,738	3,053	760	2,651	9,202
Beneficiaries Per Tap	44	44	35	53	46
HH Per Tap	9	9	7	11	9

Experiences of various projects suggest that the average number of households served per water tap is nine (Table 8.2). The figures suggest that if every VDC provides additional service to nine households by constructing one water tap every five months, the MDT will be achieved for rural areas.

The above mentioned figures suggest that meeting the MDTs is not impossible. The challenge lies on how the MDT concept is localised. VDCs, municipalities and wards must be encouraged to prioritise the need of serving people with water and sanitation facilities.

Review of HMG's Documents on the Water and Sanitation MDT

Three reports have been produced by HMGN related to water and sanitation MDTs. These are:

- Progress Report 2002, Millennium Development Goals, Nepal
- Resource Requirement and Gap Estimation by National Planning Commission, November 2003
- Nepal Country Report for South Asian Conference on Sanitation, October 2003

In this section we comment on each and compare their findings with ours.

9.1 HMGN, UN Country Team Progress Report 2002, Millennium Development Goals, Nepal

9.1.1 Summary of the report

- National drinking water coverage estimated at 54% in 1990 and Millennium Development Target is 79% for the year 2015.
- MDT in water will soon be reached.
- There are problems of definition as well as inter-agency variation in reporting data.
- Progress in urban areas has remained stagnant and is likely to remain so for some years to come.
- Emerging towns are likely to face scarcity of drinking water.
- Access to drinking water does not necessarily imply access to safe drinking water. In fact, even piped drinking water is unsafe in many, probably most, locations almost throughout the year.
- Nationally, as much as 30 percent of all households reported the incidence of diarrhoea, dysentery, jaundice, typhoid or cholera.
- Among pre-school children the prevalence of diarrhoea was 25.4%.

To meet the MDTs:

- Local governments must continue to play a key role in responding to community demands for drinking water facilities, in sustained institutional strengthening of user groups in rural areas, and in supporting user groups to generate financial, cultural and political resources locally for the repair and maintenance of the facility;

- Health workers, school authorities, students and others can be mobilised for this task;
- Identification of the magnitude of arsenic contamination in drinking water in the 20 districts of the Terai and initiatives to mitigate such contamination;
- Formulation of legal, administrative and operational mandates and guidelines for dispute resolution regarding water rights. Such disputes are increasingly frequent between communities;
- Formulation of mandates, guidelines and compensation mechanisms, particularly for large-scale withdrawal of drinking water from rural locations to urban areas;
- Development of new initiatives for urban water supply. As noted, access to drinking water has remained stagnant in most urban areas. In addition, urban settlements are likely to spring up quite rapidly within the next 15 years.

The report recommends the following priority actions:

- Development of new technologies to enhance rural water supply and improve housing in rural areas (e.g. rainwater harvesting and solar pumps);
- Investigation of the level of arsenic contamination of ground water of the Terai districts and ensure provision of alternate arsenic free water for affected families including medical care and health counselling;
- Development of a simple and, if possible, mobile system for assessing bacteriological contamination;
- Investigation of alternative models for integrating hygiene and sanitation programs with drinking water programmes

9.1.2 WAN's comment on the report

The report displays an understanding of many issues relating to achieving the Millennium Development Target. These are:

- Recognition of the fact that water supply, even from the improved sources may not be safe
- Local government must play a key role in sustaining water supply schemes
- Arsenic issues in some Terai districts
- Need for new initiatives to address urban water issues
- Promotion of alternative technologies for water conservation and utilisation

However, the report has the following deficiencies:

- Does not mention sanitation MDG;
- Definition of the coverage does not include reasonable access;
- It concludes that MDT in water will be soon reached, but does not adjust this to include access within reasonable distance and safe source and rehabilitation;
- Clear statement of problems meeting urban water demand, but does not fully discuss how this is to be addressed;
- No discussion of localising MDTs.

9.2 Resource Requirement and Gap Estimation by NPC and UNDP, November, 2003

9.2.1 Summary of the report

- Assumes water coverage is 54% in 1990 and considers that there are problems of water quality but does not mention about reasonable access.
- The report states that MDG is not a concern since it was almost reached by 2002 as per the Tenth Plan Document. Hence the report estimated no resource gap for universal access to drinking water.
- The study has used estimated GDP growth rate as the major base of estimating resource availability.
- The report concludes that maximum resource available (external and HMG) will be \$ 535 million within the year 2003 to 2015.

9.2.2 WAN's comment on the report

- As a government study, it can not debate the assumptions made by HMG including water coverage and GDP growth rate.
- Assumption that water MDG is almost reached is not valid
- The study has used estimated GDP growth rate as the major base of estimating resource availability. Regardless of whether the estimated GDP will be reached, the report provides information on the resource gap to meet the universal access if the national estimated GDP is attained.
- Resource availability estimate from this study of \$ 535 million is very close to the WAN estimate \$545 million.
- Maximum resource requirement estimated by this study is \$657 million, which is \$ 279 (30%) less than WAN's estimate of \$936 million.
- Report does not consider sanitation.

9.3 Nepal Country Report: South Asian Conference on Sanitation, October 2003

9.3.1 Summary of the report

- Nepal Country Report prepared for SACOSAN 2003, reports that sanitation coverage is 6% in 1990 and 25% in the year 2001.
- MDT target on sanitation is 53%.
- To meet the MDT target Nepal needs to construct additional 2.9 million latrines in the next 12 years from 2003 to 2015.
- This implies that Nepal needs to construct additional 20,000 toilets per month to meet the MDT.

9.3.2 WAN's comment on the report

- The estimated monthly target figure is higher than WAN's estimate of 14,000.
- The difference is accountable to the SACOSAN low coverage reporting of sanitation in the base year 1990.
- Total resource requirement projected is Rs.2.9 billion (=\$ 40 million).
- Estimate of resource requirement is far below the WAN estimate of \$163 million.
- SACOSAN has estimated the requirement on a flat rate of Rs.1000 per toilet construction and has not considered different technology costs and other costs.

ANNEX 1 Water and Sanitation Gap by Districts (Ranked by Sanitation Coverage)

Coverage	S. N.	Districts	Sanitation Coverage	Water Coverage	Sanitation Gap	Development Region	ECO Region
Less than national average in both water and sanitation	1.	Rolpa	9.6	62.8	-53.2	Mid West	Hill
	2.	Bajhang	10.8	44	-33.2	Far West	Mountain
	3.	Mugu*	13.4	55.3	-41.9	Mid West	Mountain
	4.	Dolpa*	13.9	36.7	-22.8	Mid West	Mountain
	5.	Darchula	14.4	71.4	-57	Far West	Mountain
	6.	Achham	15.3	45	-29.7	Far West	Hill
	7.	Rukum	16.2	63.7	-47.5	Mid West	Hill
	8.	Humla	18.3	64.5	-46.2	Mid West	Mountain
	9.	Dailekh	18.4	37	-18.6	Mid West	Hill
	10.	Jajarkot	18.8	49.4	-30.6	Mid West	Hill
	11.	Bajura*	20.2	65.5	-45.3	Far West	Mountain
	12.	Pyuthan	21.7	69.2	-47.5	Mid West	Hill
	13.	Baitadi	23.5	60	-36.5	Far West	Hill
	14.	Udayapur	24.4	69.7	-45.3	Eastern	Hill
	15.	Sindhuli*	27.4	59.2	-31.8	central	Hill
	16.	Salyan *	29.4	65.8	-36.4	Mid West	Hill
	17.	Doti	31.9	50.2	-18.3	Far West	Hill
	18.	Ramechhap	34.9	72.8	-37.9	central	Hill
	19.	Dadeldhura	36.4	65.3	-28.9	Far West	Hill
	20.	Khotang	36.6	64.7	-28.1	Eastern	Hill
	21.	Dang	39.1	60.5	-21.4	Mid West	Tarai
	22.	Kalikot*	42.4	48	-5.6	Mid West	Mountain
	23.	Dhading	43.3	79.5	-36.2	central	Hill
	24.	Argakhanchi	46	66.8	-20.8	West	Hill
Sanitation less than average but water above average	25.	Rautahat	17.5	95.2	-77.7	central	Tarai
	26.	Mahottari	18.2	87.9	-69.7	central	Tarai
	27.	Kapilbastu	18.6	84.3	-65.7	West	Tarai
	28.	Sarlahi	18.8	88.2	-69.4	central	Tarai
	29.	Siraha*	19.3	91.8	-72.5	Eastern	Tarai
	30.	Bara	22.5	94.4	-71.9	central	Tarai
	31.	Parsa	23.6	97.1	-73.5	central	Tarai
	32.	Saptari	26.3	96	-69.7	Eastern	Tarai
	33.	Bardiya	27.9	97.1	-69.2	Mid West	Tarai
	34.	Nawalparasi	31	86.2	-55.2	West	Tarai
	35.	Rasuwa	31.9	85.2	-53.3	central	Mountain
	36.	Kanchanpur	35.4	87.8	-52.4	Far West	Tarai
	37.	Manang	35.9	93.5	-57.6	West	Mountain
	38.	Kailali	39.9	93.4	-53.5	Far West	Tarai
	39.	Mustang	40.8	84.7	-43.9	West	Mountain
	40.	Morang	42	95.1	-53.1	Eastern	Tarai
	41.	Dhanusa	42.1	93.2	-51.1	central	Tarai
	42.	Sindhupalchowk	45.1	82	-36.9	central	Mountain
Sanitation above the average but water below the average	43.	Bhojpur	49	57.5	-8.5	Eastern	Hill
	44.	Solukhumbu	51.1	76.7	-25.6	Eastern	Mountain
	45.	Surkhet *	52.3	71.5	-19.2	Mid West	Hill
	46.	Jumla*	52.4	74.5	-22.1	Mid West	Mountain
	47.	Terhathum	54	73.7	-19.7	Eastern	Hill
	48.	Gorkha	54.5	64.5	-10	west	Hill
	49.	Panchthar	57.1	69.3	-12.2	Eastern	Hill
	50.	Tanahu	57.1	69.8	-12.7	West	Hill
	51.	Okhaldhunga	57.1	70.5	-13.4	Eastern	Hill
	52.	Sankhuwasabha	59.6	62.6	-3	Eastern	Mountain
	53.	Gulmi	60	79.9	-19.9	West	Hill

	54.	Syanghja	61.7	81.9	-20.2	West	Hill
	55.	Kavre	63.8	80.4	-16.6	central	Hill
	56.	Dhankuta	64.7	81.3	-16.6	Eastern	Hill
	57.	Ilam	76.4	78.3	-1.9	Eastern	Hill
Both sanitation and water above average	58.	Taplejung	47.8	90.7	-42.9	Eastern	Mountain
	59.	Nuwakot	48.2	85.9	-37.7	central	Hill
	60.	Banke	51.7	93.1	-41.4	Mid West	Tarai
	61.	Myagdi	51.8	84.9	-33.1	West	Hill
	62.	Sunsari	53.4	95.7	-42.3	Eastern	Tarai
	63.	Lamjung	55	85.2	-30.2	West	Hill
	64.	Rupandehi	59.8	97.4	-37.6	West	Tarai
	65.	Jhapa *	63.1	82.8	-19.7	Eastern	Tarai
	66.	Dolakha*	65.8	82.7	-16.9	central	Mountain
	67.	Makwanpur	67.6	82.9	-15.3	central	Hill
	68.	Parbat	67.7	84.5	-16.8	West	Hill
	69.	Palpa	69.4	86	-16.6	West	Hill
	70.	Baglung	70.2	88.4	-18.2	West	Hill
	71.	Chitwan	80.3	83.8	-3.5	central	Tarai
	72.	Kaski	81	87.3	-6.3	West	Hill
	73.	Lalitpur	81.7	84.8	-3.1	central	Hill
	74.	Bhaktapur	91.4	82.4	9	central	Hill
	75.	Kathmandu	93.2	90.3	2.9	central	Hill

Source: Derived from census 2001.

ANNEX 2 Government Expenditure in Drinking Water and Sanitation (in Million)

FY	Total Expenditure (Rs.)	Drinking Water (Rs.)	% of total allocated to drinking water	Conversion Rate of Rs @ 1\$	Equivalent in \$ million
1950/51	24.7	0.3	1.2	-	-
1951/52	52.5	0.2	0.4	-	-
1952/53	52.9	0.6	1.1	-	-
1953/54	0	0	-	-	-
1954/55	0	0.2	-	-	-
1955/56	0	0.6	-	-	-
1956/57	58.6	1	1.7	-	-
1957/58	81.8	0	0	-	-
1958/59	112.5	0	0	-	-
1959/60	246.5	0	0	-	-
1950's	629.5	2.9	0.5	-	-
1960/61	377.2	0	0	-	-
1961/62	304.4	0	0	-	-
1962/63	297.9	0	0	-	-
1963/64	259	0	0	-	-
1964/65	349.8	0	0	-	-
1965/66	428.1	0	0	-	-
1966/67	438.8	0	0	-	-
1967/68	462	0	0	-	-
1968/69	537.2	0	0	-	-
1969/70	683.8	0	0	-	-
1960's	4138.2	0	0	-	-
1970/71	769.5	0	0	12	12
1971/72	889.6	9.5	1.1	12	12
1972/73	982.8	12	1.2	12	12
1973/74	1226.3	11.6	0.9	12	12
1974/75	1513.7	26.4	1.7	12	12
1975/76	1913.3	30.3	1.6	12	12
1976/77	2330.4	62.3	2.7	12	12
1977/78	2674.9	48.3	1.8	12	12
1978/79	3020.5	65.9	2.2	12	12
1979/80	3470.7	61.3	1.8	12	12
1970's	18791.7	327.6	1.7	12	12
1980/81	4,092.3	76.3	1.9	21	21
1981/82	5,361.3	111.4	2.1	21	21
1982/83	6,979.2	248.3	3.6	21	21
1983/84	7,437.3	226.9	3.1	21	21
1984/85	8,394.8	210.4	2.5	21	21
1985/86	9,797.1	238.5	2.4	21	21
1986/87	11,513.2	286.5	2.5	21	21
1987/88	14,105.0	250.9	1.8	21	21
1988/89	18,005.0	485.8	2.7	21	21
1989/90	19,669.3	620.0	3.2	21	21
1980's	105,355.0	2,755.0	2.6	21	21
1990/91	23,549.8	540.8	2.3	43	43
1991/92	26,418.2	1,338.1	5.1	43	43
1992/93	30,897.7	1,825.8	5.9	50	50
1993/94	33,597.4	1,077.1	3.2	50	50
1994/95	39,060.0	1,111.8	2.8	57	57
1995/96	46,542.4	1,217.1	2.6	57	57
1996/97	50,723.7	1,338.0	2.6	57	57
1997/98	56,118.3	1,681.4	3.0	68	68
1998/99	59,579.0	1,879.1	3.2	69	69

1999/00	66,272.5	2,436.0	3.7	71	71
1990's	432,759.0	14,445.0	3.3	-	-
2000/01	79,835.1	2,422.2	3.0	75	75
2001/02	80,072.3	1,914.9	2.4	79	79
2000 to 02	159,907.4	4,337.1	2.7	-	-
2002/03	84,572.3	2,418.7	2.9	75	75
2003/04	102,400.0	3,470.7	3.4	73	73
Estimate for 2000 to 2004	506,787.1	14,563.6	2.9	75	75

ANNEX 3 Coverage Estimation Methodology

The regression equation used is:

$$Y_{tr} = a + bt$$

$$Y_{tu} = a + bt$$

Where, Y_{tr} is the coverage of rural area for the year t and Y_{tu} is coverage for urban area. The regression coefficient "b" and the constant "a" are estimated using the standard regression technique using SPSS. Based on this, the revised values of Y_t is obtained. This is multiplied by the weight W_t (=proportion of households within 5 minutes walking distance of water fetching). The estimated coverage on drinking water is thus

$$Y_{tr} * W_{tr} = Y_{tr}^*$$

$$Y_{tu} * W_{tu} = Y_{tu}^*$$

The national coverage is estimated using the relation

$$Y_{tn} = pY_{tr}^* + qY_{tu}^*$$

Where, p is rural population proportion and q is urban population proportion, borrowed from census figure.

Economic survey data is used to obtain expenditure of water and sanitation from 1990 to 2000. Per capita cost is then estimated as the ratio of total WATSAN expenditure to total additional population served during the year. This per capita expenditure is consistent with the per capita expenditure reported in Aid Under Stress study. However, per capita expenditure estimates based on coverage of water and sanitation policy is not consistent to other studies. Considering the reasonable growth pattern and consistent with the level of investment, the regression smoothed values are taken as reliable estimate of the coverage.

Millennium Development Target

Millennium development target is estimated using simple algebra. The formula used is

$$Y_{2015,r} = Y_{1990,r} + (100 - Y_{1990,r})/2$$

$$Y_{2015,u} = Y_{1990,u} + (100 - Y_{1990,u})/2$$

Where, $Y_{2015,r}$ and $Y_{2015,u}$ represent Millennium Development Target for rural and urban respectively

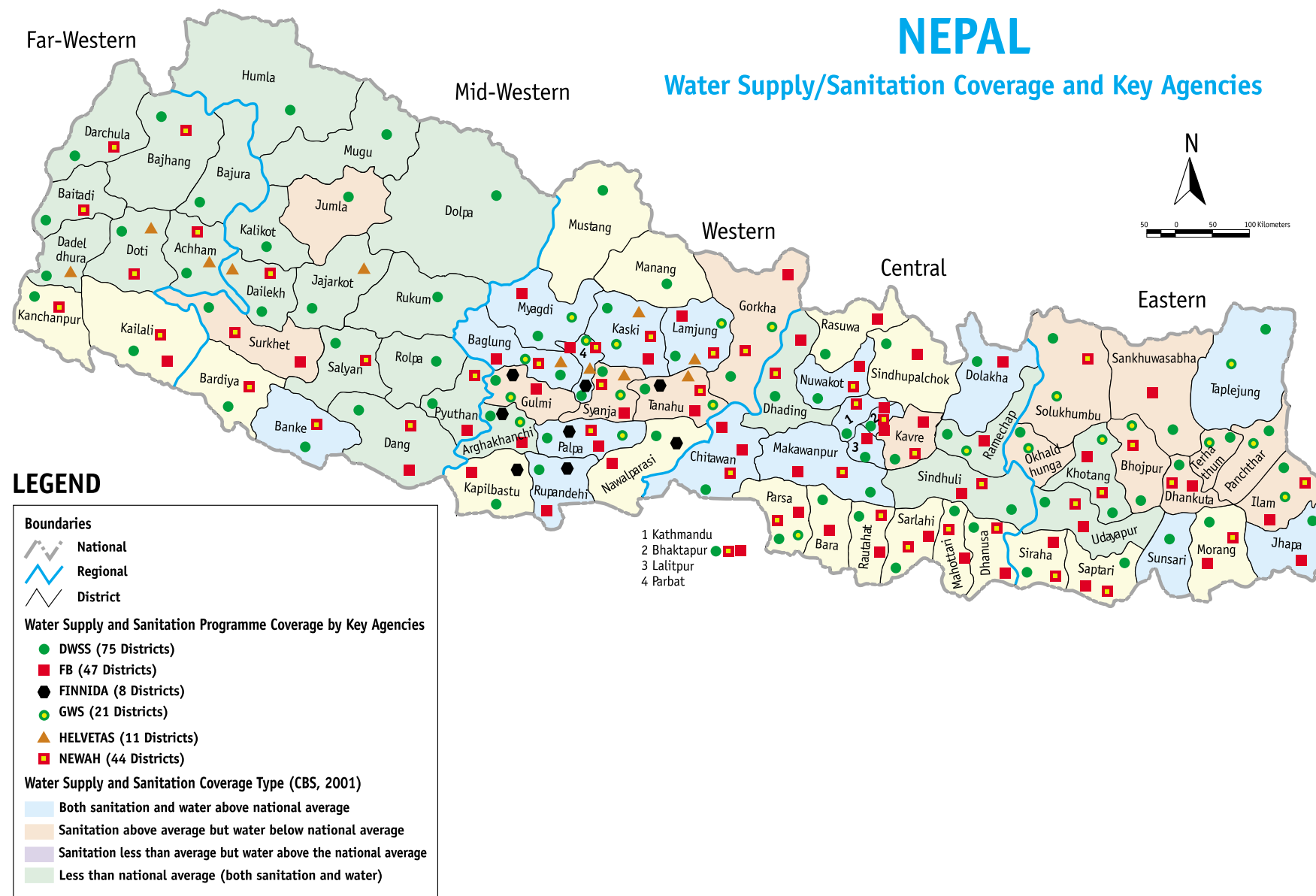
$Y_{1990,r}$ and $Y_{1990,u}$ represent coverage of the year 1990 for rural and urban respectively.

Population figure of rural and urban areas for the years 1990, 2000 and 2015 are taken from census 1991, 2001 and CBS population projection 2003. These figures are respectively denoted by $P_{1990,r}$, $P_{1990,u}$

$P_{2000,r}$, $P_{2000,u}$, $P_{2015,r}$, $P_{2015,u}$

Year	Population served/ to be served	Additional people to served/ to be served	Additional people to served/ to be served per month
1990	$P_{1990,r} * Y_{1990,r} = S1$		
2000	$P_{2000,r} * Y_{2000,r} = S2$	$S2 - S1 = P1$	$P1/120$
2015	$P_{2015,r} * Y_{2015,r} = S3$	$S3 - S1 = P2$	$P2/180 = \text{MDT R}$

The same process is applied to estimate the MDTU- the monthly additional number of people to be served to meet the MDT by 2015. The corresponding figures are divided by their household size. Rural and urban MDT is combined to get national NDT.



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WaterAid Nepal

Shanta Bhawan, Lalitpur, Nepal

Postal: P.O. Box: 20214, Kathmandu Nepal

Phone: (977-1)5552764, 5552765, Fax: (977-1)5547420

e-Mail: wateraid@wateraidnepal.org.np