



Water and Sanitation Program

An international partnership to help the poor gain sustained access to improved water supply and sanitation services

The Water Supply and Sanitation Situation of the Urban Poor in the Kathmandu Valley

Results of a Research Study

Volume 1: Main Report

South Asia Region



LUMANTI

SUPPORT GROUP FOR SHELTER



WaterAid



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Situation of the Urban Poor in the Kathmandu Valley**

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**Lumanti Support Group for Shelter
Nepal Water for Health (NEWAH)
WaterAid
Water and Sanitation Program – South Asia**

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Annex 1 Map Of Kathmandu Showing Location of Communities Profiled

List of Acronyms

ABD	Asian Development Bank
CBO	community based organisation
HH	household
IBT	increasing block tariff
KMC	Kathmandu Metropolitan City
L	litre
MHPP	Ministry of Housing and Physical Planning
MLD	Ministry Local Development
NEWAH	Nepal Water for Health
NGO	non government organisation
NLSS	National Living Standards Survey
NPC	National Planning Commission
NRB	Nepal Rastra Bank
NRs	Nepali Rupees
NWSC	Nepal Water Supply Corporation
"pucca"	well constructed, often cemented
PCPA	per capita per annum
SWMRMC	Solid Waste Management and Resource Mobilisation Centre
UDLE	Urban Development through Local Efforts
WSP-SA	Water and Sanitation Program – South Asia
YUHP	Yalla Urban Health Project

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1 Introduction

1.1 Context of the study

Water and sanitation development in Nepal has for many years been seen as a rural issue, with urban needs largely ignored. The country is, however, experiencing rapid urbanisation, putting considerable pressure on infrastructure and services that are already inadequate. The population of the Kathmandu valley has reached one million and continues to grow, and the capital is now experiencing an acute water shortage and difficulties with sanitation, sewerage, drainage and solid waste management. While there are proposals to rehabilitate the city's water and sanitation infrastructure and exploit new water sources, the specific needs of the urban poor have received little attention in development planning. This report is a first step towards filling that gap and providing a basis for informed planning and decision-making. It details the findings of a study conducted as a collaborative effort between four agencies:

<i>Lumanti</i>	A Kathmandu-based NGO working with squatter and slum communities
<i>Nepal Water for Health (NEWAH)</i>	A national NGO supporting local partners to implement rural water supply and sanitation projects throughout all regions of Nepal
<i>WaterAid</i>	An international NGO working in 15 countries supporting water supply and sanitation projects for the most vulnerable poor people throughout Nepal
<i>Water and Sanitation Program – South Asia</i>	An international partnership of the UNDP, World Bank and 15 donor agencies which aims to help the poor gain sustained access to improved water supply and sanitation services by assisting countries to reform their policies, supporting sustainable investments, learning and disseminating lessons from the field, and building capacity.

The objectives of this exploratory study were:

1. To better understand the water supply and sanitation situation in poor urban settlements (slums and squatter settlements) in the Kathmandu Valley.
2. To estimate the scale of the issue.
3. To estimate how much poor urban dwellers pay for water supply and sanitation, either directly or through coping costs.
4. To review the adequacy of technical options in use.
5. To assess the potential for water supply and sanitation services targeted at the urban poor, either through government, NGOs or the private sector.

There are five municipalities in the Kathmandu Valley. Kathmandu, Patan (also known as Lalitpur) and Bhaktapur are the largest; Thimi and Kirtipur are relatively small. The study included communities from Kathmandu, Patan and Thimi, and used the following methodology:

- community consultation via small groups (mostly women) using a variety of techniques based on
- visual inspection and technical assessment of existing infrastructure and services
- testing of water sources in low income areas to determine bacteriological quality
- key informant interviews
- two consultative meetings (one with decision makers, the other with slum and squatter dwellers)
- review of available documents and literature

Summary findings from the study are presented in this report. Full profiles of each community investigated are provided separately in Volume 2.

2 Poverty in the Kathmandu Valley

2.1 Estimates of urban poverty

The extent of urban poverty in Kathmandu is uncertain; more than one definition of poverty has been used and official reports quote a variety of figures.

As part of this study, four survey estimates of poverty were reviewed - three national and one Lalitpur based survey. Estimates of the proportion of poor people vary by definition of poverty, and by whether households or individuals are counted. As the summary below shows, the common method has been to define a minimum daily calorific requirement and then estimate the cash income required to meet this consumption. To this sum is added the income requirements of non-food essentials. One feature of all national surveys has been the use of a common poverty income threshold for both urban and rural areas.

Survey details	Poverty definition	Estimates of poverty (proportion below the poverty level)
National Household Survey of Income & Consumption, NPC, 1977; 932 urban HH* and 4,969 rural.	Income < NRs 2 per capita per day (NRs 730 p.c. per annum) for subsistence of 2,256 calories per day	19.9% of urban HH 42.2 % of rural HH 40.3 % of all HH
Multipurpose Household Budget Survey, NRB, 1984/85; 1,661 urban HH and 3,662 rural HH	Income < per capita basic needs income of NRs 2,168 for mountains & hills; NRs 1,719 for terai for subsistence of 2,250 calories per day	20.2% of urban terai HH 12.6% of urban hills HH 14.5% of all urban HH 40.7% of all rural HH
1989 reprocessing of 1984/85 survey data	income < USD 150 per capita per annum	51% of urban terai population 32% of urban hills population 42% of all urban population 74% of all rural population 71% of total population
1989 reprocessing of 1984/85 survey data	% of population whose expenditure on food is 70% or higher	5% of urban terai population 52% of urban hills population 51% of all urban population 68% of all rural population 66% of total population
Nepal Living Standards Survey, 1995-96 & 9 th Five Year Plan	Per capita annual income < NRs 4,404 required for 2124 calories per day	9.8% of urban population are ultra-poor 13.2% of urban population poor 23.0% total urban population in poverty 44.0% rural population below poverty line 42.0% national average
FOND / Lumanti survey of 2,418 households in Lalitpur, 1999	Annual per capita income < NRs 9,000 (USD 130)	12.6% of Lalitpur HH

* households

In addition, the 1995-96 National Living Standards Survey report also provides an analysis by income quintile that distinguishes between Kathmandu (396 households surveyed) and other urban (320 households surveyed).

Income quintile	Mean consumption income (NRs pcpa)*	% of Kathmandu population	% of Other urban population	Estimated income range**
1	2571	0	12.6	< 3300
2	3893	0.2	14.6	3300 - 4500
3	5142	3.3	11.9	4500 - 6200
4	7147	6.7	17.7	6200 - 8500
5	15243	89.8	43.2	> 8500

* per capita per annum ** estimates of the income range of each income quintile developed by the researchers of this study.

If the poverty threshold of NRs 9,000 per capita per annum is accepted, then both the NLSS and Lalitpur surveys produce an estimate of around 10% to 13% of the Kathmandu population at or below that level. If it is further assumed that that the NRs 9000 level is an underestimate for Kathmandu where rents and other costs are higher than other urban areas, then a conservative estimate of the percentage of Kathmandu residents below the poverty income level is 12% to 15%.

Most Kathmandu poor people live in either in slums (established legal settlements), squatter settlements, or rented accommodation (often single rooms let by owner-occupiers). Of these, those living in slums are generally low caste, e.g. sweepers and butchers, while squatter settlements tend to be more heterogeneous. Rental accommodation is occupied by a range of low-income groups, such as day labourers, hawkers and un/semi-skilled factory workers. Large peri-urban settlements are not common; instead the poor live in small settlements sprinkled among higher-income housing. As a result they are not highly visible, and low-income renters are especially hard to locate, making it difficult to quantify the number of poor families.

Since high- and low-income groups are interwoven, and the city is small, water shortages affect both rich and poor alike. The difference is that those who can afford to install storage facilities and pumps that enable them to cope with an intermittent and unreliable public supply, or buy water from commercial sources.

2.2 Squatter settlements

Squatters are the easiest group to quantify amongst the poor as they tend to live in defined settlements on marginal government-owned land – typically riverbanks. The squatter population has grown steadily over the last twenty years. The figures below are based primarily on student research and may not be accurate, however they do indicate a clear upward trend in population.

Year	Estimated Number of Squatter communities
1985	17
1988	24
1994	33
1996	47
2000	65

(Source: Lumanti)

The current estimate of 65 communities corresponds to a total squatter population of approximately 3000 families, or 15,000 people. Most of these are located in Kathmandu municipality, with very few squatters in Patan.

A study by Lumanti in 1996 found the oldest squatter settlement to be 45 years old, indicating that these settlements are not a new phenomenon. The average number of households was just 38, though one had 171 households. They also found that squatters had their origins all over the country, though Halcrow and Fox (1991) reported that 70% came from within the valley. This suggests a rural-to-urban migration that is a multi-step process; people they may initially live in another (perhaps better) form of rented accommodation in the valley before moving to a rent-free squatter site.

Characteristics of squatter settlements

Nearly all squatter settlements in Kathmandu are on government-owned land: 67% on previously vacant sites and 25% in or around public buildings, typically unrenovated historic ones such as pagodas, and the remainder living scattered throughout the city. The defining characteristic is that the residents do not have 'lalpurja', the legal document of land title. Many settlements are on marginal land, primarily riverbanks, giving rise to a narrow linear layout. A general trend towards upgrading can be observed and most houses are pucca or semi-pucca. Furthermore, most are owner-occupied; only 11% of households were renting in a 1996 survey by the NGO Lumanti. Thus populations are relatively stable.

The Nepali word for squatters is 'sukumbasi', meaning a person or family without land or regular income. In fact, most squatters do have jobs, for example as small vendors, sweepers, labourers or servants, or running cottage industries such as weaving, breeding pigs, slaughtering animals or brewing alcohol. The 1996 Lumanti survey found that monthly household incomes were in the range of NRs. 1,000 – 3,000, though some were as high as NRs. 15,000. There is thus a significant gap between rich and poor even within the settlements. Settlement composition is mostly heterogeneous, with people from a variety of castes and not only the lowest ones.

Public attitudes towards squatters are generally negative. Squatters may also be seen as opportunistic land grabbers who already have a home and are simply looking for profit. It may be true that not everyone lives in a squatter settlement as a last resort. Nevertheless, many sites are so marginal that they have little investment potential.

2.3 Slums

Most slums comprise pucca housing which was originally of good quality but has become dilapidated and over-crowded. There are also slums that began as shack settlements but were gradually upgraded and now are permanent dwellings (with brick construction, for instance), though these are also overcrowded. Unlike squatters, the majority of householders have their own title deeds and the settlements as a whole are officially recognised by the authorities. There is known to be a substantial rental market in slums.

Slums and middle class communities were differentiated in this study using the following characteristics:

Settlement characteristics – slums vs. middle class

Slums

Inadequate basic infrastructure and services
 Housing pucca but old and dilapidated
 Small housing units
 Poor sanitary conditions
 High level of legal land ownership
 Residents predominantly of lower caste
 Household income range NRs. 3,000 – 10,000/month
 Low-status occupations e.g. sweepers, butchers

Middle-class communities

Basic services and infrastructure in place
 Pucca housing, mostly in reasonable repair
 Relatively clean environment
 High level of legal land ownership
 Residents generally of higher castes
 Household income mostly above NRs. 10,000/month
 Employment in business or services

The NLSS data for Kathmandu reported 39% of households lived in dwellings with non-cement-bonded walls and 45% had non-cement floors. If these are accepted as crude indicators of slum dwellings then a conservative estimate of the number of slum households would be 88,000 (40%).

2.4 Renters

The 9th Five-Year Plan estimates that 24% of urban families are renters, a figure confirmed by a recent study by Lumanti in Ward 21 of Kathmandu (a low-income ward). When applied to the urban areas of the valley, this ratio produces a rough estimate of 250,000 population and 50,000 renter households. The NLSS found 29% of respondents to be renters, suggesting a total of 64,000 households. It can reasonably be assumed that many of these households are poor. As well as families, there are many lone renters working as hawkers, factory workers and other low-income workers. Renters typically live in crowded conditions and share the same water supply and toilet as the owner-landlord. As they are dispersed within the house-owning population they tend not to be organised into self-help organisations and are hard for NGOs to locate, identify and assist. Due to these constraints, the water and sanitation conditions of renters were not well captured in this study.

3 Institutional framework for water and sanitation services

3.1 Policy environment

3.1.1 Decentralisation

The policy outlook in Nepal is changing in line with global trends in decentralisation, community control and increased reliance on the private sector. From being the main provider of services, government is slowly re-defining its role and aims to become an enabler, increasing the responsibilities of local government and inviting both NGOs and the private sector to play a part in service delivery. There are, however, severe institutional constraints on the fulfilment of either existing or proposed roles. So far, decentralisation has impacted primarily on health and solid waste management services.

3.1.2 Water supply

The Ninth Five Year Plan (1997-2002) estimated national urban water supply coverage at 62.5%, and set a target for 100% coverage by the end of the plan period.

A new national water supply policy was produced under ADB assistance in April 1998, though its status is unclear and it may yet be modified. The policy emphasizes cost recovery, customer orientation, and greater involvement of the private sector. The section on urban water supply is particularly interesting; it says that strategies for effective financial management of urban water supply systems will include, amongst other things:

"Leasing or allocating standpost supply to community groups with payment for metered consumption and upkeep of the surrounding area of the posts"

In interview, a senior NWSC representative was unaware of this clause or of any plans to pilot such arrangements, though he had no objection in principle.

3.1.3 Sanitation Policy

Nepal's first national sanitation policy was produced in 1994, and while it prompted some positive initiatives it had little impact on coverage among the urban poor. Generally, the sector focus has been on rural rather urban development, and water rather than sanitation. Improvements in sanitation have lagged far behind those in water.

In the Ninth Five Year Plan there is a shift away from explicit allocation to sanitation programmes and only one sanitation project is mentioned explicitly, for sewage treatment prior to disposal in the Bagmati river. Despite this the plan sets very ambitious targets for latrine coverage: 40% of the population as a whole, comprising 36% rural and 60% urban. This means doubling coverage within 5 years, but the policy does not specify the institutional mechanisms by which this will be achieved. UNICEF are now spearheading a national sanitation strategy but this is new and has yet to identify specific models for urban sanitation development.

3.1.4 Urban Development Policy

Until the 1980's, the government of Nepal made no policy response to urbanisation. In 1996 they prepared a National Plan of Action for Habitat II which included the following activities:

1. *To upgrade squatter settlements which are environmentally safe to improve the living conditions of squatter households.*
2. *Living condition improvement programme for squatters and slum dwellers focussing on female-headed households to reduce povertyby improving socio-economic conditions.*

3. To develop and launch an urban environment improvement agenda focussed on priority areas at local level.

Adoption of the first clause would have far-reaching implications, removing any fear of eviction and encouraging residents to invest in upgrading their homes and local infrastructure. Policy appears to be confused, however; a special government committee (Sukumbasi Samasya Samadhan Ayog - Squatter Issues Solution Agency) has recently recommended that legal recognition should not be granted to squatters in the Kathmandu Valley.

There has been no concrete action to operationalise the National Plan of Action, though the Ninth Plan document includes a commitment to upgrade 5 slum and squatter settlements. The Ministry of Housing and Physical Planning has not yet identified a model for implementation but have indicated that they would be receptive to proposals from NGOs.

More recently, an ADB-funded initiative has begun to develop a national urban strategy, which should be produced towards the end of 2000. It is understood that it will likely propose further decentralisation and resource transfer to municipalities as well as full economic pricing or water to provide improved services.

3.2 Roles and responsibilities

3.2.1 Ministerial Roles

Responsibilities for urban water supply and sanitation are split between two ministries as follows:

Ministry	Related Departments
<i>Physical Planning and Works (MPPW)</i> Public land development policy Water and Sanitation Policy Nepal Water Supply Corporation	<i>Housing and Urban Development</i> Policy implementation; production of urban plans
<i>Local Development (MLD)</i> Management of Urban Areas	<i>Municipalities</i> Preparation and implementation of plans together with DHUD; delivery of urban services; city management

Communication between the two ministries and co-ordination of respective roles is described as weak, contributing to a lack of clarity over priorities for urban development.

3.2.2 Municipal roles

Within larger municipalities the ward is a key functional unit and the primary point of contact for citizens. Each of the 57 wards of Kathmandu and Lalitpur contains an average of approximately 3900 households. Each has a committee headed by its local elected member, and holds small funds for local development. Wards are sub-divided into neighbourhoods or 'toles' and each of these has a committee, a 'tole sudhar samiti' (Tole Improvement Committee or 'TIC'), which can also play a significant role in local development initiatives. For the poor, their access to government services depends to a large extent on their relationship with the ward.

Water supply

While NWSC is primarily responsible for urban water supplies, municipalities are responsible for funding some public water points. With only one third of Kathmandu households having a fully plumbed house connection, standposts are an essential source of domestic water for a significant number of people. There are an estimated 1300 public water points, which suggests 20-25 per ward. Kathmandu Metropolitan City (KMC) also maintains a number of public dug wells, partly for their historic and cultural value. In addition there are over a hundred "stone spouts", centuries old, some of which are fed from springs many kilometres away. It is the responsibility of the municipality to maintain these.

Sanitation

Municipalities are responsible for the provision of public toilets (there are currently 26 public toilets, some of which are maintained under lease by independent operators), but responsibility for household sanitation is not clearly defined. It currently falls somewhere between the municipality and NWSC, but the latter are really interested only in sewerage, which covers just a small portion of Kathmandu and Patan. It seems likely that municipalities will play a role in any future projects for the promotion of on-plot sanitation.

Hygiene Promotion

Hygiene education does not generally feature in municipal services. As part of the decentralisation process, UNICEF have supported the establishment of municipal ward health clinics in Kathmandu and each ward has a Health Implementation Committee under the umbrella of a municipal co-ordination committee. The clinics provide a modest health education input, but staff do not undertake extension work relating to sanitation.

Solid waste management

Municipalities are currently responsible for the provision of solid waste management services and these are grossly inadequate, though there are some signs of progress at neighbourhood level. As part of the decentralisation drive, KMC has devolved management of the entire service to ward level in three areas, and municipalities generally are encouraging NGOs and private sector organisations to set up primary collection schemes based on user payment.

With the urban population having reached one million, over 400 metric tonnes of waste are produced daily in the Kathmandu valley and solid waste management is a critical problem. A Solid Waste Management and Resource Mobilisation Centre (SWMRMC) was set up with GTZ support some years ago with the task of transporting waste from secondary collection points in the KMC area to a dumping site. However, local opposition to all three transfer stations and the disposal site ended this service and by 1995 all KMC waste was being dumped at an informal site on the Bishnumati river bank. Following the closure of the SWMRMC, responsibility for waste collection, transfer and disposal now lies with the municipalities, but none has a satisfactory disposal site.

Development Control

In the Kathmandu valley, urban development plans are implemented through a Town Development Implementation Committee covering the three major municipalities. Within KMC however, skills in urban planning are very limited and responsibilities confused, being spread between three departments. To add to the problems, much new development takes place in areas outside official municipal limits. Land development is consequently haphazard and largely unregulated, resulting in irregular shaped housing plots and, often, narrow streets with inadequate vehicular turning space, or space for solid waste collection.

Constraints on municipal services.

Local government is relatively new in Nepal and there are many constraints on service delivery. In KMC the division between the roles of the executive and elected members is blurred, many official procedures are ignored and the municipality is suffering a financial crisis, with little or no money to fund development activities. Lack of revenue generation is a serious problem, arising largely from tardy and irregular payments from central government of local development funds that recently replaced octroi. Private sector participation has been presented as a possible solution to many of the problems, but the performance of the municipality in preparing and managing contracts has reported to have been weak.

3.2.3 Nepal Water Supply Corporation (NWSC)

NWSC is currently responsible for the provision of water and sanitation services in the three largest valley municipalities (Kathmandu, Patan and Bhaktapur) plus 10 other large municipalities.

3.2.4 Department of Water Supply and Sanitation (DWSS)

The Department of Water Supply and Sanitation (DWSS) is responsible for water supply and sanitation in all other areas of Nepal, both rural and urban. It has an Environmental Sanitation Cell for the promotion of on-plot latrines but no equivalent exists in NWSC.

3.2.5 NGOs and CBOs

The NGO sector in Nepal is substantial, and includes many international agencies. Most NGOs, however, focus on rural development. Of the few working in the Kathmandu valley, some work in solid waste management, health or micro-finance but none has specialist skills in urban water supply or latrine construction.

With democracy only a few years old, Nepal does not have a long history of CBOs campaigning for civil or consumer rights. There are some active organisations, however, including a Federation of Slum Dwellers which has been formed recently.

4 Sector issues and initiatives

4.1 Institutional reform of NWSC including private sector participation

The prospect of private sector participation in NWSC raises several issues regarding water and sanitation services for the poor, including:

- how equity of supply will be achieved;
- connection rights for informal settlements;
- incentives for extending new services to low-income settlements;
- management of the interface between operator, social intermediaries and small-scale local service providers; and
- regulation of non-NWSC supplies

4.2 Water Resource Management

4.2.1 Ground water extraction

With increasing use of deep boreholes in the valley, recharge rates are unable to keep pace with extraction and groundwater levels are dropping. It is unlikely, however, that shallow domestic tubewells have a serious impact on the problem.

4.2.2 Demand management and tariffs

At present, separate water charges apply to metered and unmetered domestic supplies. Unmetered house connections from a ½" line are charged a flat rate of NRs. 176.5 per month, if the line is a main line, and NRs. 59 per month if the line is a branch line. Metered charges are based on an increasing block tariff (IBT). The IBT allows up to 10,000 litres consumption per month for a minimum charge of NRs. 40, with additional consumption charged at NRs. 9.7 per 1,000 litres – more than double the basic rate. Since few households consume more than 10,000 litres per month, the IBT provides no incentive to limit consumption; neither does the flat rate for unmetered taps. In practice, low pressure and an intermittent supply make over-consumption impossible for most users. Meters pose many problems: they do not function well on an intermittent supply, there is a perception that they present an additional obstacle to already low pressure supply, and there is an insufficient supply of meters to serve all the NWSC consumers. Despite the fact that the metered supply is cheaper, many consumers prefer to have an unmetered supply, and will remove the meter to ensure a better flow of water.

4.2.3 *Pollution of the Bagmati River*

One of the most obvious manifestations of inadequate sanitation in Kathmandu is the Bagmati River, which receives a heavy load of raw sewage from sewers and open drains as well as suffering pollution from industrial effluent. It is grossly polluted, and a serious public health hazard, yet still some poor communities are forced to use it as a source of domestic water, albeit for non-drinking purposes. Reducing pollution of the river is an environmental health priority for the city.

4.3 *Melamchi water supply project*

The chronic water shortage in Kathmandu is set to be resolved by the long-awaited Melamchi project, which will involve diversion of water from the Melamchi river to Kathmandu via a 28 km tunnel through the mountains. This will be a huge civil engineering project costing some \$275 million and funded by a variety of donors. The project comprises:

1. Construction of an intake and 28 km tunnel:	Scandinavian funding
2. Water treatment works:	Japanese funding
3. Bulk distribution:	ADB funding
4. Management contract and rehabilitation of the distribution network:	World Bank

Funding problems have caused substantial delays in starting the project and Melamchi is unlikely to come on line before 2006. Clearly the project has major implications for the whole of Kathmandu valley and the viability of any new models of service delivery will be greatly affected by the availability or otherwise of Melamchi supply.

4.4 *Other related projects*

4.4.1 *Institutional Strengthening of Kathmandu Metropolitan City (KMC)*

The Asian Development Bank is supporting a 15-month programme to develop the capacity of KMC (which is the municipality of Kathmandu) to deliver services under the new decentralised regime. This will include adoption of a new organisational structure. Overstaffing at the junior level with too few managers is a major weakness, and while the wards play an important role at the interface between municipality and citizens, their functions need to be clearly defined.

Further reforms include the introduction of a Unified Property Tax, as envisaged under the Local Self Government Act, from which half of the proceeds will be retained by the Ward and used for new infrastructure and operating and maintenance costs. The approach is scheduled to be piloted in three of Kathmandu's 35 wards (Wards 2, 5 and 20).

Steps are also being taken to decentralise and improve the solid waste management service. So far, three wards have taken on total responsibility for the service in their areas and, if successful, this may be replicated city-wide.

If the programme succeeds, KMC could play a key role – probably via the wards - in needs assessment and facilitating the extension of services to slum and squatter communities.

4.4.2 *Cities Alliance*

This World Bank-and UNCHS (Habitat) funded initiative was recently launched in Kathmandu. It will facilitate the preparation of a City Development Strategy with special focus on upgrading of low income settlements.

4.4.3 *Urban Development through Local Efforts (UDLE)*

This bilateral project supported by GTZ has been running since the 1980's. Its objective is 'to increase the capacity of municipalities to initiate and manage urban development' and it has

provided support to towns throughout the country. In the Kathmandu valley it provides direct support only to Patan municipality, nevertheless some of the models of service delivery may have more widespread application. Of particular interest are:

- the establishment and strengthening of a Community Development Section which facilitates a range of services in partnership with local NGOs; and
- community contracting for local infrastructure improvements.

4.4.4 *Urban Management Programme, Lalitpur*

This UNDP-funded programme is supporting infrastructure development in Lalitpur.

4.4.5 *Yala Urban Health Project*

Since 1991, YUHP has focussed on improving the water quality of dug wells in Patan. It has worked with communities and wards to rehabilitate 40 dug wells by a process of draining, removal of sediment, relining, covering, installing a modified rower hand pump and chlorination. Cost per well varies between NRs 25,000 and NRs 80,000 and communities must contribute 10% of the estimated total cost – which is deposited in a maintenance bank account. They also contribute labour and some materials. Community volunteers are responsible for monitoring residual chlorine levels every few days, replenishing the pot chlorinators as required and maintaining the handpump. These volunteers are trained for this role and also provided with continuing training opportunities and support. The chlorine (bleaching powder) is provided at no cost by the Ministry of Health.

4.4.6 *Redd Barna (Norway Save the Children)*

One of the first low-income urban community development projects in Kathmandu was an initiative by Redd Barna from 1989 to 1998 in the Dhalko – Dhobichaur neighborhoods. These are sweeper and laundry caste communities in Ward 17. Using a child centered approach that mostly focussed on schooling and pre-school day care, its sanitation and health education component was successful in motivating almost all of 250 households to construct household pour flush latrines connected to a sewerage line. For these latrines, households paid the full cost with no subsidy. Redd Barna also rehabilitated two traditional stone water taps by constructing walls, improved outlets, a storage tank and improved drainage.

5 Water and sanitation services for the poor

5.1 NWSC supplies

5.1.1 Characteristics of NWSC supply

NWSC water is supplied from a mixture of ground and treated surface water sources and distributed to some 100,000 private connections and 1,300 standposts. Supply ranges from 120 MLD in the wet season to 80MLD in the dry season and is notoriously inadequate. Even in the wet season it is intermittent and most of Kathmandu receives water for less than four hours per day, at such low pressure that many people extract it from the mains with handpumps. It is predicted that by 2001, total daily demand will reach 213 MLD, and the short fall 93 MLD. The shortfall arises from population growth, delays in implementing development programs, decreasing yield from ground water sources, and leakage through the ageing supply and distribution system. Unaccounted for water is estimated at 30-40% and were it not for low pressure in the system the figure would be even higher.

Average domestic per capita consumption has been reported as 50 – 70 lpcd but it seems unlikely that users of shared taps or those without pumping and storage facilities would consume this much. Non-domestic demand is estimated at just 5% of domestic demand, since most hotels and industries install their own ground water supplies and /or procure tanker services.

5.1.2 Coverage by NWSC

Accurate data is unavailable, but officially 87% of the population is served by NWSC, including people sharing a neighbour's tap or standpost. Within the 87%, levels of service provided are (approximately):

Fully plumbed household connection:	36%
Yard tap*: 46%	46%
Standpost: 18%	18%

*a yard tap is generally shared by several households

Source: MEH Consultants, 1999

Thus only one third of customers have fully plumbed household connections, and most rely on a shared supply. Roughly one eighth of the population has no access at all to NWSC supplies. NWSC currently records 101,000 domestic connections. When this is compared with the estimated total number of urban households of 220,000, it is clear that there is a significant connection gap, only some of which is met by the 1,278 public standposts.

A 1997 consumer survey based on defined criteria found that only 34% of consumers received a supply that was 'good' or 'sufficient', while 67% had an inadequate supply. At least 15% received no water at all from their tap.

Supply condition	% of NWSC consumers	Supply hours per day	
		Wet season	Dry season
Good	19%	6 - 24	4 - 24
Sufficient	15%	6 - 8	4 - 6
Poor	49%	3 - 4	1 - 2
No water	15%	0.5 - 1	0 - 0.5
No response	3%		

Source: MEH Consultants, 1999

5.1.3 Tariffs and cost recovery

Since 1992 NWSC has achieved a simple operational surplus but this is insufficient to cover loan repayments and depreciation. Inefficient collection and the current increasing block tariff (IBT) structure are central to the problem.

A summary of the tariff structure related to domestic connections is as follows:

NWSC Monthly Tariff rates 2000 (extract)

Tap with meter within valley (consumer)

Size of Tap (inch)	Quantity (L) of free / discounted water	Minimum tariff Nrs. per month	Cost per additional 1000L
½	10,000	40.00	9.70
¾	27,000	590.00	21.20
1	50,000	1030.00	21.80

Tap without meter within valley (consumer)

Size of tap (inch)	Main tap tariff	Branch tap tariff
½	176.50	59.0
¾	1323.60	442.0
1	2206.0	736

NWSC Tanker service

Tanker Capacity (L)	Tariff	Tank Capacity (L)	Tariff
4000	725	8000	1210
5000	850	9000	1330
6000	960	10000	1450

Public taps: 809 per month for ½ " tap.

It should be noted that most poor consumers do not benefit from the first block allowance of 10,000 litres for a minimum NRs. 40 charge, as they do not have house connections. The increasing block tariff effectively provides subsidised consumption for middle- and high-income consumers. Of more relevance to the poor are the charges for shared taps. Some of these are metered but charged as for house connections, and with consumption exceeding 10,000 litres per month, charges enter the higher price band. The result is that poor consumers with a relatively low level of service pay more for their water, on a per litre basis, than better off consumers with house connections.

It is of note that between the 1999 tariff and the 2000 tariff the first block of the metered tariff was increased from 8,000 litres to 10,000 litres.

Example

a) A metered shared tap used by 20 households, each consuming 10,000 litres per month.
Total consumption 200,000 litres

	NRs.
First 10,000 litres:	40
Additional 190,000 litres @ 9.7 per 1,000 litre	1843
Total charge	1883
Price per 1000 litres	9.42
Charge per household	94

b) A private connection, used by one household, consuming 10,000 litres

First 10,000 litres	40
Total charge	40
Price per 1000 litres	4

N.B. this is for the purposes of comparison only; in reality it is unlikely that poor families would receive or use 10,000 litres per month

5.1.4 Installation Charges

In theory installation charges include a refundable deposit of NRs. 1,000; pipe laying charges of NRs. 400 plus NRs. 4 per foot; and full materials costs. In practice, however, it appears that other arrangements are often negotiated in the case of slum or squatter communities. (In a recent example, NWSC charged the community of Jorpathi a deposit of Rs 12,100 in addition to the Rs 1000 deposit and the pipe laying and materials costs. This transaction was fully documented, receipted and official. In this case, the community are under the impression that this large deposit will relieve them of the responsibility of future monthly charges).

The distance to the mains from slum and squatter communities often results in high connection costs.

5.1.5 NWSC Service options for poor consumers

Each ward has a number of standposts which supply water free to users with the municipality or Ministry of Finance liable for bills, though they rarely pay. New standposts are no longer provided in this manner, however, due to non-payment of bills and wastage at the taps. There are now three models for service delivery to the poor, as set out below. Though NWSC officially make a distinction between services to legal and illegal settlements, in practice they

do install facilities in some squatter settlements provided the appropriate charges are paid and the application is supported by the ward or an intermediary. In general, though, NWSC is reluctant to extend the distribution network due to the worsening water shortage.

NWSC also provides tanker supplies, free, to parts of the city with acute water shortages. Tankers delivering water from NWSC treatment plants arrive in a neighbourhood and anyone is free to take water directly from the tanker, using buckets or other small volume carrying vessels. Tankers are also supplied by NWSC on payment for functions and to hotels and institutions etc. at a charge of NRs. 850 (US\$12) for 5,000 litres.

There are three options for slum and squatter settlement dwellers prepared to pay for NWSC water:

NWSC user-pay supplies to slum and squatter settlements

1. Unmetered communal standposts

A water users' committee may apply direct to NWSC, or via an intermediary NGO, for a standpost. The tap installed will normally be unmetered and charged at a fixed public tap rate of NRs. 809 per month.

2. Shared taps

A group of users may apply for a shared tap via the ward. In this case the tap will be registered in the name of the ward, metered, and billed as though it were a private tap. Bills may be served to an individual who then collects money from the users. Due to the increasing block tariff, users pay higher per litre charges than they would for water from an individual private connection as they usually consume over 10,000 litres per month.

3. Private house connections

Individuals who can afford it may apply for a household connection. If the householder does not have legal title to the land, strictly speaking the connection may be denied, but in practice this rarely happens. Installation costs may, however, be high if there is no existing supply line close to the property. These connections are often shared with neighbours at the owner's discretion.

(Information from NWSC staff)

In the past, in at least one community NWSC has entered into a shared management arrangement whereby residents have run a local distribution network fed from the bulk NWSC supply.

Local Distribution Network in Chaunni

Some years ago in Chaunni, a peri-urban area, residents took over management of their local NWSC distribution network comprising a pumping station, storage tank and local distribution network fed from the bulk supply. This serves 126 houses directly and 40 more via 10 standposts. The bulk supply is free but user charges are levied to cover pumping and staff costs. Due to poor management by the user group the ward took over the scheme three years ago. Charges are now NRs. 80 per household per month but this leaves a monthly deficit of approximately NRs. 8,000, which is paid by the ward.

Most communities have developed a good relationship with their ward committee, though it has taken time to develop in the case of squatter settlements, many of which were threatened with eviction in the past. Through this relationship residents may receive support with applications for NWSC supplies or direct assistance with materials for new waterpoints. Access to services is not, however, guaranteed, and ward committees tend to be highly politicized.

5.2 Alternative Supplies

5.2.1 Shallow Groundwater – Tubewells and Dugwells

A very common source in low income areas is shallow tubewells (typically 5m deep and fitted with low cost suction pumps, either lever action "No 6" pumps or direct action "rower" pumps). Some of these are shared but many households have installed their own at a cost of roughly NRs. 3,500 (including handpump). Most of these tubewells provide a reliable yield in both the wet and dry seasons.

Dug wells are found in many areas of the city, and are typically 10 to 20 metres deep. Many are 100 years old or older. It is not uncommon for these wells to become dry in the dry season (April to June).

5.2.2 Stone Spouts

In Patan, traditional "stone spouts" also provide a substantial year-round supply of water free to the users. These are neither provided nor maintained by NWSC though they are in effect public supplies. The spouts are fed by springs several km from the city.

5.2.3 Commercial Supply

NWSC is not the sole supplier of water in the Kathmandu valley. Many commercial and industrial operations hire contractors to drill deep boreholes and numerous private operators provide tanker supplies.

Tankers do not supply NWSC water; most are filled from springs outside the city. They operate throughout Kathmandu but are not widely used in low-income settlements on a regular basis. NWSC estimate that there are approximately 40 private tankers in operation and the market is unregulated both in terms of price and quality. Prices rise as the dry season progresses but the typical cost of a 5,000 litre tanker is NRs, 800-1,000 (\$11 - \$14). The on-selling of NWSC water is also unrestricted, though the study found no examples of this being done on a commercial basis. An important question is whether, and how, private sector supplies should be regulated.

5.2.4 Informal Sources

Sources such as rivers, rainwater and illegal connections are also in use.

5.3 Sanitation

Roughly 17% of households in Kathmandu and 34% in Patan are served by sewers, which discharge straight into the Bagmati river. There have been previous attempts to introduce sewage treatment but without success: two treatment plants were built for Kathmandu city but were never used as no sewage flowed into them; two more in Bhaktapur failed, apparently because farmers blocked the sewer lines and directed sewage on to their fields.

There have been isolated schemes for the provision of latrines for the poor and this is currently being done under UDLE in Patan (see section 4.4.3). Generally, though, municipalities are inactive in this area. UNICEF have estimated current coverage as follows:

	<i>Rural</i>	<i>Urban</i>	<i>Total</i>
% of population with access to latrine in 1996-7	16	51	20
% of population with access to latrine by 2002	36	60	40

Of the latrines in use, many do not provide safe disposal of faeces; either they do not have proper pits at all, or the pits are not lined. Households also commonly build septic tanks or other systems that discharge their effluent directly into street drains or onto river banks.

5.3.1 Public toilets

Until recently, public toilets were not proved successful in Kathmandu due to poor maintenance and inadequate water for flushing and cleaning. A recent innovation, however, has been the introduction of pay and use toilets under the management of municipal ward committees. Some of these are located close to low-income settlements and used by residents.

Municipal pay-and-use toilets

Toilets are leased out to a small-scale private operator (often an individual rather than a large contractor or NGO) who charges users, cleans and maintains the toilet complex and pays a fixed monthly fee to the municipality. These fees vary widely, from as little as NRs. 1700 per month to NRs. 11,000 for a new complex. Typical charges are NRs. 2 for defecation, NRs. 1 for urination and the operator can retain any profit made after payment of the lease charges. Some public toilets also sell water from their own tubewell; one is known to sell at NRs. 5 for a 20l bucket

5.3.2 Drainage

Drainage is often ignored when land is developed in Kathmandu and many new buildings are erected on flood plains and low-lying areas. The irregular topography of city streets also causes ponding in numerous locations. About 25% of households in greater Kathmandu and 32% in Bhaktapur have reported that their houses often flood.

5.3.3 Solid Waste management

Most established slum communities receive a poor secondary collection service from communal bins and collection points. Many squatter settlements receive no service at all, and dispose of their waste on riverbanks.

5.4 Community Profiles

5.4.1 Methodology and Sampling

The study included assessments of 11 pre-selected low-income communities (4 slums and 7 squatter settlements) and, for the purposes of comparison, 3 middle-class water-stressed communities. The methodology included:

Community consultation

- Transect walks with community members for an overview of settlement characteristics, services and problems.
- Community mapping to identify settlement population, infrastructure, services and uses, sanitation practices and problems relating to water supply and sanitation.
- Focus group discussions to identify :
 - domestic practices relating to water supply and sanitation
 - key data on consumption, collection times, seasonal variations etc.
 - priorities, aspirations and (in general terms) willingness to pay for better services.Many of the discussions included problem ranking and the preparation of matrices (see Volume 2). 140 households were directly involved in group meetings and they provided information on the water and sanitation situation of all 971 households in the 11 slum and squatter communities.
- consultative meeting with slum dwellers.

Technical review

- Visual inspection and technical assessment of water points and latrines
- Identification of common water supply and sanitation technologies and their costs
- Water sampling in poor communities at source and in the home (faecal coliform tests).

Other investigations

- Study of available documents and literature
- Key informant interviews
- consultative meeting with decision makers

The original intention was to investigate four types of settlement: low-income renters, squatters in public buildings, slums and squatters on marginal land. For each, examples of high and low water stress would be sought. The first two categories were subsequently deleted; it proved extremely difficult to locate groups of low-income renters, and squatters in public buildings were found to be a special and unrepresentative case with many temporary residents – especially at religious sites. It also proved impossible to pre-select an equal mix of high and low water stress sites. In the event, 14 communities were investigated including slums, squatters on marginal land and middle class water-stressed communities. Tables summarising the key findings, with analysis, are given below. The location of each community is shown on the map in Annex 1.

Note: while much quantitative data was gathered from community maps, some figures were estimated by extrapolating the findings from focus group discussions at which participants were encouraged to provide information on their community as a whole. The limitations of this approach are recognised.

Table 1 Communities Profiled

Community Name	Type	Area of City/Ward	Population	Number of Households
Alko	slum	Lalitpur MC (Patan)/Ward No. 22	282	105
Kami Tole	slum	Thimi/Ward No. 4	86	18
Nayagan	slum	Lalitpur MC (Patan)/Ward No. 20	483	120
Pobo Thimi	slum	Thimi/Ward No. 9	411	57
Balaju	squatter	Kathmandu MC/Ward No. 6	731	148
Banshighat	squatter	Kathmandu MC /Ward No. 11	431	119
Dhaukhel	squatter	Kathmandu MC /Ward No. 13	191	42
Dhumakhel	squatter	Kathmandu MC/Ward No. 15	184	58
Kapan	squatter	Mahankal VDC (village development committee)	85	18
Pathivara	squatter	Kapan VDC/Ward No. 6	655	187
Sankhamul	squatter	Kathmandu MC /Ward No. 10	504	99
Dhalko	middle class/water stressed	Kathmandu MC /Ward No. 17	NA	150
Subahal	middle class/water stressed	Lalitpur MC (Patan)/Ward No. 7/8	1470	300
Dhoka Bahal, Tyodha	middle class/water stressed	Kathmandu MC Ward No. /27	NA	64

5.4.2 Water Supply in Slum and Squatter Communities

For the purposes of analysis, six major categories of supply were developed, based on type of ownership and payment arrangements since these were the prime determinants of household access. Some explanation of the categories may be helpful:

- *public supply* refers to a water point provided or adopted by a government agency, to which public access is unrestricted.
- *communal* means that access is open to all residents in a community but the water point is not under government ownership or control
- *shared private supply* refers to a water point secured by a user group, the members of which share payment of user charges and maintenance costs. Access to the water point is restricted to members of the group.
- *private supply* refers to a water point under the control of a single household. If (as often happens) the householder allows neighbours to use the water point it may be referred to as a *private shared supply*.
- *intermediated supply* means that a third party, usually an NGO or ward committee, facilitated the installation of the water point by applying to NWSC on the users' behalf, acting as guarantor for the payment of bills, providing financial support and /or assisting in

community mobilisation. In most cases the water points will be shared or communal, but there are also cases of intermediation for the installation of house connections.

Table 2 Categories of Water Source

Category	In whose name/ type of tariff	Ownership/ Control	Initiative/ Payment for Installation	Access	Payment for use and/or repairs
A. Free public supply	Usually government	Varies – Many cases unknown due to age	Many cases unknown due to age	Everyone	None
B. Communal or shared intermediated supply	Varies; often the Ward	Community/ TIC	Community/ TIC with possible assistance from ward and/or NGO	Entire community	Yes
C. Shared Private Supply	Private name	Users group	Users group with possible assistance from ward and/or NGO	Restricted to a specific user group in the community	Yes
D. Private Supply	Private Name	Private household	Private household with possible assistance from ward and/or NGO	Specific household, almost always shared with neighbours at owner's discretion	Yes
E. Commercial	-	Commercial	-	Any household who can pay	Yes
F. Other	Includes informal sources such as rivers, rainwater and illegal connections				No

Within each category, subcategories were created according to technology type and the presence or absence of a meter, since different tariffs apply to metered and unmetered NWSC supplies. These are the categories which have been used in assessing the types of supply in use in the communities studied.

Table 3 Detailed Categories of Water Source

A. Free public supply					
Category	In whose name/ type of tariff	Ownership/ Control	Initiative/ Payment for Installation	Access	Payment for use and/or repairs
A1. Stone Spout	-	KMC/ Heritage dept.	Unknown –hundreds of years old.	Everyone	None
A2. NWSC public standpost	None	Ultimately the NWSC	KMC, NWSC	Everyone	None by users bills paid by Ministry of Finance
A4. Dug well	-	TIC/ community	KMC/ward Unknown due to extreme age in some cases	Everyone	

B. Communal or shared intermediated					
Category	In whose name/ type of tariff	Ownership/ Control	Initiative/ Payment for Installation	Access	Payment for use and/or repairs
B1. Unmetered communal standpost	Ward. Tariff is set at Rs. 809 per month.	Community/ TIC	Community/ TIC with possible assistance from ward and/or NGO	Entire community	Community will divide tariff and cover small repairs.* (NWSC will cover major repairs.)?
B2. Metered communal standpost	Ward	Community/ TIC	Community/ TIC with possible assistance from ward and/or NGO	Entire community	Community will divide tariff and cover small repairs.* (NWSC will cover major repairs.?)
B3. Communal tube well	-	Community/ TIC	Community/ TIC with possible assistance from ward and/or NGO	Entire community	Community will divide cost of repairs.*
B4. Communal dug well	-	Community/ TIC	Community/ TIC with possible assistance from ward and/or NGO	Entire community	Community will divide cost of repairs.*

C. Shared Private					
Category	In whose name/ type of tariff	Ownership/ Control	Initiative/ Payment for Installation	Access	Payment for use and/or repairs
C1. Unmetered shared private standpost	Private name. Tariff is set at Rs. 176.50 per month	Users group	Users group with possible assistance from ward and/or NGO	Restricted to a specific user group in the community	Users group will divide tariff and cover small repairs.* (NWSC will cover major repairs.)?
C2. Metered shared private tap	Private name. Tariff is set at Rs. 40 for the first 10,000 L and Rs. 9.7 for every 1,000 L thereafter.	Users group	Users group with possible assistance from ward and/or NGO	Restricted to a specific user group in the community	Users group will divide tariff and cover small repairs.* (NWSC will cover major repairs.?)

*The way communities organise these payments differs. The Tole Improvement Committee (TIC) is usually responsible for collection but some communities have organised specific groups with this function. Where communities only pay for repairs, this is usually done on an as needed, rather than a per month or annual, basis. Equal contributions are made by all users. For NWCS tariffs most communities/user groups have set up a monthly rotary system between households. Some communities divide monthly bills between the users.

D. Private					
Category	In whose name/ type of tariff	Ownership/ Control	Initiative/ Payment for Installation	Access	Payment for use and/or repairs
D1. Unmetered connection	Private name. Tariff is set at Rs. 176.50 per month	Private household	Private household with possible assistance from ward and/or NGO	Specific household who may or may not share with neighbours.	Owner will pay tariff and may or may not charge neighbours
D2. Metered connection	Private name. Tariff is set at Rs. 40 for the first 10,000 L and Rs. 9.7 for every 1,000 L thereafter.	Private household	Private household with possible assistance from ward and/or NGO	Specific household who may or may not share with neighbours.	Owner will pay tariff and may or may not charge neighbours
D3. Tube well	-	Private household	Private household with possible assistance from ward and/or NGO	Specific household who may or may not share with neighbours.	Owners will pay for repairs and may or may not charge neighbours.
D4. Dug well	-	Private household	Private household with possible assistance from ward and/or NGO	Specific household who may or may not share with neighbours.	Owners will pay for repairs and may or may not charge neighbours.

E. Commercial					
Category	In whose name/ type of tariff	Ownership/ Control	Initiative/ Payment for Installation	Access	Payment for use and/or repairs
E1. Tankers	-	Commercial	-	Any household who can pay	Users will have to pay
E2. Vendors	-	Commercial	-	Any household who can pay	Users will have to pay

F. Other					
Category	In whose name/ type of tariff	Ownership/ Control	Initiative/ Payment for Installation	Access	Payment for use and/or repairs
F1. River	-	-	-	Everyone	-
F2. Rain	-	-	-	Everyone – during rainy season	-
F3. Illegal NWSC connection	-	-	-	Everyone	Users will organize payment for repairs

Table 4 overleaf shows the number of households which use each source in each community. From this table it can be seen that households use a large number of sources in order to ensure adequate supply, and that many of these sources are not part of the NWSC system.

The following observations can be made based on the community profiles and the data in Table 4:

- Most low-income settlements are not suffering acute water stress. Despite an inadequate (or absent) NWSC supply, most residents obtain a reasonable quantity of water throughout the year from a wide variety of private and traditional sources. A very common source is shallow tubewells; some of these are shared but many households have installed their own at a cost of roughly NRs. 3,500 (including handpump). Most of these tubewells provide a reliable yield in both the wet and dry seasons.
- While 83% of slum households had free public supply, this was due not to NWSC standposts but to the presence of stone spouts in two communities in Patan, confirming their importance to low-income communities there.
- NWSC taps (household connections, public standposts or yard taps) can be found in both slums and squatter settlements, confirming that, despite official policy, services are not necessarily refused due to a lack of land title. Few of these taps provide a satisfactory supply, however, and some deliver no water at all, hence community investments in alternative sources even where NWSC taps exist. Almost all functional taps are shared to some extent even where they belong to one household only.
- Intermediated shared or communal sources are used by 41% of slum and squatter households, indicating the importance of intermediation - by the ward or an NGO - in enabling low-income communities to access a water supply. Even some house connections have been secured with NGO assistance.
- Though commercial supplies are not used regularly, residents reported that they do use tankers and vendors in times of acute shortage.
- There is not a heavy reliance on NWSC network supplies; only 12% of households use free standposts, 11% use shared connections (these are all in one community, Balaju, in which an NGO provided assistance for these connections) and 11% use private connections.
- Tubewells are an important source of water; 27% of households use communal tubewells and 31% use private tubewells.

Table 4 Number of Households Using Each Type of Source

	Pop	Free Public Supply						Shared/Communal Intermediated				Shared Private				Commercial				Other					
		A1 Stone Spouts	A2 NWSC SP	A4 DW	Total Free Public	B1 UM SP	B2 M SP	B3 TW	B4 DW	Total Sh/ Comm/ Int.	C1 UM Conn	C2 M Conn	Total shared private	D1 UM Conn	D2 M Conn	D3 TW	D4 DW	Total Private	E1 Tanker	E2 Vendor	Total Comm	F1 River	F2 Rain	F3 Illegal	Total Other
Slums																									
Alko	382	105		25	130			0	0			1						1			0				0
Kami Tole	86	18			0	18		36										0			0				0
Nayagan	483	120			120		40	40			9	45					54				0				0
Pobo Thimi	411				0	18		36			0	16	50				66				0				0
Total Slums	300	225	0	25	250	36	0	18	58	112	0	0	9	62	50	0	121	0	0	0	0	0	0	0	0
Percent of households	75%	0%	8%	83%	12%	0%	6%	19%	37%	0%	0%	3%	21%	17%	0%	40%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Squatters																									
Balaju	731	148			0			0			110				114		114				0				0
Bansighat	431	119	18		18	55		73			0	11			27		38				0				0
Dhaukhel	191	42	9		9			0			0	33			30		72				0				0
Dhumakhel	184	58	45		45			0			0				36		48				0				0
Kapan	85	18			0		10	10			0				3		3				0	5		18	23
Pathivara	655	187	40		40		157	157			0	0			30		30				0	112	80		192
Sankhamul	504	99	18		18		18	27	45		0	0			36		36				0				0
Total Squatters	671	18	112	0	130	0	18	240	27	285	0	110	110	0	44	249	48	341	0	0	0	117	80	18	215
Percent of households	3%	17%	0%	19%	0%	3%	36%	4%	42%	0%	16%	16%	0%	7%	37%	7%	51%	0%	0%	0%	17%	12%	3%	32%	
Overall	971	243	112	25	380	36	18	258	85	397	0	110	110	9	106	299	48	462	0	0	0	117	80	18	215
Percent of households	25%	12%	3%	39%	4%	2%	27%	9%	41%	0%	11%	11%	1%	11%	31%	5%	48%	0%	0%	0%	12%	8%	2%	22%	

Note: households use more than one source, so percentages add to more than 100

SP	Standpost
UM	Unmetered
M	Metered
Conn	Connection
TW	Tubewell
DW	Dug well

Table 5 shows that there are very few NWSC taps in slum and squatter settlements, confirming the importance of alternative sources. In total there were 54 connections (not including free public standposts) in the 11 poor communities, and a total of 971 households. Only Nayagan and Balaju have a large number of taps, and these are exceptional cases since the taps were installed with external support. Where taps do exist, some are used by a very large number of households, others by very few due to the grossly inadequate supply.

Table 5 Number of NWSC Connections and Percent of Households Using Them

Community			Free Public		Shared/Communal Intermediated				Shared Private				Private			
			A2	A2	B1	B1	B2	B2	C1	C1	C2	C2	D1	D1	D2	D2
			NWSC standposts		Unmetered connections		Metered connections		Unmetered connections		Metered connections		Unmetered connections		Metered connections	
			no.	%	no.	%	no.	%	no.	%	no.	%	no.	%	no.	%
Slums		HH														
Alko	382	105												1	1%	
Kami Tole	86	18			1	100%										
Nayagan	483	120										3	19%	15	38%	
Pobo Thimi	411	57			2	31%								4	28%	
Squatters																
Balaju	731	148								11	74%					
Bansighat	431	119	1	15%			1	15%						1	13%	
Dhaukhel	191	42	1	21%										11	78%	
Dhumakhel	184	58	1	77%												
Kapan	85	18														
Pathivara	655	187	1	23%												
Sankhmal	504	99												4	0%	
Total	4143	971	4		3		1			11		3		36		

Table 6 shows the amount of time people are spending in water collection and the amounts they carry back to the house and store.

Table 6 Consumption, Collection Times and Storage

Community	No. of HH surveyed	% of HH surveyed	Collection volume (avg litres/day)	Collection time total	collection time (avg min/day)	collection time range	storage capacity (avg litres)
Alko	13	12.4%	62.9	410	32	10 - 75	66
Kami Tole	6	33.3%	45.3	255	43	20 - 75	34
Nayagan	17	14.2%	68.6	888	52	4 - 240	120
Pobo Thimi	8	14.0%	74.4	955	119	40 - 120	0
Slums sub-total	44	14.7%	65	2508	57		86
Balaju	11	7.4%	59.2	444	40.4	6 - 90	75
Bansighat	13	10.9%	101.2	1760	135.4	10 - 330	109
Dhaukhel	13	31.0%	71.2	657	50.5	4 - 120	160
Dhumakhel	13	22.4%	66.0	1074	82.6	5 - 120	183
Kapan	7	38.9%	42.7	460	65.7	30 - 180	70
Pathivara	28	15.0%	44.1	1175	42.0	5 - 120	32
Sankhamul	11	11.1%	77.3	1085	98.6	30 - 150	142
Squatters sub-total	96	14.3%	64	6655	69		99
Slums and squatters total	140	14.4%	64	9163	65		95

Some low-income households install storage tanks, handpumps and/or electric pumps to cope with the intermittent NWSC supply and low pressure. Many, however, have only limited storage in the form of pots and buckets, and on average households have only 95L in storage capacity at home. Many domestic functions are carried out at the water point to minimise the volume of water carried home. On average 64L is carried to the household per day, which is just over 10L per person. This means that essentially only water for drinking and cooking is being carried to the house.

Most water collection is carried out by adult women. Families surveyed reported spending on average 58 minutes per day collecting water; 47 minutes in slums and 66 in squatters. Higher collection times for squatter settlements may result from water sources being further away from settlements on marginal land.

5.4.3 Sanitation in Slum and Squatter Communities

Table 7 Number of Latrines by Ownership and Type

Community	No. of HH	No. of toilets by ownership			No. Sanitary	No. Insan.	HH with private latrine (any type)	HH with private sanitary latrine
		Private*	Communal	Public				
Slums								
Alko	105	77	0	0	1	76	73%	1%
Kami Tole	13	1	0	3	1	3	8%	8%
Nayagan	120	44	0	0	44	0	37%	37%
Pobo Thimi	55	31	0	0	31	0	56%	56%
Slums sub-total	293	153	0	3	77	79	52%	26%
Squatters								
Balaju	148	84	15	0	32	67	57%	11%
Bansighat	83	25	0	0	22	3	30%	27%
Dhaukhel	47	23	0	1	0	24	49%	0%
Dhumakhel	58	17	0	0	1	16	29%	0%
Kapan	18	4	0	0	0	4	22%	0%
Pathivara	187	14	3	0	1	16	7%	1%
Sankhamul	99	99	0	0	4	76	100%	4%
Squatters sub-total	640	157	3	1	60	206	25%	9%
Slum and squatters total	933	310	3	4	137	285	33%	15%

Note: A sanitary latrine is defined here as one that provides safe disposal of faeces, irrespective of superstructure type.

* includes private shared latrines

Coverage with with sanitary household latrines was found to be just 15% overall, with lower coverage in squatter settlements than slums. Nevertheless, one third of households had a latrine of some sort, many of them shared with neighbours. In Sankhamul (a squatter settlement) every household had a latrine. The presence of a large number of insanitary latrines suggests a significant demand for the privacy and convenience offered by a latrine, but less appreciation of the importance of safe excreta disposal. In slums, more durable latrines were found, some connected to sewers, but these simply discharged into local nallahs or the river.

Where pay-and-use toilets were found they were functioning and kept reasonably clean. Residents appreciated them though it is doubtful that all family members were using them.

In at least one case residents have established a primary solid waste collection service based on user payment.

In Dhunsihat (a squatter settlement) there is one KMC container which is emptied twice weekly, and the community recently initiated a primary collection service. A collector is paid NRs. 1200 per month for which each household contributes NRs. 20 or more, depending on ability to pay.

Drainage is poor in many settlements and in some cases residents cited it as a serious problem.

Typical costs of latrines installed at users' own expense are in the following ranges:

Type	Description	Typical Cost
Sanitary	Single offset pit with pucca superstructure	2500 – 6000
Sanitary	As above but with a less durable superstructure.	1500 – 3000
Insanitary	Lightweight shelter made from any available material. No pan or plinth; faeces spill onto ground.	None

5.4.4 Middle Class Water Stressed Communities

For comparison purposes, three non-slum non-squatter communities, identified as "lower middle class" areas, but which were experiencing severe water stress, were also surveyed. Dhalko is a Kathmandu community (Ward 17) in which Redd Barna has worked for almost a decade and can now be classified as an upgraded slum after extensive investments in water connections, latrines and schools. Subahal is a Newari community in Patan (Wards 7 & 8) in which UDLE has supported upgrading of latrines, old buildings and solid waste management. Finally, one courtyard in Tyodha (Kathmandu Ward 27) was included, which is in an old lower middle class community.

As the organisation carrying out fieldwork (Lumanti) had no connection with these communities it was difficult to obtain widespread co-operation and the data are limited by small numbers of respondents and a lack of completeness. Nevertheless, they do illuminate some significant differences.

In two of the communities there was universal connection to NWSC supplies and in the third, three-quarters of the households had a NWSC connection. Nevertheless these communities suffered higher water stress than the slum and squatter settlements visited, due to the inadequacy of NWSC supplies. Collection times, for example, were double those in low-income settlements.

These communities cope by using alternative supplies to a certain extent (39% use private tubewells) and investing in storage capacity: volumes were roughly two and a half times that in slums and squatter settlements.

Table 8 Collection and Storage in Middle Class Water-Stressed Communities

	Average volume collected from the source (l/day/HH)	Average time spent on collection (mins/day/HH)	Average storage capacity (l)
Middle class	102	126	238
Slums and squatter settlements	64	65	95

It is interesting to note that, as would be expected, almost all middle class households had private latrines, however in the case of Subahal these were not sanitary.

Table 9 Number of Households Using Each Type of Source in Middle Class Water Stressed Communities

No HH	Free Public Supply										Shared/Communal Intermediated										Shared Private										Private										Commercial										Other			
	A1		A2		A4		B1		B2		B3		B4		Total		C1		C2		Total		D1		D2		D3		D4		Total		E1		E2		Total		F1		F2		F3		Total									
	Stone Sp.	NWSC sp	DW	UM sp	M sp	TW	DW	UM conn	M conn	UM conn	M conn	DW	UM conn	M conn	UM conn	M conn	UM conn	M conn	UM conn	M conn	UM conn	M conn	UM conn	M conn	TW	DW	UM conn	M conn	UM conn	M conn	UM conn	M conn	UM conn	M conn	UM conn	M conn	UM conn	M conn	river	rain	illegal	Total												
Dhalko	150	82		82							30				30									66	99																													
Subahal	300	135	0	135						0														0	162																													
Tyodha	64		56	56																																																		
Total	514	135	82	56	273	0	0	30	0	0	30	0	0	0	30	0	0	0	0	0	0	0	0	122	199	162	162	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
			16%	11%	53%	0%	0%	6%	0%	0%	5%	0%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	24%	39%	32%	32%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				

Table 10 Number of NWSC Connections and Percent of Households Using Them in Middle Class Water Stressed Communities

Free Public Supply	Shared/Communal Intermediated						Shared Private						Private					
	A2	B1	B2	B2	C1	C2	B2	C1	C2	C2	D1	D1	D2	D2	D2	D2		
NWSC sp	UM sp	UM sp	M sp	M sp	UM conn	M conn	UM conn	M conn	M conn	UM conn	UM conn	M conn	M conn	M conn	M conn	M conn		
no.	%	no.	%	no.	%	no.	%	no.	%	no.	%	no.	%	no.	%	%		
Dhalko	3	55%												150	44%			
Subahal	2	0%												245	0%			
Tyodha														50	88%			

SP Standpost
 UM Unmetered
 M Metered
 Conn Connection
 TW Tubewell
 DW Dug well

Table 11 Sanitation in Middle Class Water Stressed Communities

Middle class	No. of HH	No. of toilets by ownership		Public	Sanitary	Insanitary	HH w/ pvt lat (any type)	HH with private sanitary latrine
		Private*	Communal					
Dhalko	150	150	0	0	150	0	100%	100%
Subahal	300	245	0	0	245	0	82%	0%
Tyodha	64	64	0	0	64	0	100%	100%
Middle class sub-total	514	459	0	0	214	245	89%	42%

5.4.5 Low Income Renters

Though it was difficult to collect disaggregated information on them, individual low-income renters appear to be the most vulnerable to water and sanitation stress since they have the least control over access to facilities. Renters are largely dependent on their landlords for these services, and are not organised into communities or user groups that could seek improved services as a collective.

5.4.6 Community Initiatives and Intermediation

There are many examples in the communities studied of external agencies providing intermediation and support to community water supply and sanitation improvements.

EXTERNAL INTERMEDIATION & SUPPORT

<i>Community</i>	<i>Intermediary</i>	<i>Water & Environmental Sanitation Support</i>
Alko	Lumanti Ward	HH latrines, well maintenance paving
Kami-Tole, Thimi	ward	Tube well construction
Nayagan	UBS (UNICEF) & LSMC	Well maintenance, HH latrines, paving
Pobo-Thimi		
Balaju	Women & Environment NGO, Reyukai & Lumanti	HH latrines NWSC shared connections
Bansighat	Lumanti	One shallow tubewell
Dhaukhel	KM/DHUD Ward	One public toilet 2 storage tanks
Dhumakehel		
Kapan	VDC	NWSC illegal connection (now regularised)
Pathivara		
Sankhamul	Ward	2 Storage tanks with shallow tubewell supply
Dhalko	Redd Barna	Rehabilitated stone taps Hygiene & sanitation promotion Paving
Subahal	UDLE	Solid waste management
Tyodha		

6 Issues in Water Supply and Sanitation Service Delivery to the Poor

This section considers the financial, technical and institutional implications of the study for the design of viable water and sanitation services for the poor. Affecting all of these are three key findings:

1. The water and sanitation problems of low-income communities are, in physical terms, of a solvable size since most low-income communities are small and scattered among higher-income settlements in central city areas. Through a combination of network rehabilitation, reduction in unaccounted for water and Melamchi supply, NWSC should be able to provide an adequate water supply to the entire urban population of Kathmandu.
2. Consumption of NWSC water in low-income communities is restricted more by supply factors than by cost. (Installation and connection charges are a constraint but there is evidence that residents can at least afford shared water connections).
3. The poor are valid consumers who are able and willing to pay for services that they value; there is no need to plan for completely free supplies. (Note that many poor households already have metered electricity connections).

6.1 *Financia!*

If the poor are to be treated as valid customers it is necessary to know how much people are willing and able to pay for better services. Specifically, could they afford house connections – both installation costs and user charges – and if not, what are the alternatives? A full willingness to pay study was not part of the research, and should be considered for the future. An indication of ability and willingness to pay can be obtained by examining what people currently pay for shared and non-NWSC supplies and latrines, plus any other costs incurred in coping with an inadequate supply.

6.1.1 *Installation costs*

For a house connection (including a yard tap), costs including connection charges are in the range of NRs. 11,000 to NRs. 15,000 (\$160 - \$220) depending on the length of pipe to be laid. Few new house connections were encountered in the study though in one slum 18 houses had taps for which the occupiers paid installation charges of NRs. 1500 some 20 years ago. It is difficult to make any hard conclusions from this, though the low incidence of connections (perhaps influenced by limited rights of access to services) suggests that most poor people cannot afford a private house connection. There may be a few households at the top end of the income range that could afford a higher level of service, but they do not represent the general trend.

Shallow tubewells with handpumps ("rower" pumps and Nepal No 6) are relatively common in squatter settlements and cost roughly NRs. 3,500 to install including materials and labour. For shared taps, investments per household are generally modest (under NRs. 1,000). For latrines, most people have paid less than NRs. 4,000. The study found no examples of households investing as much as NRs. 11,000 to 15,000 and it seems reasonable to suppose that for the majority this would be unaffordable. It appears, then, that a shared water point will be the only affordable NWSC supply for most poor people – perhaps community-built but fed from the bulk supply, as in Chaunni. The availability of micro-credit, however, might raise the affordability level significantly. It will be important to investigate how this might be provided; perhaps the utility itself could offer credit facilities.

6.1.2 *User charges and maintenance*

Typical monthly charges for shared or non-NWSC water points are mostly in the range of NRs. 50 to 80, indicating that NRs. 40 per month, the current minimum charge for a metered supply for a house connection, is affordable. Charges for unmetered connections (and ones with non-functional meters) are much higher, however, at NRs. 176.50 per month. The percentage of users paying the unmetered rate is not known, but the majority of connections are unmetered, due in part to a lack of meters at NWSC. Installation of new meters is part of the planned network rehabilitation program to be implemented by the private operator. New tariffs and a trend towards universal metering will have an impact on the poor.

6.1.3 *Coping costs*

At present, coping costs are for most low-income residents are significant but not excessive. Only a few households purchase water from vendors or adjoining settlements and most have a reliable source of water close by, in many cases a cheap shallow tubewell with low running costs. If, however, tubewells proved unsuitable in the long term (due to high iron content or bacterial contamination, for example) then it is not clear how people would cope. A shift to tanker supplies at current rates could prove very expensive.

Few poor families can afford to invest in electric pumps or overhead storage tanks (space is also a constraint in the case of storage tanks). Water storage at the household level is done in a variety of small containers such as buckets, jerry cans and pots, many of them recycled containers which are not costly. As can be seen from the slum and squatter profiles (section 5.4) household storage capacity varies between 32 and almost 200 litres, with an average of about 100 litres.

Time spent in water collection is significant but not excessive; in slums it was found to be on average about 57 minutes per household per day, in squatter settlements it was slightly more, at approximately 69 minutes per household per day. (These figures reflect only the time for collecting water to be brought back to the house for use there; they do not include time spent at the water source bathing, doing laundry or washing utensils, which if available, would give some indication of the time cost associated with having a source away from the house.) Water is collected by adult women.

It is interesting to note that in the middle class water-stressed communities profiled, where dry NWSC household connections were common, the times spent in collection were almost double that of slums and squatters (126 minutes per household per day), suggesting that poor communities have well established alternate sources.

6.1.4 Aspirations and Willingness to Pay

In slums, people were generally satisfied with their latrines; problems with water supply, drainage and solid waste management were of greater concern. In one case respondents were willing to pay NRs. 50 per household towards water supply improvements, in another NRs. 300. In squatter settlements, most respondents wanted better water supplies and sanitation and again indicated a willingness to contribute towards them. In two communities they were willing to pay up to 50% of the cost of improved water supplies, though no sums were mentioned. Regarding sanitation there was evidently a demand for better drainage, with two communities willing to pay up to NRs. 500 per household, another up to NRs. 300.

There was also evidence of previous expenditure on improved facilities: most families were upgrading their houses or had already done so, and many had invested in tubewells, concrete piggins, latrines, or shared water points - some with ward assistance. Electricity connections were found to be common in both slums and squatter settlements. Below are some examples of community investments.

Sankhamul (squatter settlement)

In 1999 the ward provided two 5000 litre HDPE storage tanks, an electric pump, and a pipe to connect the tanks to an existing shallow tubewell. Residents contributed NRs. 50 each (approximately NRs. 5,000 total) to construct a platform and tapstands, and with the surplus installed a second communal tubewell and rower pump. They then began raising NRs. 10 per month per house for maintenance of all communal water points in the settlement. This system petered out after six months but the Tole Improvement Committee still raises maintenance funds from the community when necessary. The electric pump breaks down quite often, and costs around NRs. 600 to repair.

Bansighat (squatter settlement)

In this settlement of 83 households, there are two communal (shared) NWSC taps, of which one is metered and payment of bills is shared, while the other is unmetered and free. There is also a private NWSC tap which is accessible only to people who pay the owner; he currently charges NRs. 50 per household per month. There is also a waterpoint served by a shallow tubewell installed by a local NGO which is used by the whole community. Costs are as follows

Source	Installation costs (NRs.)	User charges (NRs.)	Annual maintenance costs (NRs.)
First communal NWSC tap	7,000 approx (1992)	None	300 to replace tap (paid by TIC)
Second communal NWSC tap	15,000 (1999)	500 – 700 per month (metered)	None so far
Private NWSC tap	11,000	50 per user household per month	NA
Tubewell waterpoint	18,000 (7600 paid by community, rest by NGO)	None	NA

Savings and credit groups have been established in several squatter settlements with NGO support, increasing the potential for user investment in infrastructure upgrading.

Although a formal willingness to pay study was not included in the community assessments, a workshop was held by Lumanti and NEWAH May 25, 2000 as a follow-up to the fieldwork so that slum and squatter dwellers to give their feedback on some of the issues facing the provision of the urban poor with improved supplies. This included a rough non-economic assessment of willingness to pay.

The participants (57 people; 25 from 6 slums in Lalitpur and 32 from 12 squatter communities in Kathmandu) were divided into six groups and asked the following questions:

1. If the tap was installed in your community for every 15 households, with a flow of 3 ggris per person per day (a ggris is a traditional Nepali water pot containing about 15 litres, so 3 ggris is about 45 litres), how much are you willing to pay per month and how much are you willing to pay for installation?
2. In the same condition as above, if a storage tank was constructed / installed with the tap, how much are you willing to pay per month and for installation?
3. How much are you willing to pay per month and for installation for private connection?

There was a wide range of responses from the groups (see table below). Willingness to pay for the first option ranged from NRs. 10 to 50 per month, with some groups giving a range which makes calculating an average difficult. A rough average of NRs. 25 per month can be arrived at, however. Willingness to pay for installation ranged from NRs. 50 to NRs. 450, with NRs. 200 as a rough average.

Group	Connection for every 15 HH (per HH)		Connection with tank (per HH)		Private connection (per HH)	
	Monthly fee	Installation cost	Monthly fee	Installation cost	Monthly fee	Installation cost
Group 1	30	450	30	500	100	1000
Group 2	15	175	16.50	247.50	60	1000
Group 3	10-30	50	15	100	80	
Group 4	40-50	6-8 per ft.			50-60	6-8 per ft
Group 5	15	200	15	300	30	1000
Group 6	#	100	#		65	1000

Monthly fee should be according to the meter

Willingness to pay for a tap with a storage tank was approximately the same, but willingness to pay for a house connection was significantly higher. Some participant groups expressed a willingness to pay up to NRs 100 per month, and a rough average of NRs 65 per month for all 6 groups can be estimated. Participants were willing to pay NRs 1000 for installation. If Option 1 were to be installed, metered and paid for under the existing tariff structure, the cost would be as follows:

45 litres per person per day x 5 people per hh x 30 days per month = 6750 litres/hh/month	
6750 litres x 15 households = 101,250 litres per month	
First block 10,000L	NRs. 40
Second block 91,000 L @9.3/1000	NRs 849
Total bill	NRs 889
Cost per household	NRs 59
If the same option were to be billed at the tariff projected for 2004* (assuming no IBT) the cost would be as follows:	
101,250 litres per month @ NRs 13.88/1000 l	NRs 1,405
Cost per household	NRs 94

*In 1998 prices estimated by consultants as the required average tariff to achieve financial equilibrium by 2005

The projected 2004 tariff is about four times the current rough willingness to pay expressed in the meeting. However, it is 44% more than the monthly tariff people are willing to pay for house connections, suggesting that even though this is not the level of service people aspire to, it is not completely unaffordable.

6.1.5 *Tariff structure*

Issues of tariff structure and equity have to be considered for the city as a whole, as subsidies for one income group impact on the resources available to serve another. With regard to the needs of the poor, the current increasing block tariff is fundamentally flawed in that:

- it allows excessive consumption at a flat rate that does not enable full cost recovery. There is consequently no incentive for the utility to extend new services to the poor
- it effectively provides a subsidy to better off customers with private household connections while levying a higher per litre rate to users of metered shared taps

With the prospect of private sector participation in NWSC and an improved level of service from Melamchi, economic pricing of water is now proposed and there is a strong case for ending the IBT or at least revising it radically. Charges based on metered consumption at a single tariff would resolve the current iniquitous situation and encourage responsible consumption.

If it is decided that the IBT must be retained, then in addition to raising the tariff to an economic level the size of the first block should be reduced.

6.2 *Institutional*

NWSC is not the only player involved in the delivery of water and sanitation services to the poor and if adequate services are to be assured in future, it may be necessary to harness the resources of the municipality, CBOs, NGOs and the small scale private sector. It is assumed here that NWSC if a private operator is brought in to manage NWSC, the operator will remain responsible for bulk and secondary supplies; it is at the tertiary (neighbourhood) level that other agencies may have a role.

6.2.1 *Connection rights*

NWSC displays a relatively benign attitude to the poor but legally, squatter households (estimated by the researchers of this study to number approximately 3000 in Kathmandu) do not have a right to an NWSC connection. Unless this changes, the operator will have neither incentive nor opportunity to serve some of the city's poorest residents. The government policy objective to upgrade slum and squatters settlements (see 3.1.4) may yet provide the necessary sanction for providing connections, but better still would be the adoption of explicit rights of access and a de-linking of connection rights from land tenure.

6.2.2 *Easy access*

It appears that the poor lack access to network services due in part to the complexity of the application process. To facilitate access of the poor to services and make it easier to serve them, an explicit approach for low-income communities – individually or collectively – is required. This could be done, for example, by:

- setting up a special cell that functions as a user friendly 'one-stop-shop' for applications
- recognising the role of the wards, NGOs or other intermediaries in mobilising users and making applications on residents' behalf
- offering credit for installation or providing links to finance organisations who could;
- interfacing with small scale independent providers (SSIPs)
- taking responsibility for the construction of tertiary infrastructure
- preparing standard designs and options suitable for use in low-income communities.

6.2.3 *Intermediation and Guarantees*

The utility may be reluctant to deal with clients, such as user groups, that are not individuals, or may perceive that services to low income people carries with it a risk of non-payment of bills. Possible solutions include:

1. *Security Deposit.* This is an existing requirement for both house connections and shared taps, and for low-income communities is paid collectively or per connection, depending on the form of supply. It could be increased but may become a deterrent if the amount required is set too high.

2. *Intermediation.* An intermediary such as an NGO, the ward committee or another organization would act as guarantor i.e. undertake to pay the bills should the users default. This might be viable but would only have city-wide application if there were sufficient suitable intermediary agencies willing to take on the role.

3. *Bulk supply.* The utility extends a bulk supply to a community which then constructs water point(s), or a local distribution network, if necessary or feasible, at its own expense and imposes user charges to cover the NWSC tariff plus installation and operating costs. Alternatively, water points or distributions systems can be run on a commercial basis by small entrepreneurs. This option would reduce capital investment by the NWSC operator and allow for easy disconnection in the event of non-payment of bills. Local distribution networks under this model can be very "low tech", consisting of above ground plastic pipe.

6.2.4 Consultation

Consultation and transparency are key to success in providing services to the poor. In the case of private sector involvement the poor may have legitimate concerns that they will see little benefit; indeed they may be negatively affected. Experience elsewhere (for instance Buenos Aires) has shown that a formal consultation process can go a long way towards avoiding problems. A way to address this is to create a permanent forum for consultation and stakeholder input in the form of a committee with representation from civil society, users and local government. This committee then advises the utility and helps design public education programmes.

6.2.5 Role of the ward

A repeated theme emerging from the study is the importance of the ward, not only as the channel of communication between NWSC and the poor but as a source of direct assistance. Wards hold only modest funds but there are numerous examples of them supplying hardware; in the case of Chaunni they have even taken over management of the local distribution network and provided an operating subsidy. Unfortunately, ward committees are also political in nature and have a variety of other roles. As such they could not be relied upon to play such a comprehensive role in every case, and are unlikely to take on the role of financial guarantor.

A more realistic vision may be for the wards to take responsibility for local needs assessment; validating applications; bringing in NGOs to facilitate the procurement of community services and to promote latrine use; seeking donor support where necessary; and appointing contractors for latrine construction, solid waste management and other infrastructure works.

In any case, ward approval for many of the options outlined here would be required, so their role is important and must not be overlooked.

6.2.6 Role of NGOs

NGOs could potentially play a variety of roles in securing services for poor communities:

- as *intermediaries* they could facilitate communication between service providers and users, help identify needs and options, raise awareness of rights and options, support applications for new connections, facilitate local planning and mobilisation; help form and train user groups, and carry out user education;
- as *donors or micro finance providers* they could provide up-front funds for construction of local networks, shared water points and house connections;

- as *technical advisors* they could help in the preparation of designs for local infrastructure and oversee its installation.

It is doubtful that many NGOs in Kathmandu would currently have the skills and capacity to serve poor communities in this way, and it may not be appropriate for NGOs to take on the long term obligations inherent in the role of guarantor. However, with a program of capacity building, NGOs active in other sectors could be trained to play intermediary roles, as they have in other cities such as Dhaka.

NGO overhead funding would also be a constraint, though the operator might be willing to provide funds for this, particularly for awareness raising, demand creation and user education. Central government may also take a role in supporting NGO intermediation.

The recently formed Federation of Slum Dwellers may also be able to take a role in awareness raising, education and intermediation.

6.2.7 *Role of user groups*

The UDLE project in Patan has for some time used community contracting for local infrastructure development, with apparent success. There may be some potential in doing the same for the installation of tertiary water and sanitation services in poor communities. This could help to minimise costs, promote a sense of community ownership, and plough resources back into the community. There may, however, be problems of technical competence and quality control, thereby increasing the need for external support and raising transaction costs. It may be more efficient for NWSC to adopt standard designs and oversee their installation directly.

Community management of tertiary services is also a possibility but the example of Chaunni indicates the need for training and support. The capacity to manage local services technically and financially cannot be assumed and again, external support and capacity building will be needed.

6.2.8 *Role of the small scale private sector*

Private sector roles in the domestic water supply are largely confined to tanker supplies, borehole drilling for institutional and commercial clients, and the installation of shallow tubewells with handpumps. Commercial on-selling of NWSC water was not found in the study areas, but there is no reason to assume that it could not be a viable service delivery option in the future.

Heavy handed regulation of small scale independent providers, price controls on non-NWSC supplies or the prohibition of on-selling are not justified. In fact, the on-selling of bulk supplies by user groups or small commercial operators may offer a viable means of extending services to poor communities, especially squatters, once Melamchi comes on line or a private operator is able to increase supply. As such, it should be encouraged. One activity which does have to be regulated, however, is the large scale extraction of deep ground water, for reasons of water resource management.

Turning to sanitation, there is a potential role for contractors or trained individuals in the construction of improved latrines should the wards or local NGOs become active in latrine promotion. Materials for latrine construction are available in local markets.

6.3 *Technical*

6.3.1 *Water Quality/Water Resource Management*

Faecal coliform tests were carried out on samples from several sources and from water stored in households and are presented in Table 12. Levels above 10 faecal coliforms per 100 ml were regarded as contaminated.

Due to the limited number of tests conducted, this data must be treated with caution. Nevertheless, some general trends can be observed. The tests found that 9 out of 16 samples from handpumps on shallow tubewells were contaminated by faecal coliforms. However, samples from 4 NWSC connections showed roughly the same incidence of contamination.

Both samples from dug wells were highly contaminated.

8 out of 10 household samples were contaminated, substantially so in some cases. The data suggests that transportation and storage may introduce a significant degree of contamination, highlighting the importance of good hygienic practices.

Contamination by iron is also a concern with shallow tubewells, as is the fear that bacterial contamination will increase dramatically if waste water flows increase.

Table 12 Water Quality Test Results

	Handpumps				Other sources				Within Household	
	1	2	3	4	NWSC Tap	NWSC Tank	Dug Well	Stone Tap	1	2
Slums										
Pobo Thimi	1						770		47	
Kami Tole	0	129							850	
Alko								0	12	
Nayagan									0	0
Squatters										
Pathivara	65	109	88	129					4800	
Kapan	26								20	
Sankhamul	0	0	29		0					
Balaju	0	0	10			0				
Dhumakel	0	0								
Dhaukhel	18				118				34	192
Bansighat					1500		1800		3000	

Note: Numbers indicate faecal coliforms per 100ml

6.3.2 Impact of Melamchi supply

The introduction of Melamchi supply will have implications for poor consumers:

- increased pressure will cause massive leakage in the distribution network if current deficiencies are not rectified; this may effect poorly drained low-lying communities more than other areas of the city;
- increased volumes of waste water could pollute shallow groundwater, contaminating handpump tubewell supplies used by low income people;
- additional waste water will also exacerbate local drainage problems, especially around shared water points, and may reduce the effectiveness of pit latrines.

Network rehabilitation is already planned under the proposed NWSC management contract but investments in surface water drainage will also be needed, not only at water points. This is a municipal responsibility and additional funding may be required.

6.3.3 Water point design

Drainage at standposts and shared taps is mostly inadequate, and few water points are designed to accommodate essential activities such as bathing and laundry. Improved standard designs are needed and should be produced in consultation with users. NGOs and the wards could assist in their development and support water point rehabilitation.

6.3.4 *Technical expertise*

In considering potential roles in the planning and delivery of new services, the technical capacity of each player must be borne in mind. Community contracting and / or community management of tertiary supplies may be attractive in principle but the technical capacity to install local infrastructure is not assured and the provision of technical support could result in substantial transaction costs. It is in any case uncertain whether there are sufficient sources of technical support to meet the potential demand.

In the case of latrines, the study found little knowledge of cost-effective designs in low-income communities. There is a need for both hygiene education and the training of latrine builders – an ideal task for competent NGOs if they can be found.

There is little knowledge of the international experience in serving the urban poor.

7 Models for service delivery

7.1 *Service Delivery Options*

Based on the foregoing analysis the grid overleaf identifies a number of potential options for service delivery. In considering their relative merits it must be remembered that the pre- and post-Melamchi scenarios are hugely different; it may be necessary to develop options for both. The models fall into four categories:

1. Free public supply
2. Intermediated shared supply
3. Private household supply
4. Commercial supply

Existing and potential options for water supply to slum and squatter communities

Free public supply	Existing	Potential	Comments
Public standposts	<p>Older ones supplied free to users, though rarely in squatter settlements. NWSC charges should be paid by Ministry of Finance, but not done.</p> <p>NWSC are reluctant to put in any more of this type due to lack of supply and non-payment by Ministry of Finance.</p>	Standposts free to users, as now.	<p>No incentive for utility operator to provide or maintain supply.</p> <p>Could result in substantial wastage.</p> <p>No sense of community responsibility for maintenance.</p> <p>Not recommended.</p>
Stone spouts	<p>Fed by springs several km from city. Provide a substantial yield all year, are popular, people consider safe for drinking. Quality tbc.</p> <p>No established maintenance system and transmission line at risk of contamination. Serving densely populated areas in Patan.</p>	<p>As now but with defined maintenance system including monitoring of sources, repair/protection of transmission lines and transmission lines, and collection and management of maintenance funds.</p> <p>(Needed due to potential for contamination)</p>	<p>Valued traditional source, unlikely to fall out of use completely, but significance in domestic use may diminish if more NWSC supply available.</p> <p>Very localised and no potential for expansion.</p> <p>Question of who to take maintenance responsibility; not necessarily operator, municipality may be more appropriate.</p>
Dug wells	A number found as a secondary supply; water not used for drinking	As now but technically improved as per YUHP. Not recommended as free option as dug wells require maintenance	

	Existing	Potential	Comments
<p>Intermediated shared supply</p> <p>NGO or ward -intermediated shared taps</p>	<p>Installed in name of ward following users' request via ward committee. Installation charges include deposit, materials and installation costs; supply usually metered on household tariff (IBT) or on fixed monthly payment (NRs. 809 per month).</p>	<p>Wards identify communities needing connections, wards or NGOs assist in planning, mobilisation, formation and registration of user groups and submission of applications. NWSC extend network into unserved area and provides shared or household connections according to demand. Installation costs either free, financed by micro-credit, or recovered through tariff.</p>	<p>NGO intermediaries should not take on a long term commitment.</p> <p>User groups need to have formal recognition and registration. Method of cost recovery at shared connections needs to be developed by user group.</p> <p>Efficient for NWSC to install infrastructure direct; ensures quality control and can be done alongside rehabilitation of city network.</p> <p>Need to create incentive for utility operator and remove perceived risk. Deposit may be required but must be affordable to users.</p> <p>May not be legal option for squatters though intermediation may help.</p>
<p>CBO-run mini distribution systems</p>	<p>Chaunni water supply; free bulk supply, community-built tertiary infrastructure. Ward operates the system, imposes user charges and provides an operating subsidy.</p>	<p>Bulk supply from NWSC; CBO installs and operates standposts or local distribution system. Mobilisation by wards or other intermediary (NGO, CBO, Federation of Slum Dwellers?). Intermediary also supports application to NWSC (made direct or via ward), acts as guarantor and provides loan for installation costs.</p> <p>Standposts may include storage facilities.</p> <p>User group operates the water point / network and sells water at a rate set to cover both NWSC tariff (metered charge), loan repayment to NGO and caretaker salary.</p>	<p>If community pay installation costs without a loan, user charges will be lower.</p> <p>Utility operator could provide the loan, with recovery through tariff, and install connections.</p> <p>Connection would need legal status. If CBO could not become legal operator, intermediary would have to take on long term obligations.</p> <p>Metering of bulk supply essential for cost recovery; suitable tariff needed.</p>

	Existing	Potential	Comments
Intermediated shared supply cont'd			
Community managed deep boreholes	Not found in slum or squatter communities	Community-managed, water sold to users; NGO provides loan / grant for installation and local distribution network, and technical support.	Need information on aquifer and groundwater quality. But may be an option where shallow tubewell supplies unsafe or unreliable. Could potentially serve whole community. Unlikely to be attractive post-Melamchi.
Communal shallow tubewells	Tubewells with handpumps (rower pumps or No 6 pumps) common in both slum and squatter communities often provided with NGO technical and financial support. Apparently provide a reliable supply all year, but quality is a concern.	NGOd could continue to assist communities to install but with technical improvements in platform design, drainage, or siting to avoid contamination from latrines. May still be a good option for squatter communities in peri urban areas. Role for micro-credit?	Future viability of shallow groundwater is uncertain; may be contaminated by increased volumes of waste water post-Melamchi; already about 50% are contaminated with bacteria. Also problem of high iron content.
Communal Dug Wells	No new ones being installed, but many traditional ones offer good supply, especially if improved.	Potential limited. More wells could be rehabilitated but numbers served would be small.	

Private household supply		Existing	Potential	Comments
House connections	Users must pay installation costs which can be high depending on distance from main line. According to NWSC squatters not legally entitled, but in practice anyone can apply for one.	As now but possible role for micro-credit to fund installation costs. Economies of scale if many / most of the community install at one time.	Not clear how micro-credit could be provided city-wide, or what institutions best to provide it.	
Shallow tubewells with handpumps	Tubewells with handpumps (rower pumps or No 6 pumps) common and private owners often allow others to use water, either for free or for a fee. Apparently provide a reliable supply all year, but quality is a concern.	As now; though may be scope for technical improvements in platform design, drainage, or siting to avoid contamination from latrines. Role for micro-credit?	Connection rights for squatters would need to be established. Future viability of shallow groundwater is uncertain; may be contaminated by increased volumes of waste water post-Melamchi; already about 50% are contaminated with bacteria. Also problem of high iron content.	
Rainwater harvesting	Harvesting common in monsoon using buckets etc. - no special arrangements	Possible role for NGOs and microcredit for development of improved facilities and storage?	Seasonal application	
Commercial Supply				
Tankers	Private tankers operate throughout city, especially in dry season, but not commonly used by the poor.	As now. Provide bulk water sources to vendors, allow on-selling, use market competition to set prices and consumer education to control quality. Monitor via random testing – but by whom?	Useful supplement to NWSC supply but may not be needed post-Melamchi.	
Water kiosks	None at present.	NWSC supply to small scale private operator who on-sells at a profit. The kiosk operator may add value by providing simple treatment e.g. UV. Also, possibility of private sector installing small distribution systems if incentives are right – small scale concession contracts (2 year)?.	Could also operate from point sources e.g. boreholes. On-selling of water must be legal. Potential concerns over price regulation and mini-monopolies.	
Private deep boreholes	None at present	Small scale independent provider drills borehole and sells water either through waterpoint or mini-distribution system	High cost Unreliable as water table drops Deep boreholes may be regulated in future with extraction charges levied	

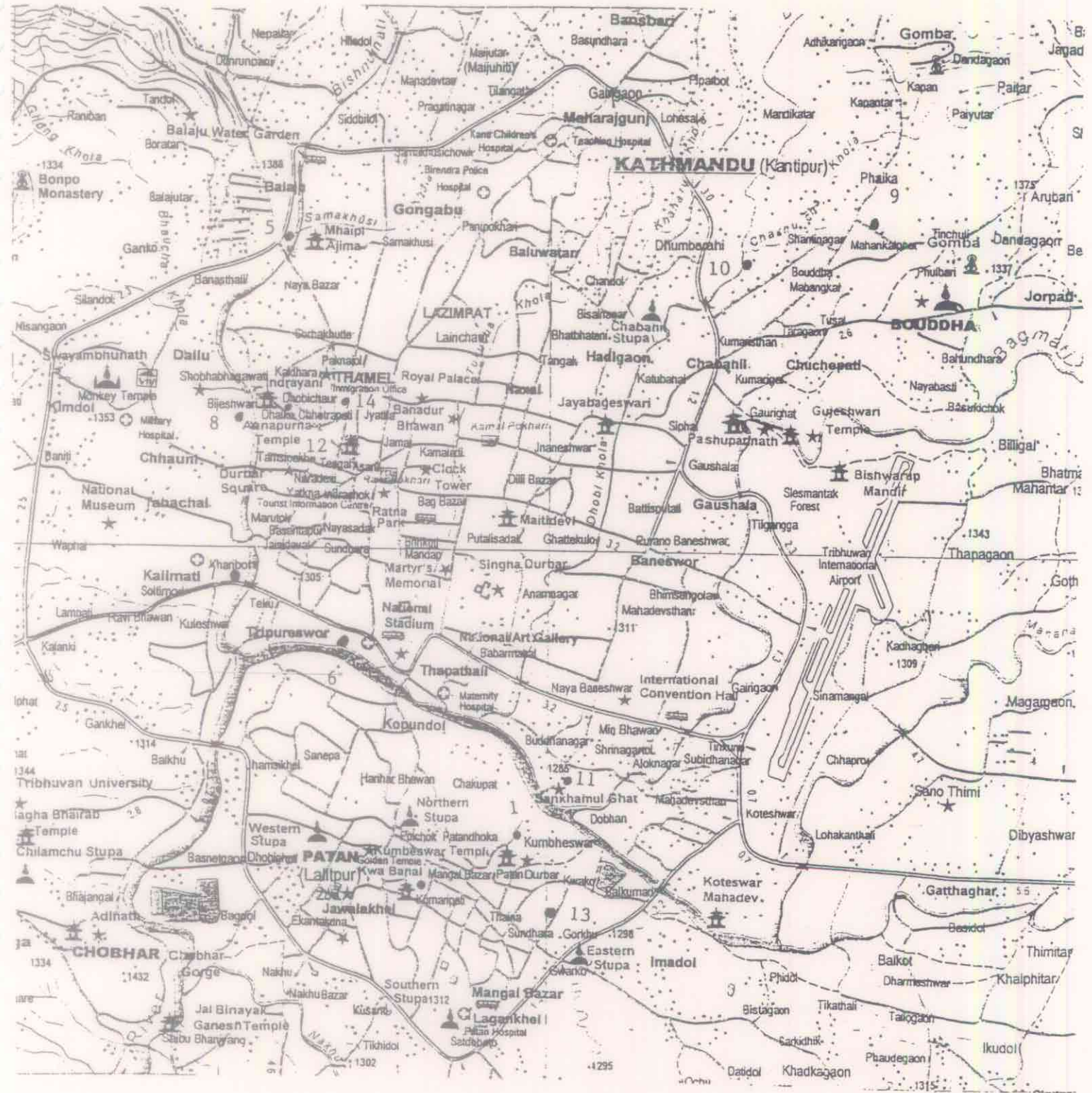
Sanitation	Existing	Potential	Comments
Public toilets	Free municipal toilets not maintained or cleaned. More success with pay-and-use toilets, operated by small entrepreneurs under ward control.	Scope for expansion in public places but may not be ideal for residential areas: cost may deter use by all family members, especially children. Location or access may be inconvenient, especially at night. Could include caretaker-operated sanitation and bathing blocks. Make free for children? Where cost or space prohibits the installation of a toilet in every house, provide a smaller number of individual toilets, each reserved for the exclusive use of use of a self-selected group of 4 or 5 families who are willing to share.	
Shared toilets	Some owners share in established communities. Not always sanitary or durable.	Role for NGO in micro-credit, technical support, development of low cost designs, training of masons, hygiene education. Subsidies may not be needed. If sewers available, ward negotiates right to connect. Tariff? If it is a percentage of the water bill then rates could be high if linked to a metered shared connection.	
Household toilets	Mostly built by owners at own expense but not always sanitary or durable. Some built by grant / subsidy under NGO or government schemes, connected to local sewers with no final treatment.	Indian LCS model: government-funded promotion of household latrines. Municipal ward contracts local NGOs for promotion, hygiene education and implementation. Construction by trained community artisans. NGOs may also provide micro-credit. Subsidy-free? Single- or twin-pit pour-flush may be suitable depending on user willingness to empty full pits. If sewers available, ward negotiates right to connect. But if the number of connections is low, there may be insufficient water to maintain flows. Small bore or condominal sewerage may be possible, though capacity of users / local agencies to install or maintain them is uncertain.	NGOs train artisans in selected communities, strengthen supply chain, promote cost-effective models, provide access to micro-finance, and hygiene education. NGOs work under the ward to ensure good linkage with the municipality. Subsidy-free? If sewers available, ward negotiates right to connect.
Other options (public, shared or private)	A small portion of the city is seweraged, but there is no sewage treatment.		Utility operator could be required to investigate options.

8 Conclusions

1. Contrary to expectations, water stress in most low-income communities is not acute. Faced with an absent or unsatisfactory NWSC supply the poor have coped through their own initiative and invested in alternative sources, sometimes by organising communally. Nevertheless, low-income communities consistently identify water and/or sanitation problems as a high priority and are willing to contribute to improved facilities. Given the choice, most would opt for a reliable NWSC supply, partly because NWSC water is regarded as good for drinking.
2. While some middle class communities are suffering more acute water supply problems than the poor, they do at least have NWSC connections and should be adequately served after network rehabilitation, a reduction in unaccounted for water and the introduction of Melamchi supply. The poor, meanwhile, will still lack access to adequate NWSC supplies.
3. If the water supply needs of the poor are to be met via NWSC supply, three key obstacles will need to be overcome:
 - a) The poor need easy access to connections. Access at present is patchy and inconsistent: despite official rules, some squatters obtain taps but for all low-income communities the procedures are slow and residents are largely reliant on the goodwill of ward committees and the assistance of intermediaries. The poor need clearer right of access to NWSC connections, and a simplified applications procedure.
 - b) In order to secure connections, the poor may need assistance with installation costs, which can be substantial where the nearest supply line is some distance from the community. Micro-credit could be valuable here.
 - c) There is a need for appropriate pricing of water and it is essential to recognise that the current lifeline tariff does not benefit the poor, since few of them have house connections. There is no need to provide the poor with free or even subsidised water, but they should not pay more per litre than better off consumers.
4. Private sector participation should be tailored to suit the needs of the poor by providing suitable incentives for the operator to deal with the issues outlined above. This can best be achieved by treating the poor as valid, paying consumers. There are many examples of community self help initiatives and intermediation by NGOs and local government. These initiatives could serve as models for institutional arrangements under a private sector arrangement.
5. While NWSC should, in the long term, be able to meet the water supply needs of the poor, many people will remain dependent on alternative sources for some time to come. This being so, NGOs and other support agencies should consider supporting the upgrading of traditional and alternative water sources. This could include improving water source design to accommodate domestic activities such as bathing and laundry, providing better drainage and protecting water sources from contamination. Technical guidance on the wide range of available technologies could also be helpful, for example handbooks in Nepali and English.
6. Water quality enhancement is not widely practised in low-income households due partly to a lack of awareness and partly to the high cost of boiling water. There appears to be significant potential for low cost methods of water purification such as solar disinfection, point of use chlorination and household slow sand filtration.

7. Sanitation in its broadest sense needs attention in slum and squatter settlements, and this will require different strategies to those for adopted for water supply. There is a need for:
 - a) Promotion of cost-effective household latrines. NGOs, perhaps in partnership with ward committees, could do much by researching appropriate designs, training latrine builders, ensuring a local supply of materials and providing access to micro-credit.
 - b) Improved solid waste management. As with water supply, a right of access to official services will help but the municipalities provide only secondary collection at present. More could be done to promote primary collection, and again competent NGOs could help by developing viable models of service delivery. There is evidence that low-income communities may be willing to pay for such services.
 - c) Effective drainage. Many squatter settlements suffer severe drainage problems and there is evidence that residents are willing to contribute to improvements. A government decision to implement a policy of upgrading would obviously help but failing that, this may be another area for NGO assistance.
8. Though there is a potentially major role for NGOs in direct support to the poor and in intermediation, the capacity of the local NGO sector in Kathmandu is limited and needs strengthening.
9. The role of Municipalities and Wards in infrastructure and services has been increased under the Local Self Governance Act. All community based water and sanitation interventions must work with and support municipal and ward politicians and staff.
10. This study has touched on a number of issues needing further research if the design of water and sanitation services is to meet the needs of the poor. They include:
 - enumeration and mapping of the poor;
 - the water and sanitation needs of low-income renters;
 - the potential role of the wards and NGOs in facilitating water and sanitation improvements;
 - technological options
 - the nature of demand for water and its susceptibility to price changes; and
 - willingness to pay for water and sanitation services.

Map of Kathmandu Showing Locations of Communities Profiled



Legend

1. Alko	8. Dhumakhel
2. Kami Tole*	9. Kapan
3. Nayagan	10. Pathivara
4. Pobo Thimi*	11. Sankhamul
5. Balaju	12. Dhalco
6. Bansighat	13. Subahal
7. Dhaukhel	14. Dhoka Bahal, Tyodha

*Communities 2 and 4 are in the Municipality of Thimi, approximately 5 kms off the areas shown in this map.

