3 Status of Infrastructure and Services

This section analyses the status of infrastructure and services in terms of water supply, sewerage and sanitation, drains and storm water drains, solid waste management and transport.

3.1 Water Supply

Piped water supply was first commissioned in Lucknow town in 1895 with the construction of one intake works at Gaughat on the River Gomti. Raw water from the Gomti was pumped through a 21-inch cast iron main to the Aishbagh Water Works in the Cis-Gomti area where fill-and-draw type settling tanks and slow sand filters were constructed for treatment. The filtered water was then pumped to the City for distribution through a network of cast iron mains. Subsequently in the first half of the 20th Century the old steam engine device pumps were replaced with electricity driven system.

A major reorganization of the water supply system was taken up around 1960 where the whole town was divided into various zones - four service districts namely (A) City Service District, (B) North Service District, (C) East Service District (D) South Service District. R.C.C. overhead tanks were installed as storage reservoirs and a trunk main to feed these reservoirs was also laid along with the extension and reorganisation of the distribution system. Rapid gravity filtration plants were also added with the latest a 10 million gallons per day capacity plant under the reorganisation scheme. Subsequently it was observed that the trunk main was not able to fill all the overhead tanks because of the various connections on the distribution mains thereby reducing the pressure inside the main.

The next major reorganisation was taken from 1975 onwards under the World Bank funded U. P. Water Supply Project. In the face of difficulties of separating the trunk main from the distribution main connections, Zonal reservoirs were constructed to supply the various overhead tanks within a zone. The expansion of the City warranted the construction of another water works on the River Gomti upstream of Gaughat. The existing raw water intake at Gaughat was augmented by the construction of another 'intake' and installing pumps for raw water pumping. These years also saw an extension of the distribution mains in line with the expansion of the City.

To augment the supply, tube-wells were installed in areas that were at some distance from the Aishbagh water works as well as in those areas where there was a scarcity. The newly developed colonies in the Trans-Gomti area are supplied through tube wells. The tube wells are connected to overhead storage reservoirs and a distribution network. The ground water based system was considered economical and able to meet additional requirements in the lean periods.

3.1.1 Coverage

The water supply network extends over most of the core city and peripheral areas (map overleaf), but does not meet consumer demand. Although more than ninety per cent of the population within municipal limits is covered with piped water supply system, around ten percent is served with hand pumps. Within the areas served with piped water supply, about 30% of the population does not get water as per the design demand as water supply is intermittent throughout the City and available for only a few hours a day. Consumers spend considerable resources on intermediate systems and tube wells to manage or augment the supply. This is costly and mostly beyond the reach of the poor. Household booster pumps – installed directly into the water mains to cope with erratic water supply – further reduce the pressure in downstream areas.

The UP Jal Nigam and the Lucknow Jal Sansthan estimate that around fifty three percent of water produced in Lucknow is lost due to leakages and pilferage. As there is no metering of water supply, estimates of leakages and wastages are impressionistic and – given the age of the infrastructure – probably conservative. The spill over effects is wide – it is impossible to plan and monitor supply properly, or to recover costs on any accurate basis. It also undermines the credibility of tariff setting.

3.1.2 Water Sources

The River Gomti continues to be the main source of water supply to the City though a number of tube-wells have been bored to exploit ground water. However, the available discharge in the River Gomti as per C.W.P.C. at Lucknow during lean period is around 500 mld while in the monsoons, the discharge is around 55,000 mld. For most of the period the discharge on an average is around 1,500 mld only. Considering that several towns like Jaunpur and other habitations also draw water from the River Gomti and it is not feasible to tap all the river water in Lucknow. In fact at times in the dry season, the river water level goes down to such an extent that there is need to request the State Irrigation Department to augment supplies to meet the drinking water needs.

According to a report of the U.P. Jal Nigam in 2005, Lucknow has around 407 tube wells of which 387 are in working condition. These 407 tube wells produce around 190 mld of water. Additionally there are about 100 tube wells that have been installed by various institutions and private colonies to meet their water demand. This situation has resulted in ground water depletion and falling levels and in fact, in some localities it is reported that the fall is more than five metres during the last decade. The state does not have a 'ground water law' that regulates its exploitation and this aggravates the situation. The average depth of tube wells installed is around 350-400 metres, but since the strata is over exploited, the yield from each tube well has decreased from 1000 lpm (litres per minute) to around 600 lpm (**Annex 5)**. The ground water levels are likely to reduce further and attempts to tap the next layer of ground water are already underway. Regulation of ground water exploitation is mandatory to check its exploitation and use.

The demand in the periphery of the City and villages are mostly met through hand pumps. Within the City, hand pumps have been installed in slums to supply drinking water. The Lucknow Jal Sansthan reports that around 6,150 India Mark II hand pumps are installed in those areas inhabited by the economically weaker sections of society. These hand pumps on the whole yield around 15 mld of water. However with the falling ground water table these hand pumps may not be able to sustain their yield. There are very high possibilities of these hand pumps going dry in the years to come especially in the summer months, as the average depth of these pumps is only around 120 metres.

3.1.3 Water Produced

The total quantity of water produced as per the Jal Sansthan records is as below:

Table 3.1: Water Produced in Lucknow

River Water source	200 mld from Aishbagh Water Works 70 mld from 2nd Water Works.	Capacity: 240 mld Capacity: 90 mld
Total produced	270 mld	Capacity: 330 mld
Ground Water	190mld from 407 tube wells 15 mld	from 6150 hand pumps.
Total	**205 mld**	

Source: Lucknow Jal Sansthan

At present a total of 475 mld of water is produced amounting to a supply of 175 lpcd (litres per capita per day) for the present population. The entire volume of water produced does not reach the customers and it is estimated that almost 53% is lost due to leakages and pilferage. Although compared to the norm adopted for per capita water supply viz., 150 lpcd, the supply is quite adequate, considering the leakages, at present only about 80 lpcd of water may be reaching the consumers.

3.1.4 Water Demand

The population projections for the City as per the Lucknow Master Plan 2021 are:

Table 3.2:

Year	2006	2011	2021
Total population (in millions)	2.714	3.166	4.440

Based on per capita supply of 150 litres per day plus 15% as unaccounted for water due to leakage and wastage the corresponding water demand during different years works out as below:

Table 3.3:

Year	2006	2011	2021
Water demand in mld	468	546	766.

3.1.5 Key Issues

At least three sets of issues around water supply need to be considered in planning for the future:

- ***Inadequate service delivery and management of water supply:*** Although Lucknow does not have an intrinsic water resource constraint, water supply is intermittent and restricted to a few hours a day and quality of water inconsistent, imposing high coping costs on consumers and increasing health risks as household distribution systems often involve alkathene pipes that have been laid across drains to save cost. Finally, estimated leakages are high, which affects service delivery negatively and deprives the water agencies of revenue.

- ***Water resource management:*** In the absence of regulation governing the exploitation and use of ground water, extraction has become expensive and unsustainable. Rising contamination of the River Gomti with the discharge of sullage from 27 drains as well as industries has meant that costs of treatment are higher. The total volume of water produced is assessed crudely on the basis of pumping plant capacity and number of hours of pumping in the absence of proper measuring devices. This also means that there is no control on leakage, wastage and theft of water is high. The overhead storage reservoirs have, in most cases exhausted their capacities leading to inadequacy of supply and rising exploitation of ground water.

- ***Data is inadequate***. Because there is no metering, it is impossible to accurately assess consumption, leakage and revenue potential. General data on distribution network plans, details of pipes, material, location of fittings and other infrastructure is too weak to support planning, management, monitoring and maintenance. The system therefore is 'reactive' rather than 'proactive', and unable to ensure efficient supply.

3.2 Sewerage and Sanitation

The sewerage system in Lucknow town was first provided in 1918. Subsequently more and more sewers were laid as the town grew in size. In 1948-49 a Comprehensive Drainage Scheme for Lucknow was prepared to cater to a population of 7 lakhs of which 6 lakhs were expected to reside in the Cis-Gomti side and 1 lakh in the Trans-Gomti side. The plan included construction of branch and trunk sewers, pumping stations, rising mains and a sewage farm for disposal of sewage on land for farming. The works under this scheme were completed in 1955. In 1960-61 during a heavy flood in the River Gomti, considerable damage occurred to the sewerage system. As such in the 1960s and 1970s as part of the Flood Protection Scheme, the construction of a pumping station behind the flood protection embankment rectified the damage caused to the sewerage system. In 1987-88 another Sewerage Master Plan was prepared. However, there have been no major works since the 1948 Master Plan, although a detailed Urban Environmental Services Master Plan Lucknow (1996-2021) was prepared in the 1990s to deal with improving the sewerage and sanitation situation in the City. An aspect not explicitly discussed in this section, but returned to in section 8, is that aside from infrastructure shortfalls, sanitation challenges have been heightened by embedded behavioural practices, such as open defecation that has dramatically increased health risks. Second, the sanitation and hygiene challenge is not merely about building toilets, but about more new hygienic practices such as hand-washing with soap after using toilets and before handling food; hygienic collection, storage and handling of domestic water for drinking, cooking and washing; improved management and treatment of wastewater; and safe disposal of human excreta. Overcoming deeply embedded beliefs and practices that run counter to these behavioral practices demands policy change as well as shifts in public opinion, marketing of better practices (e.g. sanitation) and empowering potential change agents, such as women. This usually takes time, and requires thorough knowledge and understanding of local conditions and values.

3.2.1 Sewerage Network

The existing network of sewerage is broadly described below:

- **Cis-Gomti Trunk Sewer:** This sewer runs along the southern bank of the River Gomti starting from the Chotta Imambara to Cis-Gomti Sewage Pumping Station located at the edge of National Botanical Garden. It is 7 km long and at its head is a 750-mm. diameter circular RCC sewer increasing to 2100 mm. diameter brick sewer at the tail end. The main sewer has several branches – the Sarkata A - diameter 750 mm., Sarkata B - diameter 1050 mm., Pata Nala Sewer- diameter 900 mm., Shahmina Road Sewer - diameter 450 mm. and the Ghasiyari Mandi, Chamberlane, Ashok Marg sewers that join the main trunk sewer near the tail end.

- **Trans-Gomti Trunk Sewer:** This sewer runs along the north bank of the River Gomti and is 3 km long from Daliganj to the Trans-Gomti Sewage Pumping Station. For most of its length, it is of 900-mm. diameter except at the tail end when it discharges into the pumping station where it is 1100 mm in diameter. This sewer carries load that is pumped from Daliganj Pumping Station as well as that flows from the Mukarram Nagar and University Road area.

- **The Eastern Intercepting Sewer:** Starting from Golaganj, this sewer is oval shaped with a size of 600-mm.x900 mm. The sewer discharges into the Cis-Gomti Sewage Pumping Station. Additionally, the 600 mm. Butler Palace sewer also discharges at the Cis-Gomti Sewage Pumping Station.

New colonies have come up in the Trans and Cis Gomti side and while sewer networks have been provided inside the colony, the ultimate disposal is into natural drains, which finally discharge into the River Gomti.

The installed capacity of the various sewage pumping stations are as follows:

Table 3.4:Installed capacity of Sewage Pumping Stations

Name of Pumping Station	Capacity
Cis-Gomti Sewage Pumping Station	250 MLD
Trans Gomti Sewage Pumping Station	40 MLD
Daliganj Intermediate Pumping Station	40 MLD
Mahanagar Intermediate Pumping Station	7 MLD
Paper Mill Sub Pumping Station	3 MLD
Total	**303 MLD**

Source: UP Jal Nigam

The 1200 mm. diameter rising main from the Cis Gomti Pumping Station crosses the river through a road bridge and in the trans side is joined by the 450 mm diameter rising main from the Trans Gomti Pumping Station where after its size increases to 1350 mm. Earlier the sewage from the rising main used to discharge into a 1.25 x 30 m. brick channel leading to a 600-acre sewage farm. This farm has now been reclaimed to construct the Gomti Nagar Colony. In the absence of any disposal arrangements, the sewage is discharged directly into the river aggravating the pollution problem since the sewage is discharged upstream of the Gomti barrage.

3.2.2 Coverage

The sewer network extends across the main city areas on the Cis-Gomti side as well as newly developed colonies on the Cis-Gomti and Trans-Gomti sides. However, according to a survey conducted in 1997, only 45% of household in the core area of the city and 35% households in the peripheral area were connected to the network. There are about 44000 service latrines in the city area. Taking into consideration the service latrines, latrines discharging into nallas, existing public toilets and open defecation about 40% of the population do not have access to adequate sanitation. Informal sewers connecting a few households and discharging into nearby open drains are also seen. For the most part, the existing network is either completely blocked or its capacity severely reduced due to disposal of silt and solid waste – the problem is aggravated by the absence of regular sewer maintenance. This has increased the prevalence of pour flush toilets discharging into a single leach pit and on site disposal of sewage.

The Lucknow Jal Sansthan estimates that 81737 households are connected to the sewer network excluding the newly developed colonies. In these colonies, the sewer network has been provided but no disposal arrangements made since the Lucknow Jal Sansthan has not taken over the system for maintenance. In the core area of city, around 65000 households are connected to the sewer network.

The City has a significant number of septic tanks that together with overflowing leach pits usually discharge into roadside drains. Authentic records on the numbers of septic tanks and leach pit latrines are unavailable and it is estimated that the number of septic tanks in the city could be about one lakh and the number of twin pit pour flush latrines is around 32000.

The City has around 135 operational community sanitation complexes mainly in the slums. It is estimated that the community complexes serve about 4.5 lakhs of people – this roughly amounts to one complex per 3300 people. However, not all people are using the toilet complexes and it is assumed that one latrine seat is sufficient for 30 users per day. Based on this, 120 ten-seater and 24 twenty-seater latrine complexes have been proposed besides the existing ones in the non-sewered areas to increase the present sewerage coverage to 80% of the population.

3.2.3 Existing system of disposal

Prior to its development as Gomti Nagar, the site used to be the sewage farm. In the absence of a disposal facility, at present all sewage is discharged directly into the River Gomti. Assuming the present water supply to be 475 mld and waste water as 75% of it, the total waste water generated is approximately 356 mld of which only 42 mld is treated at the Daulatganj Sewage Treatment Plant with the balance 314 mld being directly discharged into the river without treatment. The cost of O&M of Daulatganj STP is about Rs. 164 lakhs/annum.

Based on the rental value of the household, a sewerage tax at the rate of 3% of annual rental value is charged. In the tariff, it is also provided that sewerage connection charges will be 25% of the water charges. The higher of the two values is levied as sewerage charges and the average current sewer charges per household works out as Rs. 573/- per annum.

The Lucknow Jal Sansthan is responsible for the maintenance of the STPs and the sewer network, while the maintenance of drains is the responsibility of the Lucknow Nagar Nigam. The two agencies function as discrete entities and at times it is observed that in case of blockage in a sewer, the sewer is broken and connected to the nearby nullahs. The problem of poor maintenance of the sewers and drains is further aggravated by the practice of disposal of solid waste into the drain or the sewer manholes.

In the newly developed localities, the Developers are responsible for the maintenance of sewers and drains until the colonies are handed over to the Corporation and it is observed that levels of maintenance are poor. It is common practice for a household to engage a private sweeper to deal with problems of blockage. This compartmentalisation of approach to systems maintenance as well as individual interventions has resulted in intermixing of the sewerage and drainage system aggravating the pollution load and flooding during the monsoons. Since the sewage at the pumping stations is bypassed into the sewer in most cases, their maintenance is totally ignored and the large installations of pumping machinery are deteriorating daily. The Lucknow Jal Sansthan accords low priority towards maintenance of the sewerage system since income from it is very low.

3.2.4 Key Issues

- Lucknow's sewerage and sanitation challenges are considerable. ***Socially, embedded practices*** like open defecation are prevalent, and are reinforced by poor facilities. This poses severe health risks.

- As far as ***infrastructure*** is concerned, ***information is patchy***, for example on pumping stations and sewerage systems. This makes planning for extension and assessment of volumes of sewage presently flowing into the system difficult. The lack of complete information also impacts effective maintenance and corrective actions.

- The ***standard of maintenance***, particularly of electrical and mechanical equipment, is poor. This is due to lack of resources and trained and experienced staff to plan and manage the operations and maintenance. As a result, no major sewage works have been undertaken since the Master Plan of 1948. All additions to the network that have taken place have been at the behest of the private developers in the new settlements – there is little evidence of coordination between developers and the government department in planning although the latter is formally responsible for O&M of sewage infrastructure.

- ***Service and infrastructure deficiencies*** also have an ***impact on water resource and supply***. Although not quantified given the poor information systems, it is widely recognized that a very low proportion of the sewage generated within the City enters the main sewage

system. A large proportion enters the surface drainage system either directly or through spillage from damaged or blocked sewers. Moreover, pollution due to discharge of untreated sewage into the river adversely affects river water use. It also has a negative impact on the appeal of the riverfront and poses health risks.

- Sewerage and sanitation problems continue to worsen. Damaged manholes, sewer damage particularly in the nallahs and the connection of the latter to the sewerage system and the common practice of discharging sullage into the roadside nallahs rather than into sewers have resulted in frequent blockages of sewers. The frequent sewer blockages and on site sanitation systems contaminate shallow aquifers. The existing service latrines are in a state of disrepair resulting in night soil being dumped into solid waste depots or in nallahs and nallis. With the system at breakdown, it becomes very difficult to alter social behaviour patterns that in the first place have disregarded infrastructure systems. As infrastructure and service facilities fail, practices like open defecation continues.

- At present there is only one treatment plant at Daulatganj with a capacity of 42 mld. This is based on FAB technology mostly used in Western Countries for high B.O.D. wastes whereas domestic waste has considerably lower B.O.D. values. The rest of the sewage discharges directly into the river. Under the National River Conservation Programme, the construction of a sewage treatment plant at Kakraha with a capacity 345 mld based on UASB technology with application of effluent on land for irrigation has been sanctioned as part of the Gomti pollution prevention works.

3.3 Drainage

Like most of the old towns located along rivers, storm run off drains into the river. The City varies in altitude from 106.5 to 122 metres above sea level and a large portion of the City is almost flat. The old city settlements mainly to the southwest are at a higher elevation while the remaining city is more or less flat at a lower elevation. The highest flood level in the River Gomti is 113.2 metres recorded in 1960.

3.3.1 Coverage

The main city area has over 20 nallahs (drains) with a combined length of around 70 kms. On the eastern side there is a canal that was built for connecting the River Ganga to Gomti during the rule of the Nawabs. This canal runs from the southeastern side of City towards the northeast, and drains into the river downstream of the newly constructed barrage – this is the Ghaziuddin Haider Canal. This canal now carries most of the storm water run off during the rains and in the dry weather, the sullage and sewage of the area around it. On the Trans-Gomti side there used to be a small rivulet known as Kukrail, which now carries the storm water of this area and discharges into the river upstream of the barrage. At present during the dry weather, most of the sullage of the Trans-Gomti area is carried by it. In addition to the big drains and the Haider Canal and Kukrail, there are small drains and nallahs with a combined length of 200 kms. In the past, there were large ponds that received storm water and helped manage the problem of water logging in the City. However, at present, most of these ponds have been encroached.

3.3.2 Major Drains and their Discharges

There are 25 major drains 13 of which drain the Cis-Gomti area and 12 the Trans-Gomti area. Some of these drains are big and carry sullage discharge of as much as 78 mld during peak hours while the smaller drains carry only 0.5 mld discharge. Most of these drains are made of brick for most of their length except for a few metres at the head. The discharge carried by these drains as recorded in the dry seasons is shown below:

Table 3.5: Drains and their discharge

Cis-Gomti drains (13 Nos.)	Average dry weather flow in mld.
Gaughat drain	1.0
Sarkata	18.0
Pata	18.0
NER Upstream	0.3
NER downstream	0.5
Wazirganj	13.0
Ghasyari Mandi	10.0
China Bazar	2.0
La-Place	1.0
Jopling road	1.0
G.H. Canal	78.0
Jiamau	--
La-Martiniere	0.5
Trans-Gomti side (12 drains)	**Average dry weather flow in mld.**
Mahesh Ganj	--
Rooppur Khadra	0.5
Dyer Meakin	3.0
Daliganj No. 1	8.0
Daliganj No. 2	1.0
Arts College	0.5
Hanuman Setu	0.5
TGPS	1.0
Kedar Nath	2.0
Weshatganj	1.0
Kukrail	20.0
Baba ka purwa	--

Source: Lucknow Nagar Nigam

In the newly developed areas there is a good network of several drains but no storm water drains that follow the topography. These therefore can cause water logging.

3.3.3 Floods

In 1960 Lucknow recorded its highest flood level at 113.2 metres with large parts of the City being inundated. To protect the habitations earthen embankments were constructed all along the bank of the river as well as on Kukrail to a top level of 114.4 metres. In the flood of 1960, the waters back-flowed through these drains into large parts of the City and during the construction of embankments sluice gates on the barrels were installed for discharge of drains during normal weather and stopping back flow during floods. When river water level rises to the drain invert levels, these gates are closed so that no back flow occurs. In case of heavy rain and floods, the pumping stations pump storm water across the embankment into the river so as to prevent water logging in the City. The embankment and the flood pumping station are almost 25 to 30 years old and in this period no serious flooding has occurred. Local water logging does occur in some localities during rains but on the whole, the city is well drained. In some small stretches, the

embankment is not yet complete and may be the cause for flooding in some localities in case of high floods in the river.

3.3.4 Key Issues

- While there are obvious ***infrastructure deficiencies*** that constrain Lucknow's capacity to manage drainage currently, some obvious ***planning and management issues*** need to be addressed. Aside from the general governance issues discussed in chapters 5 and 8, one of the specific issues around drainage concerns regulation in newly developed areas. The common practice is to make the developer responsible for the provision of internal surface water drainage, but little attention is paid to linking these drains to the larger local drains. Nallahs are neglected, which causes severe problems of water logging in some places.

- ***Maintenance of drains is 'reactive'*** with the common practice being to desilt the drains and dump near the edge of the drains to dry out before lifting. In practice, a part of the sludge gets blown away while the remaining finds its way back into the open drains.

- While in general, the City is well drained; there are local pockets of water logging especially in those areas where the carrying capacity of the drains has been reduced. Such flooding has been observed in Hazratganj crossing and at Mawaiya Bridge crossing almost each year during rains. Localities that are subject to annual flooding have repeatedly requested for assistance. In many places the nallahs and embankment have been encroached, restricting the flow in these drains and causing floods. These sites are predominantly housing the low-income groups. The nallahs are at a high risk of blockage arising from the disposal of solid waste and street sweepings. In some stretches of large size drains, encroachment has meant that there is hardly any space left for desilting and as such these stretches remain unclean. Cleaning the whole drain while leaving such stretches of blockage has low overall impact. Proper mechanical desilting equipment is needed for early cleaning and lifting of desilted material especially from inside the culverts and covered parts of the drain.

3.4 Solid Waste Management

A solid waste management system that is efficient, hygienic and environment-friendly is an essential requirement for Lucknow. This system is interlinked to sewerage and drainage system since garbage eventually finds its way into the sewers through manholes and into open drains adversely impacting their functioning.

3.4.1 Prevailing System

Usually the waste from the households is thrown on the streets, and door-to-door collection is limited mainly to new areas. Municipal staff responsible for cleaning the street collects the waste and dumps it at the nearest waste depots. There are few depots, and travel time is fairly long leading to the dumping of garbage in any available open space, into drains or in some spot that over time becomes an unauthorized depot. Some households have begun to contract private collectors to deposit the waste into the nearby depots, but this is not being institutionalized or regulated at any scale, and it is not uncommon to see street cleaners simply burning the waste.

Poor regulation and monitoring poses many health and environmental risks, both at the source of waste and at depots. In areas with service latrines, it is common for human faeces to be dumped along with the household wastes; despite legal provision for incinerating hospital waste, it often finds its way to the dumps; construction waste is dumped indiscriminately; and street cleaners often dispose of commercial and industrial waste near the source before eventually being carting it off to the landfill sites. With such open waste, stray animals littering waste around depots and elsewhere is a common sight.

3.4.2 Waste Generation and Recycling

Lucknow generates about 1300 MT of wastes daily. Formal recycling systems are underdeveloped, but an appreciable quantity of solid waste generated at the household level is sold to the kabariwalla who purchases all recyclables. It is estimated that there are around 2000 kabariwallas in Lucknow who pick up waste from the households and sell to retail traders. In addition to these kabariwallas, there are about 8000 rag-pickers who every day scourge the refuse dumps for recyclable paper, plastic and metal waste. The recycling industry is valued at Rs. 25 crore per annum handling about 200 tonnes per day. The Municipality disposes about 1000 tonnes of waste per day. Around 60 to 80 per cent of waste comprises vegetable matter and rag pickers collect small proportions of manufactured waste.

3.4.3 Disposal Arrangements

The Lucknow Nagar Nigam has prime responsibility for solid waste management. Within the LNN, responsibility for primary collection of waste up to depots is under one department while secondary collection, i.e. from depots to disposal site, is with another department thus posing problems of coordination. There are about 3800 safai karmacharis working in the Nagar Nigam i.e. almost 1.8 sweepers per 1000 population as against the Health Department norms of 2.8 per 1000 population. Collection practices vary from sweeping some streets twice a day to no street sweeping. In localities established by private developers, the responsibility for street sweeping rests with them. Some of the developers have engaged safai karmacharis. The Nagar Nigam will be eventually responsible for this once the colony is handed over. In the peripheral areas and surrounding villages, there are no arrangements for street sweeping.

A variety of vehicles are used to transport the waste from the depots to the disposal sites. These include three-wheelers, trolleys, tractor-trailers, tipper trucks served by mechanical loaders, dumper placers, and compaction rear end loaders. The Municipality has a solid waste transport fleet of 75 vehicles of which on an average only half are in usable condition at any time since the average age of the fleet is around 15 years. The fleet collects an estimated 850 to 1050 tonnes of waste per day from approximately 500 depots with the frequency of collection varying from daily to once in a month depending upon the quantity of waste collected at a depot.

The density of waste in Lucknow varies from 500 to 700 kg per cum. and as such suitable pay loads in the collection vehicles is achieved without compaction although the Lucknow Nagar Nigam does have some of this equipment. In some areas households practice segregation and the Municipality collects the organic mater separately for use at the disposal plant for generating gas. Some NGOs have popularised vermicomposting in some of the wards and charge households a nominal amount per month for services.

2000 cleaners who charge individual households for the service clean the 44000 service latrines in the city. The Nagar Nigam has employs 6000 safai karamcharis on various terms of contract. The key issue here is one of efficiency of the existing staff and systems rather than on increasing numbers.

3.4.4 Key Issues

In considering solid waste management issues for future planning, it is useful to clearly identify three related problem areas:

- ***Existing infrastructure clearly is inadequate***, Lucknow has fewer depots than required and they are located at some distance from the primary collection points. This situation allows for the disposal of wastes in the open, thereby adding to the pollution load. The infrastructure shortcomings are compounded by inadequate maintenance of vehicles and equipment.

- ***Practices of solid waste management are inefficient and pose significant risks***: Intermixing of wastes in the depots is common – human faeces, hospital waste and household wastes expose rag pickers, safai karmacharis and service latrine cleaners to health risks, and ultimately risks spreading further. The waste depots are not sanitary and are a breeding ground for mosquitoes, cockroaches, flies and rats. Some of these are not paved and during rains large pools of leachates gather and seep into the ground water. While rag pickers play an important role in segregation, this has not necessarily supported environmental improvement as many litter the areas around a bin. While on the one hand there is need to promote the activity of garbage collection and segregation, there is also need to organise it in a more systematic manner

- ***Significant institutional inefficiencies exist***. The LNN is inadequately staffed in terms of safai karamcharis and do not have a sufficient number of vehicles to cater to the needs of the entire City. Additionally, inadequate coordination within the LNN of primary collection and secondary transport, as well as poor relations between the labour force and management results have made the task even more challenging. Moreover, regulatory rules and arrangements are either unclear or non-existent, or not rigorously applied. The activities of ragpickers and other informal agents in the solid waste environment, poses much potential for the authorities to engage small and bigger private sector or community providers for different aspects of the solid waste management cycle. Together with assigning clear accountability, improved performance management and consistent leadership that prioritizes these issues within the LNN, room does exist for innovative partnerships to at least begin to deal with one of the significant challenges as the city prepares for the future.

3.5 Traffic and Transportation

Lucknow has grown all around in a radius of 25 km. taking the General Post Office in Hazratganj as the centre. The main office and commercial complexes are located in the central part of the town thereby making daily commutes a necessity. Considering the existing condition of the arterial roads from the north to south and from the east to west there is not much scope to augment the existing public transport system which includes public buses, three wheeler tempos and private vehicles. The growth of Lucknow in recent years has resulted in vastly increased demand for transport and a dramatic rise in the number of vehicles. Transport infrastructure, however, has not grown correspondingly and is therefore highly inadequate. With the number of registered vehicles rising by about 40,000 vehicles per year in the past decade, the roads and parking spaces in the City have become extremely congested, especially during peak hours.

The U.P. Transport Corporation operates a fleet of ninety-eight buses on ten different routes and estimates that the total passenger load on these buses is around 47000 daily.

Table 3.6: Registration of Vehicles in Lucknow

Type of Vehicles	1994	1998	2005	Annual growth rate (1994-2005)
Two Wheelers	212774	285511	601745	16.62
Car Jeep Vans	27608	42855	97878	23.14
Bus	1126	1349	3553	19.59
Truck/HCV	4219	5264	7742	7.59
Tractor and LCVs	10077	11017	19985	8.94
Three Wheelers, taxis, and others	6487	8579	9567	4.32
Total	**262291**	**354579**	**749395**	**16.88**

Source: RITES Report and UP State Transport Department

The city extends from Indira Nagar and Gomti Nagar on the east to Rajaji Puram on the west and the main traffic generating areas are Lucknow Railway Station, Charbagh Bus Stand, Vidhan Sabha, Secretariat, and the commercial areas in the central parts of the city. With the expansion of the city, traffic has been increasing in and around the peripheral areas. The main artery of Lucknow City, Station Road-Vidhan Sabha Marg, remains extremely congested throughout the day. The traffic situation in main commercial areas that include some heritage zones like Hazrat Ganj has become unmanageable. There are long waiting periods at all the traffic signals in the central parts of the city. All roads in commercial areas are encroached by small vendors. The parking spaces are very limited, and as a result, vehicles are parked all along the roads. This further reduces the available carriage width of the roads and causes traffic congestion.

The State Road Transport Corporation manages the public bus transportation in the city with a fleet of 104 buses. In the absence of a proper public transport system, many inefficient modes of transport have emerged in the city. Cycle rickshaws are commonly used for short distance commuting. Other public modes of intra-city transport include three-wheeled scooters (capacity to seat 6-7 passengers) and four-wheeled jeeps (capacity to seat 10-12 passengers). The current bus network caters mainly to the developed colonies and passes through the centre of the town. In addition there are around 4000 three wheelers. There is a proposal to make these three wheelers run on CNG in the coming years. For short distances cycle rickshaws are the preferred mode of transport and there are about 10,000 of them operating in the city.

3.5.1 Transport Demand Forecast

The UP Transport Corporation has prepared a plan for enhancement of the public transport system on the basis of the population projection in the Master Plan 2021. It is estimated that 30% of the estimated 45 lakh population will need public transport daily i.e. 13.50 lakhs, which will commute every day. According to the norms followed in the state, for every 30,000 commuters 100 buses with one depot and six terminuses are required. Based on this the total requirement of buses works out to 4500 with 45 depots and 270 terminus stations with 900 bus stops (average 20 stops per route). Given the number of buses and the constraints of the road network, it seems likely that it will not be possible to meet the needs of commuters through the current fleet of public buses or private taxis and three wheelers.

The plan also mentions an LRTS with the following four routes suggested:

(1) Sarojini Nagar in the south to Chinhat in the northeast across Gomti.

(2) Sarojini Nagar in the south to Jankipuram in the northwest across Gomti.

(3) Post Graduate Medical Institute in the east to Chowk in the west end.

(4) Post Graduate Medical Institute in the east to north of Rajajipuram in the west.

Additionally significant numbers of people commute to Lucknow on a regular basis from the surrounding towns of Rae Bareili, Kanpur, Unnao, Hardoi and Barabanki. The current circular rail network through E.M.U.s is sufficient to meet present requirements. But since most of these commuters need to travel to the centre of the city on work, the pressure on the road network remains and there is need to consider alternate means of transport.

A number of bridges have been constructed to connect the Cis-Gomti and Trans-Gomti areas but connectivity needs to increase further. The city may well need to consider an integrated ‘multi modal transport system’ to increase inter and intra city connectivity.

3.5.2 Key Issues

- The first set of transportation ***issues*** concern ***infrastructure and service facilities***. Rapid development of the peripheral areas of the city has increased demand for new connections to the central parts of the city, and decisions are required about the modes of transport to deal with this challenge. City and state decision-makers support the concept of an integrated multi modal transport system. A recent study proposed a Light Rail System, but issues of affordability, financing sources and volume need to be clarified further before a firm direction is set. Meanwhile though, the public bus transport in the city is limited to a small part of the city and has poor frequency, and investment in this service, as well as widening of roads, for example to create bus lanes, may need to be considered. The conditions and width of roads require attention in any event, and the state and city authorities, as well as other stakeholders all stress the need for immediate steps needed to widen the roads, remove the encroachments, and construct subways, flyovers and parking places. The issue of parking facilities near commercial and institutional areas in central parts of the city concerns most business and working people, and have also been cited as an issue that needs to be addressed in relation to the upgrading of heritage sites. It is seen as an opportunity for private sector involvement, as a well-managed parking system is considered as a viable revenue generating activity.

- Inevitably, transportation interventions on such a scale require careful ***attention to management***, especially as the existing system has not coped well with expanding and maintaining the networks. Thus typically is an area that is open to private sector involvement, but partnerships are often complex legal and financial arrangements, and need to be monitored and regulated effectively. To achieve this would require the authorities to be well organized, with clear roles and responsibilities, and supported by the necessary capacity to negotiate arrangements and then monitor them. It will require a good deal of coordination across levels of government, in terms of both physical and financial planning as well as implementation. Road works and other transportation investment also mostly affect residents and businesses while in progress, and due consultative mechanisms and processes, and compensations arrangements where relevant, would require detailed attention.

SUMMARY

There is insufficient information on the status of most services, and no effective metering and other systems of quantification. This makes it difficult to plan for the future.
Water supply is mainly based on surface sources from the River Gomti. Ground water exploitation is rising due to the absence of any regulation and to meet the demand since supply overall is intermittent.
It is estimated that about 53% of the water available for supply is lost due to leakage and pilferage – this is an impressionistic estimate in the absence of metering.
27 nallahs discharge about 314 mld sewage directly into the river only 42 mld sewage is treated.
Sewers and drains are blocked due to encroachment; disposal of wastes thus reducing their efficiencies.
The number of waste depots is less than the number required and situated at some distance from the collection points – encouraging open dumping and growth of unauthorised collection sites.
Final disposal is through dumping in landfill sites.
Within the LNN, separate departments have responsibility along the waste collection and disposal chain – lack of coordination also dilutes the chain of responsibility and accountability.
Bins receive mixed wastes – human faeces from service latrines, household wastes and hospital wastes.
Composting and door-to-door collection initiated in limited area through NGO interventions.
With the expansion of the city, there has been a rise in private vehicles although the road infrastructure has not grown at the same pace as the city.
There is need to con sider an integrated multi modal transport system to improve inter and intra city connectivity.