

9. URBAN SERVICES

9.1. INTRODUCTION

This chapter presents the existing status of core urban services in Jaipur. It covers water supply, sewerage, solid waste management, drainage and roads. The chapter also estimates the present and future gaps by the year 2021.

9.2. WATER SUPPLY

9.2.1. Situation Analysis

Present status of demand and production: The population within the Jaipur Urban Agglomeration was 23,74,180 according to 2001 census. This has been estimated to have risen to about 27.70 lakhs in 2005. Out of this, population within the walled city is estimated to be about 6.50 lakhs, the rest about 22.24 lakhs residing in the colonies outside the walled city.

Extent of coverage: In 2005, the entire population was not dependant upon PHED water supply. According to PHED estimates, about 23.80 lakhs population was being served by PHED water supply system, the rest 3.72 lakhs population was served through other systems developed and maintained by housing cooperative societies or from own sources. Thus in 2005, about 86.50 % population was under PHED supply system. (Figure 9-1)

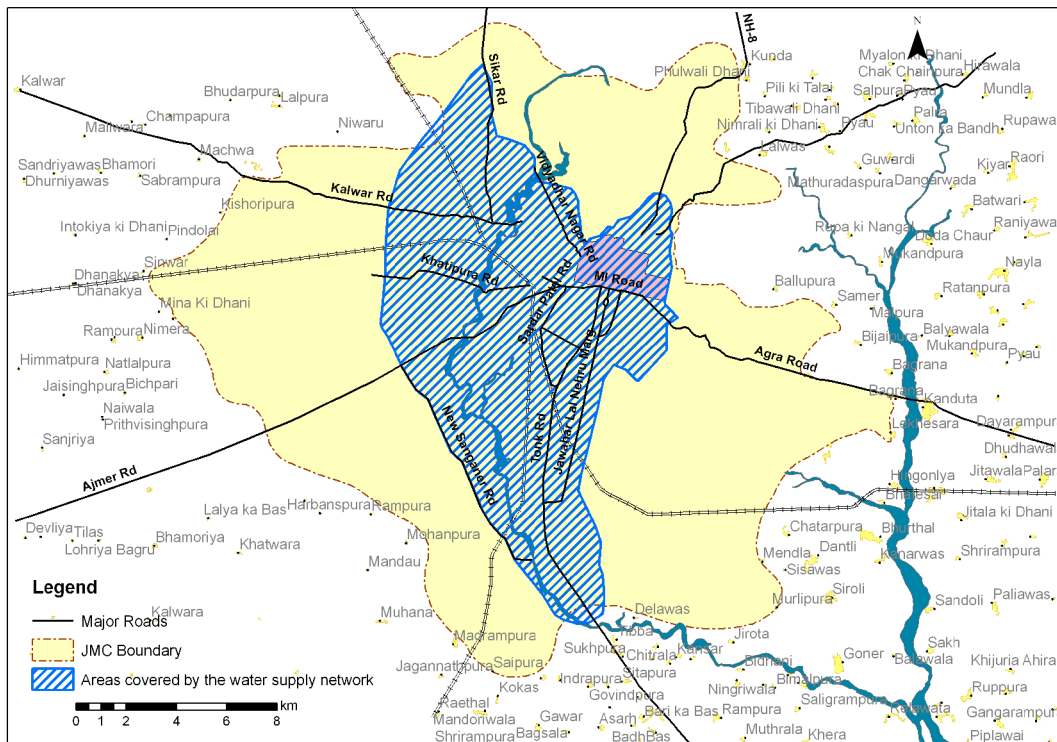


Figure 9-1: Water Supply Network Coverage

Service levels: Production in Jaipur water supply system in that year from all sources, was an average 348 million litres a day (mld). This worked out to a per capita supply of 146.20 litres per day for the population under the PHED supply system. For the total population, it worked out to 126.50 lpcd. Judging by prevalent national standards and compared to water supply systems in most of the large urban cities including metros, water supply system of Jaipur in 2005 and currently, could be termed as satisfactory.

These figures however, represent only the production from all sources. Actual quantity reaching the consumers is lower due to high Unaccounted For Water (UFW). A study entitled "Assessment of UFW and reduction of losses in Jaipur water supply system" was conducted by PHED between 1997 and 1999, which showed that UFW was as high as 44 % on account of different reasons. This means that against 348 mld production, the quantity reaching consumer ends was only about 195 mld. In per capita terms, availability at consumer ends is only about 82 litres per capita a day. This perhaps is the major cause why the general population feels that supply is inadequate against the requirement. Other causes include substantial drops in supply pressures due to large quantities released in short durations.

9.2.2. Existing system

Sources : The Jaipur water supply system is predominantly dependant upon ground water. The only surface source namely Ramgarh lake, which used to be the main source of supply more than 30 years back, produces insignificant quantity. After the monsoon of 2005, not enough quantity was received in the lake and the present level is only about 29'. No water is being drawn from the lake at present and the current storage is being kept in reserve to meet the contingency situation during summer season. About 1 mld is being however drawn from the seepage from the dam. The 1340 tube wells scattered over various parts of the city, are responsible for the bulk of the total production (347 mld). In addition, there are about 1845 hand pumps installed at various locations, which help in meeting the demand of the weaker sections of the society.

Details relating to locations of a large number of tube wells, Clear Water and Overhead Reservoirs and their capacities, Hand pumps and productions in different zones are enclosed in Annexure 9.1. Efforts have been made to document details of these to the extent it has been possible to collect the information from the Public Health Engineering Department.

Treatment : For the production from Ramgarh, a filter plant of 72 mld capacity is situated at Laxman Doongri, near Jal Mahal. This plant has to be operated even when there is water production from ground water from seepage of Ramgarh and Jal Mahal lakes.

Water obtained from tube wells is given bacteriological treatment only. In each zone, tube wells have been drilled forming batteries and water from these tube wells is pumped through submersible pump sets in to the partially underground reservoirs called as clear water reservoirs. Chlorine is added prior to distribution in these reservoirs. Chlorination is usually done using bleaching powder.

Distribution : Chlorinated water from Clear Water Reservoirs (CWRs) is pumped in to Overhead Service Reservoirs (OHSRs) which feed the distribution system of the zone under

each. Under normal circumstances, area served under each OHSR is called a supply zone. Details of many OHSRs serving several zones are enclosed Annexure 9-1.

9.2.3. Projects implemented in recent past

Rajasthan Urban Infrastructure Development Project (RUIDP): Prior to the year 2000, an estimated 7.5 lakhs population living in colonies developed by Cooperative Housing Societies was not covered by PHED supply system. The developers had provided residents of these colonies with little or no water supply system.

One of the major components undertaken by the Rajasthan Urban Infrastructure Development Project was, coverage of these colonies through properly designed tap water supply schemes. The work was carried out in between 2002 to 2004, by grouping water supply schemes under different packages. These packages were formed separately for drilling of tube wells, providing and laying of production and distribution networks and construction of CWRs, OHSRs and pumping stations. Implementation of these packages saw installation of full-fledged water supply systems including production, treatment and distribution. For construction of tube wells, 2 packages namely JAI/WS/04 and JAI/WS/17 were implemented. For construction of reservoirs, four packages namely JAI/WS/01, 05, 12 and 15, were implemented. For construction of pumping stations also, four packages namely JAI/WS/02, 08, 13 and 19, were implemented. For laying of pipelines in production and distribution systems, five packages namely, JAI/WS/03, 06, 07, 14 and 16 were implemented. (Figure 9-2)

In addition, one package JAI/WS/09 for replacement of pumping machineries in existing pumping stations, package JAI/WS/11 for laying of a DI pipe transfer main, package BSL/CWR/01 for construction of 30 and 15 ml capacity CWRs at Balawala and Ramniwas garden and two packages PMU/WS/03 L1 and L2 have also been implemented for supply and installation of electromagnetic bulk meters.

Total cost of these works is Rs. 66.92 crores and it has been possible to provide satisfactory potable water supply to about 6 lakhs population residing in colonies developed by cooperative housing societies.

A map showing areas and colonies covered with water supply systems under RUIDP is shown in Figure 9-2.

9.2.4. Issues

The above description shows that Jaipur water supply system stands on a firm foundation, in terms of quantity of supply and coverage of population. However, the present satisfactory situation is not likely to continue for long. Following are the reasons.

Continuous increase in water demand : The population of Jaipur is increasing at a fast pace. The economic growth is also one of the highest among the cities of India. These two factors are leading to increase in water demand at a high rate. Though the present per capita production is at about 146 litres per day, the population is faced with inadequate quantity of supply and at low pressures. PHED has to continuously make efforts to maintain the minimum required supply levels, which usually lag behind the demands.

Depleting ground water table : As earlier stated, there are about 1340 tube wells operating under Jaipur water supply, producing about 347 million litres of water daily. Extraction of ground water in the recharge drainage blocks around Jaipur is continuously on the increase and production has to continuously increase to match the demand. Rate of recharge of ground water table on the other hand is decreasing due to factors namely, (i) urbanization, (ii) coverage through sewerage system and (iii) erratic rainfall. The combined effect of these factors is resulting in fast depletion of ground water table. A study conducted by PHED during 1997-99 indicated that water table was depleting at an alarming rate of more than 1 metre per year and it was predicted that by about 2008, water from the Jaipur underground aquifer might deplete. According to PHED estimates, depletion of water table at present is observed as an average 3 metre per annum.

Deteriorating water quality: Extension of sewerage network has also been slow and has not been able to match the growth of Jaipur. Though sewer network in the walled city is more than 60 years old, extension of sewerage system in outer colonies was not paid serious attention between 1980 to about 2000. Outfall sewer for south zone was laid between 1997 and 2000 and a major program for laying of sewer networks in outer colonies was taken up under the RUIDP between 2002 to 2005. Lack of demand for sewerage is usually attributed to feasibility of construction of septic tank - soak pit arrangement, which work satisfactorily in the sandy strata of Jaipur.

The soak pit disposal method has however, adversely affected the quality of ground water. Coupled with overdraft, the recharge of water table with wastewater has given rise to increase in TDS, especially the nitrates. Today there are certain areas, where concentration of nitrates is so high that the water has become un-potable. The feasibility study undertaken by PHED has also shown that along with substantial drop in water table, its quality is also fast deteriorating and reaching a state which might render it unsuitable for domestic consumption in near future.

9.2.5. The long term scenario

Subsequent to the feasibility study, PHED and RUIDP agreed to the following revised population and demand figures as follows.

Table 9-1: Water demands and supply scenario

S. Nos.	Years	Population projections	Average Demand In mld	Proposed local production In mld	Peak demands from Bisalpur in mld		
					For Jaipur	For rural	Total
1.	2006	30,09,000	400.0	200.0	200.0	40.0	250.0
2.	2007	31,16,000	415.5	185.0	241.9	40.0	291.9
3.	2008	32,25,000	431.0	170.0	283.8	40.0	333.8
4.	2009	33,35,000	446.5	155.0	325.6	40.0	375.6
5.	2010	34,47,000	462.0	140.0	367.5	40.0	417.5
6.	2011	35,60,000	477.5	125.0	409.4	40.0	459.4
7.	2012	36,75,000	493.0	110.0	451.3	60.0	526.3
8.	2013	37,91,000	508.5	95.0	493.1	60.0	568.1
9.	2014	39,09,000	542.0	95.0	535.0	60.0	610.0
10.	2015	40,29,000	575.0	95.0	576.3	60.0	651.3
11.	2016	41,52,000	609.0	95.0	618.8	60.0	693.8
12.	2017	42,77,000	642.5	95.0	660.6	60.0	735.6
13.	2018	44,03,000	676.0	95.0	702.5	120.0	852.5
14.	2019	45,33,000	709.5	95.0	744.4	120.0	894.4
15.	2020	46,64,000	743.0	95.0	786.3	120.0	936.3
16.	2021	47,99,094	776.5	95.0	828.1	120.0	978.1
17.	2022	49,34,188	810.0	95.0	870.0	120.0	1020.0

It was decided that stage I shall be for 540 mld for Jaipur and 60 mld for enroute villages and towns. Phase I of this stage was decided for 360 mld for Jaipur and 40 mld for enroute villages and towns. Following capacities of different elements have also been decided.

Table 9-2: Phasing of Bisalpur project elements

Component	Stage I Phase I	Stage I Phase II	Stage II
Raw water pumping (mld)			
Planning	1060	1060	1060
Pumping capacity	624	624	1060
Water Treatment Plant (mld)			
Planning	1020	1020	1020
Design	600	600	1020
Construction capacity	400	600	1020
Raw water main (mld)			
Design	1060	1060	1060
Execution	416	624	1060
33/3.3 kv sub stations			
Planning	1020	1020	1020
Execution	600	600	1020
Clear water reservoir (ml)			
Design	50	50	50
Execution	25	25	50
Clear water pumping station (mld)			
Civil works			
Planning			
Execution	960+60	960+60	960+60
	540+60	540+60	960+60
Clear water Pumps (mld)			
Planning	960+60	960+60	960+60
Design	540+60	540+60	960+60
Execution	360+40	540+60	960+60
Clear water pipeline (mld)			

Component	Stage I Phase I	Stage I Phase II	Stage II
Planning	960	960	960
Design	540	540	960
Execution	360	540	960
Service road Planning Execution	For final 2 pipes layout	For final 2 pipes layout	For final 2 pipes layout
Civil works	As for final requirement	As for final requirement	As for final requirement

Till such time the project is commissioned, it could be safely assumed that adequate quantities of water from the present sources will be available for the next 2-3 years time.

9.2.6. *Projects in pipeline*

The Bisalpur Water Supply Project : Looking to the anticipated drinking water crisis in near future, implementation of Bisalpur water supply project has been contemplated under RUIDP. This project envisages supply of about 960 mld water (360 mld in first phase) from the Bisalpur dam, constructed across river Banas, about 120 kms south of Jaipur. The dam has been built and filled to its maximum capacity and is already a source of drinking water to Ajmer and 5 other towns.

Project implementation in two parts : Implementation of the project is being done in two parts namely, (a) transmission and (b) transfer and distribution. Transmission part is being taken up under RUIDP and consists of lifting of raw water from the river, its treatment and conveyance up to a point near Jaipur. This is being financed under the assistance of Asian Development Bank. The Transfer and distribution part consists of transfer mains & reservoirs and linking it to the existing network, along with minor modifications. This part is being taken up by PHED with financial assistance from JBIC and HUDCO. Both the projects are slated to commence soon and are expected to be completed by 2008. The coverage due to Bisalpur project is shown in Figure 9-3.

9.2.7. *Further scope for improvements*

Adequate production and proper distribution however, would not address the problems faced by the population. There are some serious concerns regarding present inefficient operation and management of the water supply system in Jaipur. The issues that need to be addressed include, (a) refurbishment of the existing distribution system with a view to reduce unaccounted for water, (b) measurement of production through bulk metering for better management and, (c) efficient assessment of distributed quantities through consumer metering.

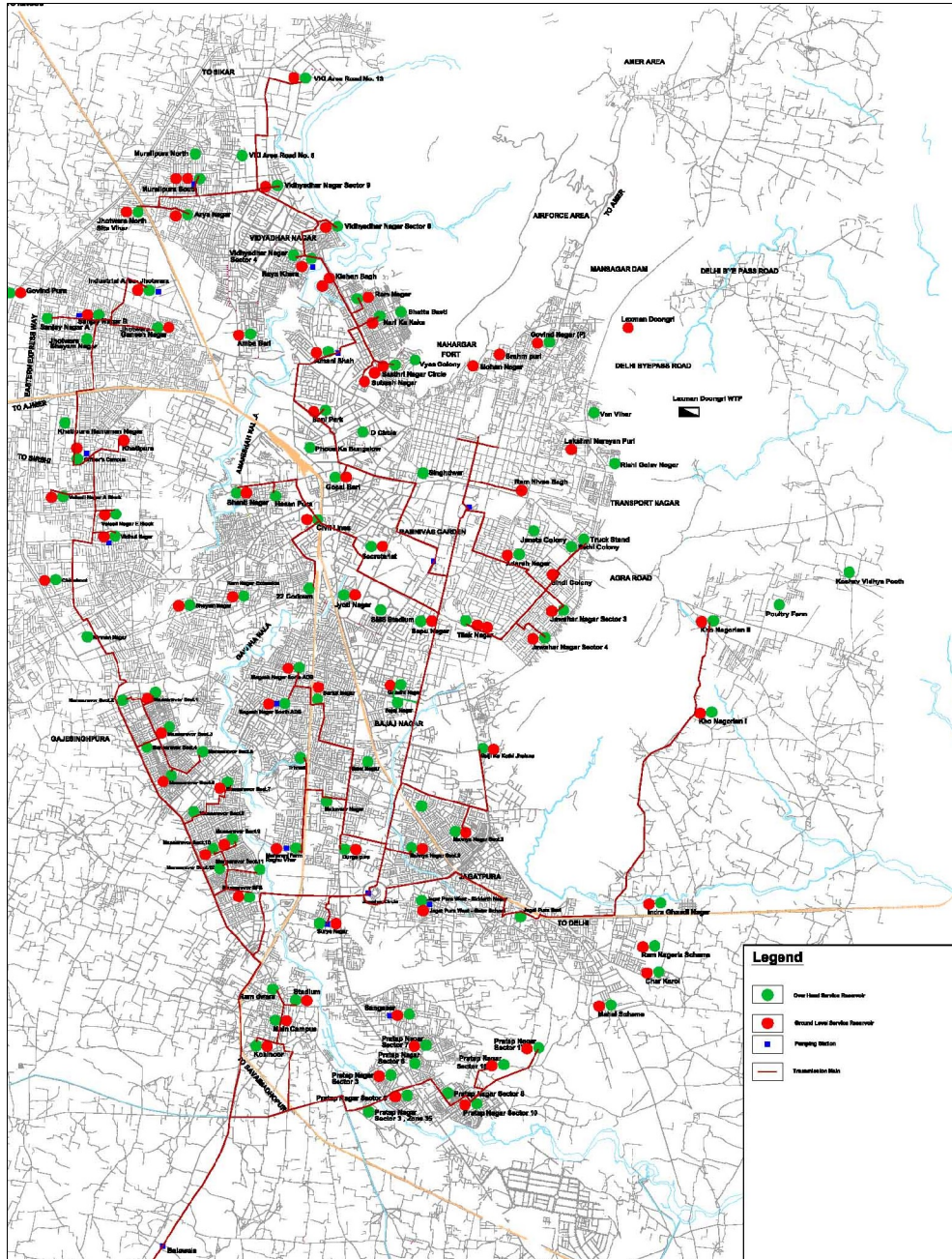


Figure 9-3: Existing water supply system components and proposals under Bisalpur Project

9.3. SEWERAGE

9.3.1. Present status of collection, treatment and disposal

Sewerage system in Jaipur was first laid more than 75 years ago. The city was confined to four walls at that time and sewer networks were provided within the old city. Topographically, Jaipur is divided in two sewerage zones, the north zone and the south zone. The line joining Chandpole and Surajpole gates lies along the ridgeline, which divides these zones.

Area north of the ridgeline drains towards a depression called as Man Sagar or Jal Mahal. Canals downstream of Man Sagar dam ultimately drain in to a seasonal river in the east, called Dhoond river, which flows in a north to south direction. The south zone is featured by existence of a valley situated in the heart of outer city, popularly known as Ganda nallah, also flowing in a north – south direction and ultimately joining Dhoond river in the extreme southeast. Thus the entire drainage of Jaipur takes place towards the east – southeastern direction.

Existing sewerage system of north zone was refurbished between 1977 and 1980 by PHED under a project. A sewage treatment plant of 27 mld capacity, based on extended aeration system was also installed under this project. The system after commissioning functioned satisfactorily for about 5 years and Jal Mahal lake during that period was a clear water lake. Due to poor upkeep of the plant subsequently however, resulted in lake again becoming polluted, which is the status today. Now under the RUIDP, refurbishment of this treatment plant is underway.

Sewer networks have been laid in a large number of colonies in the south zone prior to 1990 (Figure 9-4). In the absence of southern outfall sewer, wastewaters from these colony networks were discharged into Ganda Nallah. Between 1997 and 2000, PHED laid a 17 kms long southern outfall sewer of diameter varying between 1200 and 1800 mm. This facilitated the collection of sewage at Delawas, where a

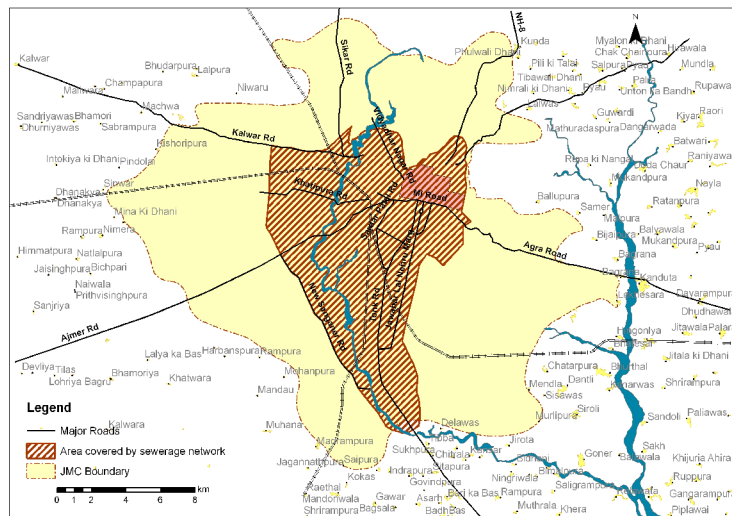


Figure 9-4: Sewerage network coverage

62.5 mld capacity treatment plant has been installed under the RUIDP, which is on the verge of commissioning. A large number of colonies have also been covered by sewer networks under the RUIDP. The present sewer networks comprise about 605 km of sewerlines. Figure 9-5 showing the sewerage improvements in Jaipur under RUIDP.

9.3.2. Sanitation in Slums and Uncovered Areas

The existing sewerage system covers about 65 % of total area of Jaipur. In the areas uncovered by sewerage system septic tanks are used to dispose night soil. According to the studies conducted by Safage in 1998, the septic tanks cater to about 25 % of the population in Jaipur. Roughly about 1,20,600 septic tanks are in use in Jaipur. Basic sanitation facilities are absent in most of the slums and Katchi Bastis. Most of these places neither have sewerage system nor septic tanks. There are about 76 community latrines throughout Jaipur catering to the slums and public in general, which is much below the requirement. As a result most of the slum dwellers resort to open defecation along the roads and open drains polluting the surroundings and risking their health. This problem is also rampant in places like bus stands, bus stops and around community centers such as hospitals, Marriage gardens, etc.

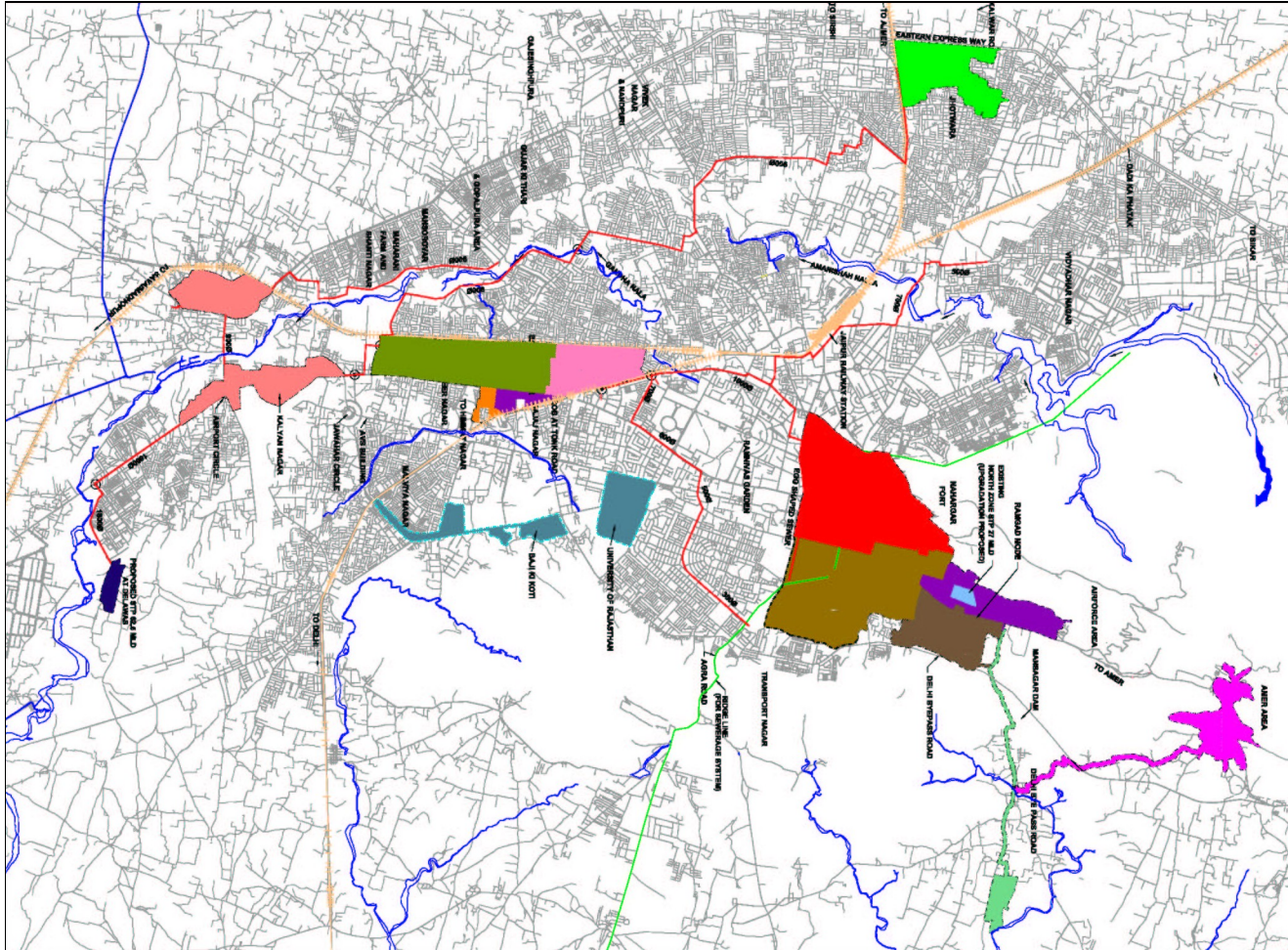


Figure 9-5: Sewerage Improvements in Jaipur under RUIDP

9.4. SOLID WASTE MANAGEMENT

9.4.1. Legal AND INSTITUTIONAL FRAMEWORK

Legal Framework

The solid waste handling rules (SWHR)-2000 of the Government of India (GoI) describes the compliance criteria to be met for collection, segregation, storage, transportation, processing and disposal of municipal solid wastes (MSW).

The SWHR provides for the following implementation schedule to be complied by the municipal authorities for cities with a population between 0.1 to 1 million: (i) setting up of suitable composting facilities by 31.12.2001, or earlier; (ii) improvement of the existing landfill sites as per the existing provisions of the rules by 31.12.2001, or earlier; and, (iii) identification of landfill sites for future use by 31.12.2000, or earlier.

On the similar line of SWHR- GoI, Jaipur Nagar Nigam has prepared one draft state level Solid Waste Handling Rule for Rajasthan in the year 2005. These rules have also drafted some service charges for the non-compliance of the rule or indiscriminate waste dumping in the city. The charges as prescribed are given in Table 9-3.

Table 9-3: Service charge for the non-compliance of SWHR rules and indiscriminate waste disposal in the city

Description of Stakeholders	Charges Prescribed (Rs. per Day)
Residential sources	100
Shopkeepers	250
Restaurant Owners	400
Hotel Owners	500
Industrial Units	1000
Sweet Shops, Fast food centres, ice cream centres, juice centres	100
Urine in public places	20
Disposing cow dung at public places	500
Shop equipment construction materials like bricks, cement, iron rods, stones etc.	200
Spillage of waste on Nagar Nigam roads	1000
Commercial hoardings, posters etc if pasted on building gates, walls etc.	500
Household sewer on public roads	100
Street cutting with a prior information	500
Households sewer on common drains	500
Spillage of oil, grease and other earthen materials on streets etc.	100
Meat shop wastes i.e. cutted bones, animal parts etc.	1000
Nuisance created by domestic animals on public roads	200
Marriage reception areas	1000
Meat and fish preparation on open roads and if wastes are disposed on roads.	1000
Waste from hair cutting saloons	100
Commercial shops on encroached government land	2500

Institutional Framework

Jaipur Nagar Nigam is responsible for the management of solid wastes within the municipal boundaries of Jaipur (518.30 sq. km). The municipal area is subdivided into 6 zones and is further sub-divided into 70 wards (Table 9-4).

Table 9-4: SWM zones within SMB

Sr. No.	JNN Zones	Ward No.
1	Civil Lines	2,3,7,11,4,5,17,6,16,19,15,20,21,38
2	Motidungri	35,34,33,18,31,30,29,32,27,26,28
3	Vidyadharnagar	1,9,10,68,69,70,65,63,67,66,64,8,36,37,62
4	Hawamahal (East)	52,55,51,56,57,44,45,46,47,49,50,48
5	Hawamahal (West)	53,54,58,59,60,61,40,42,43,41,39
6	Sanganer	12,13,14,22,23,25,24

Source: Jaipur Nagar Nigam

There are two separate wings in Jaipur Nagar Nigam. The executive wing is headed by one Chief executive Officer (CEO). Under his guidance the Public health and Public works and Mechanical (Garage) sections of JNN are responsible for the SWM system delivery. The responsibilities of public health and public works and mechanical sections towards SWM in Jaipur is given in Table-1-5. However, the legislative wing is formed with elected ward councilors. The wing is headed by one Deputy Mayor. There are about 18 functional committees and 75 ward committees. However for SWM system delivery Health and Sanitation committee of the legislative wing take responsible actions. The elected corporators, as revealed from the stakeholders consultation (dated 4th and 14th February 2006) maintain a close watch on the SWM activities carried out by JNN and contractors within their respective wards and provided information to the CEO on a regular basis for the improvements required or deficiencies if any.

Table 9-5: Functions of Public Health, Public works and Mechanical (garage) sections

PUBLIC HEALTH	PUBLIC WORKS	Mechanical (Garage) section
Overall Monitoring of Comprehensive and Complete Sanitation	Silt cleaning from open drains.	Transportation of collected wastes Refuse vehicle's operation and maintenance.
Street sweeping and waste collection from markets and commercial areas, hotels and restaurants. Waste collection from hospitals and nursing homes and health aspects of the sanitation workers, sweepers		
Concentrate more or less on primary collection.		

The public health section of JNN is headed one chief health officer. The chief health officer is assisted by two other health officers, one chief sanitary inspector, sanitary inspectors, sanitary supervisors, and sweepers. Each JNN zone is headed by one zonal commissioner who is responsible for the SWM system delivery for the respective zone. The organizational set-up of the SWM section is given in Figure 9-6 and the detail staff strength of public health section is given in Table 9-6.

Table 9-6: SWM Team in the public health section of JNN

SI. No.	Staff	Total Strength
1.	Zonal commissioners	6
2.	Chief Health officer	1
3.	Health Officer	2
4.	Chief Sanitary Inspectors	4
5.	Sanitary Inspectors	70
6.	Sanitary supervisors/Jamadars	250
7	Sweepers & vistis	6395
Total		6728

Source: JNN

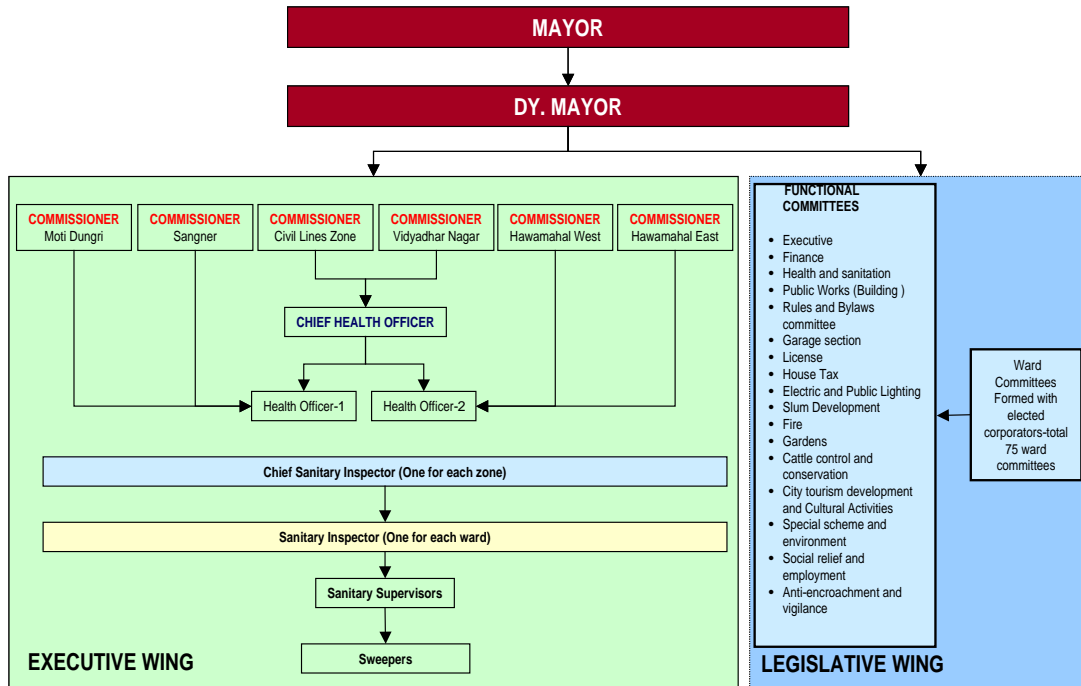


Figure 9-6: Organisation Structure of Jaipur Nagar Nigam on SWM

The Garage section of JNN is headed by one executive engineer (mechanical) who is assisted by one assistant engineer each for the three JNN garages. Each assistant engineer is assisted by two junior engineers, mechanics, helpers, cleaners, welders, fitters, carpenters, drivers & operators. The organization set-up of garage section is shown in Table 9-7.

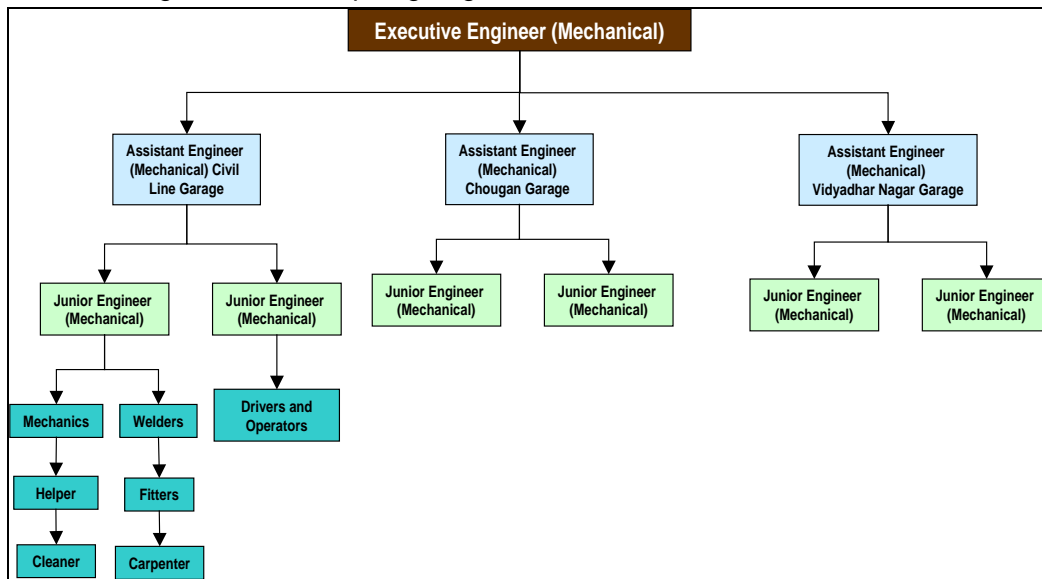


Figure 9-7: Organisation Structure of Municipal Garage in Jaipur Nagar Nigam

The total sweeping staff available with JNN is in a ratio of 1 per 470 persons (considering a population of 30,09,000 within the JNN boundary as per 2006), which is a fair enough ratio as per the prescribed norm of 1:500 in Central Public Health and Environmental Engineering

Organization (CPHEEO)¹ manual. The other sanitary staff available with JNN is almost at the satisfactory level as specified in the CPHEEO manual. However, except the health officers, the technical capability of other staff members of public health section is not adequate enough towards management of MSW. Therefore, towards enhancing the efficiencies of the present framework, adequate capacity building, training and induction of technical staff is required in the public health section. However, though the technical capabilities of the Garage section is at the satisfaction level induction of modern technologies required to introduced in the section towards increasing its efficiencies for a better SWM system delivery.

Within the municipal area, some zones have been contracted out to the private contractors from the primary collection to waste disposal. They have their own sweeping staff, waste collectors and vehicles to transport the waste from the collection points to the disposal sites.

In some selected pockets, NGOs has also been contracted out the work of house-to-house waste collection in a collective manner. One NGO named CDC is pioneer in this field. Nearly 50000 houses have been covered through this system.

9.4.2. The Present SWM Service

The management of MSW in Jaipur is therefore managed by JNN and contractors together. The sanitation practices prevail in Jaipur is (i) comprehensive sanitation (ii) complete sanitation and (iii) general sanitation. The components of these sanitation practices and their differences and the zones covered under these sanitation practices are shown in Table 9-7. Figure 9-8 shows areas with primary collection of solid waste.

Table 9-7: Prevailing sanitation practices in Jaipur

Sanitation Practices	Comprehensive	Complete	General
House-to-house waste collection	√	√	X
Street Sweeping and collection of sweeping wastes	X	√	√
Desilting of storm water drains	X	√	√
Desilting of sewer lines	√	√	X
Desilting of service lanes	√	√	X
Secondary waste collection	√	√	√
Transportation of wastes	√	√	√
Disposal of wastes	√	√	√
Zones covered	Hawamahal (east), Hawamahal (west) and Sanganer zones	Pratapnagar, Ward no. 21 & 23 of civil lines zone, 68 & 69 of V.D zone, ward no. 13 of Sanganer zone and Military area of Civil lines zone.	Civil lines Motidungri and Vidyadharnagar zone

¹ The norms and requirement of various staff with respect to population as specified by the CPHEEO manual are mentioned below:

1. Public health/Environmental engineer or Civil engineer having training in Environmental Science should be the in charge of SWM department.
2. Sanitation officer (S.O) @ per 0.1 million of population to look after the collection, transportation, processing and disposal of waste or @ 1 per 2 sanitary inspectors.
3. Sanitary Inspectors (SI) @ one S.I per 0.05 million or @ 1 per 80 sweepers.
4. Sanitary sub-inspector (SSI) @ one S.S.I per 0.025 million or @ 1 per 40 sweepers.
5. Sanitary Supervisors (SS) (a person who can read, write and report or having a matriculate) @ one SS per 0.0125 million or 1 per 20 sweepers.
6. Sweepers strength 2 to 3 sweepers per 1000 population

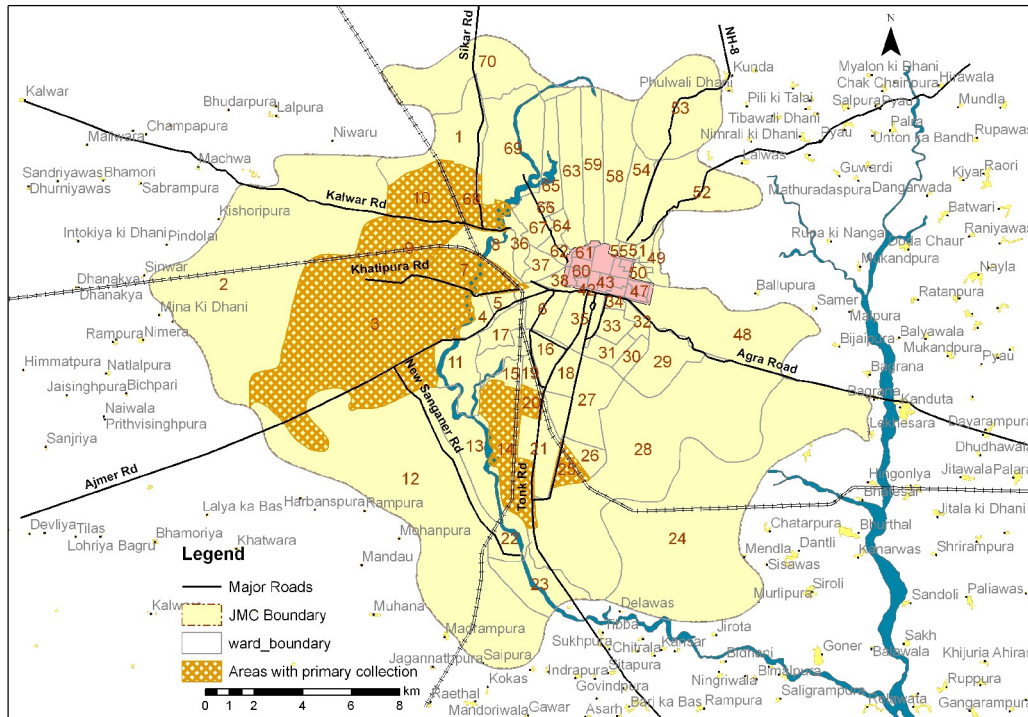


Figure 9-8: Areas with Primary Collection of Solid Waste

The comprehensive and complete sanitation practice has been contracted out. However in case of comprehensive sanitation practice the street sweeping and desilting of storm water drains are not done through the contractors and are taken care of by JNN. In the following sub-sections the detail MSW management system like waste generation, waste collection, waste transportation, waste disposal has been narrated subsequently.

a) Solid wastes generation

The type of waste generated within the municipal areas can be largely classified as (i) MSW (ii) Biomedical Wastes, (iii) Industrial Wastes and (iv) Construction and Demolition Wastes.

The estimated waste generated with the municipal boundary as estimated through RUIDP project and JNN for the year 2001-2002 is given in Table 9-8. The quantity of waste generated has been taken in metric ton per day (mtpd).

Table 9-8: Waste generation estimated by RUIDP and JNN as on 2001-2002

Type of waste generation as estimated	Quantity of waste (mtpd) as per RUIDP	Quantity of waste (mtpd) as per JNN
Residential and commercial sources	870	-
Slum areas	135	-
Hotels	12	-
Slaughter House Waste	12	-
Market Waste	73	-
Total MSW	1102	1040
Biomedical waste	17	
Industrial Waste	-	
Construction and Demolition waste	120	
Total Waste Generated	1239	1040 (only MSW)

Note: The industrial waste has not been considered, as the waste collection from these does not fall under the purview of JNN. Source: RUIDP report and JNN data as submitted to Rajasthan Pollution control Board (RPCB)

However, considering the present population growth, population density, and spatial distribution of income groups in the city the waste generation pattern in the city has been calculated for the 2006-2007 and is given in Table 9-9.

Table 9-9: Waste Generation in 2006-2007

Type of waste generation	Quantity of Waste (mtpd)
Residential areas	826
Commercial areas	256
Hotels	9
Markets and slaughter houses	68
Street Sweeping	104
Total MSW	1263
Biomedical Wastes	16
Industrial Wastes	26
Construction and demolition Wastes	116
Total Waste	1421

b) Waste Generation projections

The waste generation projections have been done for the Jaipur. On an average a per capita waste generation of 0.46 kg per day has been considered for population within the JNN areas. Considering the strong potential for growth² of Jaipur, an annual increase of 1.5% in per capita per day waste generation has been considered. The projected waste generation considering the population growth as projected on high growth basis is given in Table 9-10 and Figure 9-9.

Table 9-10: Waste Generation (mtpd) Projections for JNN

Years	2011	2016	2021
Population (High Growth Based)	35,60,000	41,52,000	47,99,094
Waste Generation (mtpd)	1421	1910	2208

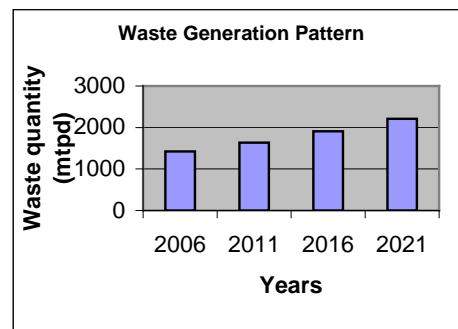


Figure 9-9

c) Collection and Storage

In areas under complete sanitation programme, the primary collection of wastes are through (i) street sweeping and (ii) house-to-house waste collection. Contractors deploy their own sweepers and house-to-house waste collectors. However areas covered under comprehensive sanitation, waste collection from households are arranged by contractors but the street sweeping and drain silt clearing are taken care of by JNN. The collected waste are then deposited to storage bins or in open storage points. However, the areas covered by JNN does not have a house-to-house waste collection facility. From various secondary information and consultants site visit to Jaipur it is estimated that nearly 50,000 households (*source JNN*) has been covered by house-to-house waste collection. A NGO named CDC is involved in the house-to-house waste collection system. However, the stakeholder's consultation with some Residential Welfare Associations (RWAs) reveal that they also arrange house to house waste collection in their society. This is

² Per capita waste generation in developed countries is 0.7-1.8kg/capita/day as compared to 0.4-0.9 kg/capita/day in low to middle income countries (CPOHEEO manual).

done through JNNs “*Swasta Mitra Apke Dwar*” programme. The wastes collected through this system are collected by the refuse vehicles. The organizations who are given permission for collecting waste from households need to have at least Rs. 9000 as bank balance and JNN provides them one tricycle and one mechanized container. These organizations have been allowed to take Rs. 20 from households and Rs. 25 from commercial areas. The zones and wards in which such system is exists are:

- Ward numbers 3,7 and 20 of Civil Lines Zone;
- Ward numbers 14 and 25 of Sanganer Zone
- Ward numbers 9,10 and 68 of Vidyadharnagar Zone

However, this is not a common practice in all the residential areas in the city. The house-to-house waste collection system as exist in Jaipur is not through with segregation of biodegradable from the non-biodegradable.

There is no specific waste collection norm exist in the city. In areas under complete sanitation, normally 1000 running meter has been allotted to one sweeper for waste collection. However, in areas under the comprehensive and normal sanitation programme (covered by JNN) 700-800 running meter of sweeping is allotted to one sweeper. In all the cases, this norm is little on higher side as compared to the norm prescribed in CPHEEO manual (which mentions about 500 running meter in average). The sweeping time is in between 6

a.m. to 7a.m in the morning and 3p.m. to 4p.m in the evening along major roads. At the start of the shift, the attendance register of sweepers is maintained. However, with all such efforts only 45% i.e. 810 mtpd of waste is collected on a regular basis. The zone wise waste collection coverage is shown in Figure 9-10.

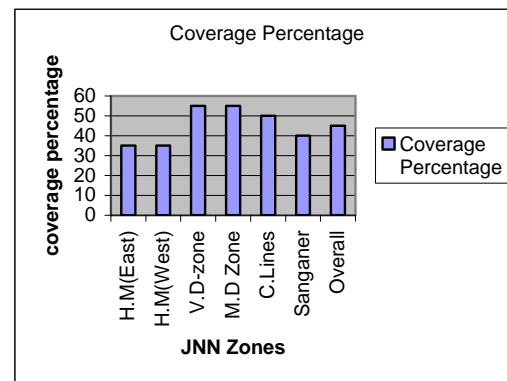


Figure 9-10

There are mixed type of storage facilities available in the city. Mechanized containers of 4.5 cubic meter (cu.m) capacity have been provided by JNN in Motidungri, Vidyadharnagar, Civil Lines and Sanganer zone. In addition, contractors also provided their own containers at Hawamahal (east) and Hawamahal (west) zones. However, attempt has been made to track the existing number of containers provided by JNN and is given in Table 9-11. In addition there exist many open waste collection points. The percentage comparison of open collection points and containerized storage points is shown in following graph. From Figure 9-11 it can be considered that open collection points are higher in the Hawamahal (east) and Hawamahal (west) zone and on an average about 50% open collection points still exists in the city.

Table 9-11: Number of containers provided in JNN zones

JNN Zones	Number of containers provided by JNN
Motidungri Zone	190
Vidyadhanagar Zone	250
Civil Lines zone	
Sanganer zone	
Pratapnagar	20
Total	460
Total working containers	375
Total storage Capacity	=375*4=1500cu.m per day=975mtpd

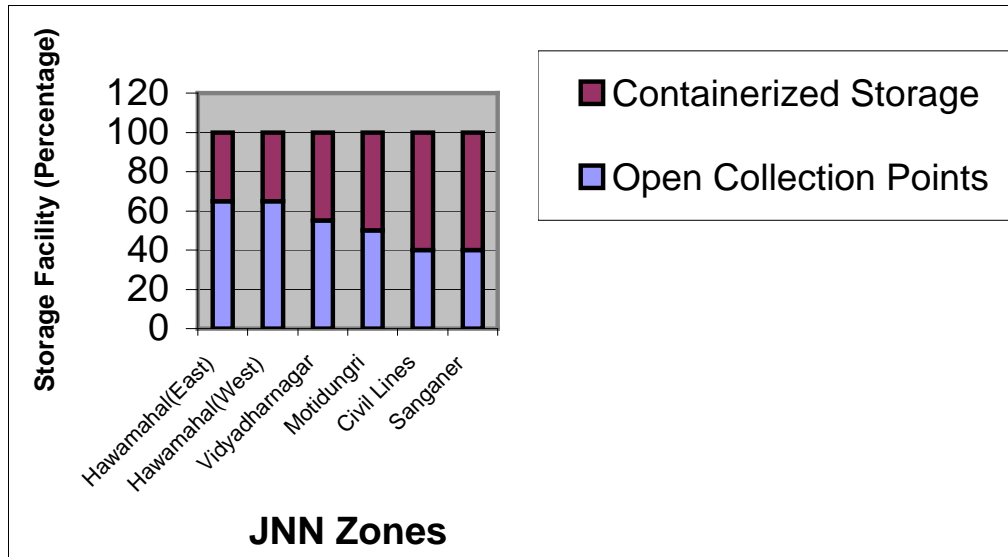


Figure 9-11: Type of Storage Facilities

In areas where open storage points exist the system of waste collection is through a manual/multihandling³ system, which degrades public health and environment and is not in conformance to SWHR. Moreover, no waste segregation (biodegradable parts from non-biodegradable) is practiced. In addition, wastes from industries and construction activities also get mixed with MSW. However, JNN has taken active role towards separate collection and treatment of biomedical wastes. The biomedical wastes are treated at a common treatment plant at Khori Ropara.

d) Waste Transportation

Waste accumulated in the community containers are removed by refuse vehicles. The garage section of JNN is headed by one executive engineer (mechanical). 71 vehicles are in working condition available with JNN. The breakup of these vehicles their purchase years and waste carrying capacity is shown in Table 9-12 and Figure 9-12.

³ Waste collected through street sweeping is first stored manually, then from the storage point to the refuse vehicles it is loaded manually and then from the refuse vehicles to the disposal site it is unloaded manually and wastes are segregated at the disposal site for the recyclables, leads to multihandling.

Table 9-12: Vehicle details of JNN

Sl.No	Type of Vehicle	No. of vehicles	Year of Purchase	Waste carrying Capacity	Make
1	Loader (Total-10)	2	1993	5T	ECEL-710
		2	1995	5T	ECEL-710
		2	1997	5T	ECEL-710
		4	2003	5T	ECEL-770
2	Dumper Placers (Total 35)	7	1988	2T	TATA-1210
		5	1993	2T	EICHER
		4	1993		TATA-608
		2	2001	2T	TATA-1613
		1	1995	2T	ALL.NISS
		7	1993	2T	Ashoke Leyland
		3	2001	2T	Ashoke Leyland
		6	2003	2T	S.MAZDA
3	Tippers (Total 4)	3	1993	2T	ALL.NISS
		1	1995	2T	ALL.NISS
4	Tractors (Total 16)	6	1995	1T	HMT-Zetor
		3	1983	1T	Zetor
		6	2005	1T	Mahindra Tractor
		1	2003	1T	Escort 435
5	JCBs (Total 6)	1	1991	Are used for taking wastes from the open collection points to load into the loaders	Esc.JCB
		2	1992		Esc.JCB
		1	2001		Esc.JCB
		2	2003		Esc.JCB
Total Waste Carrying Capacity (considering 2 trips)				288 mtpd	

It is clear that nearly 72% vehicles as available with JNN are more than 5 years old and 63% are more than 10 years old. Only 9% of the vehicles are purchased in 2005. The vehicles more than 5 years old increases O&M cost in terms of fuel consumption and that too vehicles which are more than 10 years old increase the O&M cost to a great extent. Therefore, there is serious need to replace such vehicles.

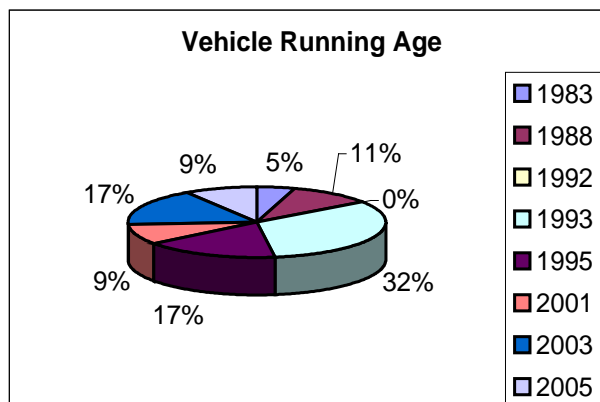


Figure 9-12

The number of vehicles as available with contractors has been observed of less than 5 years old and therefore can be used efficiently for the next 5 years. 240 vehicles are available with contractors but for SWM system delivery on an average 200 vehicles are in use. The waste carrying capacity considering both the JNN and contractors vehicles is about 1200 mtpd considering 2 trips for each vehicle. However, in absence of a weighbridge the actual quantity of waste going to the disposal site is not known but from secondary information it can be concluded that about 750mtpd of waste is actually transported to disposal sites.

e) Disposal System

Three disposal site is working at present namely Sewapura at the North and Mathura Daspura at the east. Under the RUIDP funding a new sanitary landfill site is also coming up at Lengriwasa at the east. Earlier there waste disposal sites at Sewage farm and Jagatpura, which

has been abandoned now. One new disposal site proposed at Khori Ropara has not received the clearance from the State Pollution Control Board. Due to proposed physical growth of the city disposal site is not possible to be taken at the Western and North Western part of the city. And, in the southern part of the city due to the existing aero drum disposal site is not possible to be constructed. The waste collected from the Vidyadharnagar zone and part of civil lines zone are disposed at the Sewapura site. Wastes from other areas are disposed at Mathura Daspura. Once the sanitary landfill site at Lengriwasa get constructed a significant quantity of waste can be taken t this site.

In absence of weighbridge at the disposal sites the quantity of waste going to the disposal site is not possible to be known. However from secondary data it is estimated that about 750-800 mtpd of wastes are actually disposed to these sites.

f) Processing & Recycling

At present there is no waste treatment facility available in the city. A compost plant was in existence at Mansarovar earlier, which has been closed due to some functional problems. The officials of Jaipur Nagar Nigam (JNN) are of opinion that compost plant is not a suitable treatment technology. With private sector partnership (Grasim Industries) a new refuse derived fuel paletization unit is coming up Lengriwasa sanitary landfill site with 500mtpd capacity. The private partner also has planned to establish another unit of same capacity. The operation of these plants shall solve the waste disposal problem to a large extent as it is estimated that the plants can reduce the waste load to the disposal site by 45%.

g) FINANCE

The detailed purchase cost of refuse vehicles, as on date is Rs. 39.306 million. As regards O&M costs (2004-2005), for SWM system delivery the expenditure incurred by JNN is about INR 710 million. The revenue sources of JNN are limited to tax, water tax, lighting tax, sanitation tax, fees, rent and toll tax. JNN have collected on an average Rs. 5 million from service charges or penalties for non-conforming to the notified rules as prescribed under SWHR, 2005 by GoR.

9.4.3. COMMUNITY CONSULTATIONS AND SURVEYS

a) Consultation

A detailed stakeholders consultation has been carried out in Jaipur during the CDP preparation. From July 23rd January to 4th February, these initial consultations were broadened and deepened to include discussions with a variety of community representatives. Collective and individual meetings with several RWA, Trader's Association (TA), NGOs, women groups, slum groups have been carried out. The priorities for improvement varied a lot across the consultation. Improvement of solid waste has been sought with first priority ranking (see Table 9-13) by the stakeholders amongst the nine other improvement sectors. A summary of the consultations is provided in Table 9-13.

Table 9-13: Priority Ranking of Issues for the City

Sectors	Weighted Score	Final Ranking
Water supply	170.21	3
Sewerage	172.34	2
SWM	210.64	1
Roads and Street Lighting	104.26	4
Drainage	104.26	4
Traffic management	104.26	4
Housing	95.74	7
Heritage	72.34	8
Urban Environment	68.09	9

Table 9-14: Summary of consultations findings for SWM

S. No	Stakeholders	Issues raised by stakeholders		
		Present service Delivery/Other issues	Effect	Proposals/suggestions for improvement
1	Community (RWA, Traders association and slums)	<ul style="list-style-type: none"> o Waste collection is limited to selected areas in the city. o Absence of mechanized storage bins leads to unhealthy condition as waste are therefore dumped in open storage points and are spread all over the roads- especially in walled city. o No waste collection facility available in slums-waste are disposed in to the drains or burnt at spot. o Narrow roads and traffic congestion make it difficult for the free movements of refuse vehicles. o Waste spillage occurs during waste transportation. o Lack of civic sense among the people and awareness level is poor 	<ul style="list-style-type: none"> o Impact on public health is high due to infrequent waste clearing. o Drains get blocked leading to water logging during rainy season, water contamination, and health and hygiene problems. <ul style="list-style-type: none"> o Waste stored in pits for about a week, which leads to generation of vermin's and deteriorate human health and environment. 	<ul style="list-style-type: none"> o Require regular waste cleaning and collection. o Waste disposal at the open points shall be closed completely. o Slum areas shall be covered by regular waste collection programme.
2	Women	The non-clearance of waste from the slums increases the generation of vermin's ⁴ which contaminate food.	Drains get blocked leading to landslides, water contamination, and health and hygiene problems.	Need for more dustbins
3	NGO and CBOs	Regular waste collection is limited to higher income groups. Infrequent or no service is provided in the low-income groups areas. The house-to-house waste collection is concentrated to small pockets in the city. Poor people does not have much awareness level for the ill effects from solid wastes	Poor collection system increases the burden of improper waste collection and the respective ill effects are very high.	House-to-house waste collection to be improved and shall be extended to other parts of the city.

⁴ Flies and rodents

9.4.4. Waste Characterization

As part of the Jaipur City development Plan (CDP), a waste characterization survey was carried out by the Design and Supervision Consultants (DSC) of RUIDP project in Jaipur. The physical characterization indicates that in most of these locations the biodegradable portion varies between 18-20% of the total collected quantity, which is at the lower side as compared to the biodegradable portion from other parts of India. Whereas the survey also indicates that in vegetable markets the biodegradable quantity generation varies between 65-80% of the total collected sample. It has been observed that the inert materials, silts etc. are quite high in Jaipur, varies between 22-45% of the total waste generated.

9.5. URBAN TRANSPORT

Transport infrastructure forms the backbone of an economy. It plays a very significant role in the growth and development of the city. It is also responsible, besides other factors, for the spatial growth of the city by increasing the accessibility of sites on the periphery of the city. The objective of studying the transport sector is to analyze the role of transport in the present scenario and to identify its strengths and weaknesses.

The road and the rail sector play a very significant role in Jaipur and the surrounding region. The chapter has been divided into the following sections: Regional linkages, city level road network, traffic characteristics, parking, public transportation system and finally Issues. The section on regional linkages describes the connectivity of Jaipur city to the other cities. City level road network identifies the main arterial roads inside the city and features related to it. Traffic characteristics details out the traffic volume, flow characteristics, modal split and vehicle growth in Jaipur city. The section on parking deals with the present parking scenario in the city mainly in commercial areas. Public transportation system section talks about the modes of public transport and other details associated with it. Regional linkages and connectivity is described in the ensuing section.

9.5.1. Regional Linkages

Jaipur is well linked to the rest of the country by roads, rail and air. National highway 8 and National highway 11 intersect at Jaipur and NH 12 leading to Jabalpur starts from Jaipur. NH-8 connects Bombay and Delhi while NH-11 connects Agra and Bikaner. NH-8 transects the city in North-South direction and NH-11 does so in an East-West direction. An estimated 38% of the vehicles enter the city from Ajmer Road, 18% from Delhi Road, 17% from Agra Road, 14% from Tonk road and the remaining 13% from Bikaner and Kalwar Roads.⁵ The city lies on Delhi-Ahmedabad rail route of Western Railways. It is well connected to Delhi, Agra, Ahmedabad, Calcutta, Jodhpur, Kanpur and Mumbai by more than 3 trains daily, the maximum being for Delhi with 9 trains. The Jaipur airport is situated in South of the Jaipur city at Sanganer. It presently caters to domestic flights but is proposed to be upgraded to an International Airport. Figure 9-13 depicts the regional linkages for Jaipur city.

⁵ Jaipur City investment Plan, Louis Berger International inc, 1998

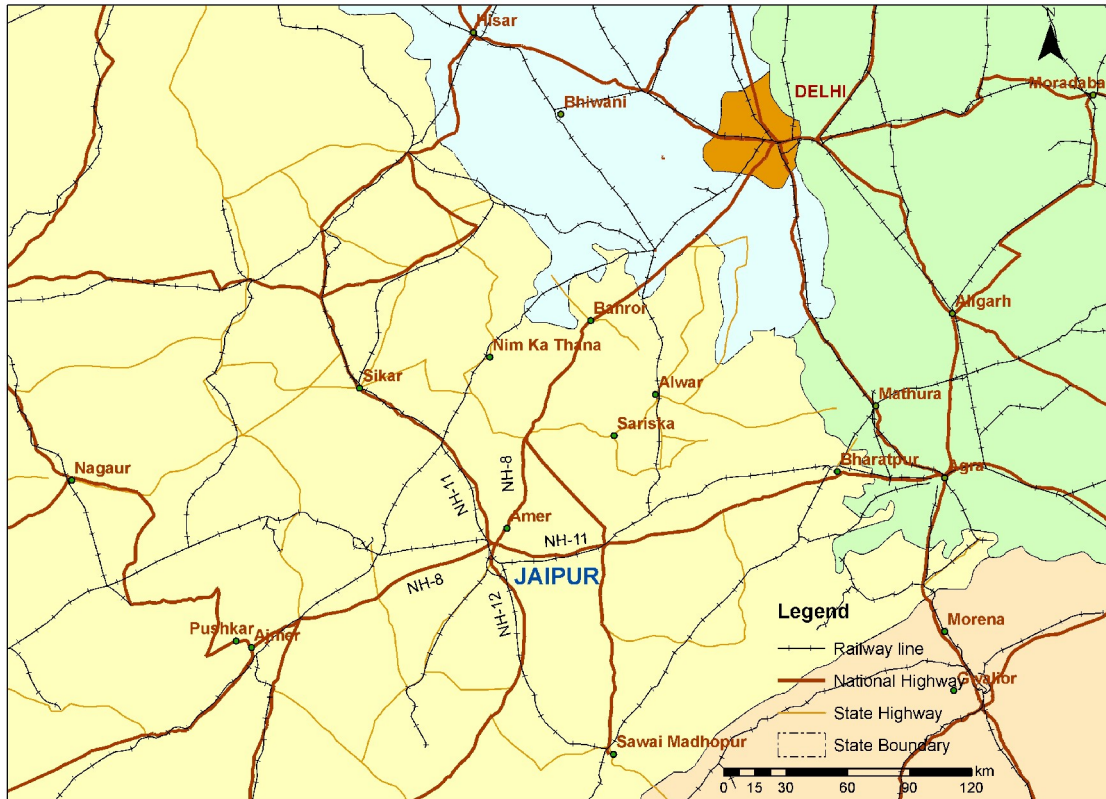


Figure 9-13: Regional linkages

The following section involves the study of the city level road network and it has been dealt in the light of different road characteristics inside the walled city and outside.

9.5.2. City level road network

The transport of Jaipur is mainly road based in the absence of an MRTS. The road network characteristics is very different for the walled city and the areas outside. Both have been discussed below. The road network for the city along with major roads is shown in Figure 9-14.

a) Walled city:

The walled city has a grid pattern of roads and most of the wholesale and retail trade activities are located in the walled city. The road network follows a hierarchy. The major East-West, Surajpol-Chandpol road and North-South Roads which form the sector boundaries measure 33m wide. Following this there is a network of 16.5m wide roads which run North-South in each sector linking internal areas of the sectors to the major activity spine formed by the major roads.

The road condition is not good inside the walled city except the main roads. The by-lanes are very narrow and pedestrian vehicle conflict chances are extremely high.

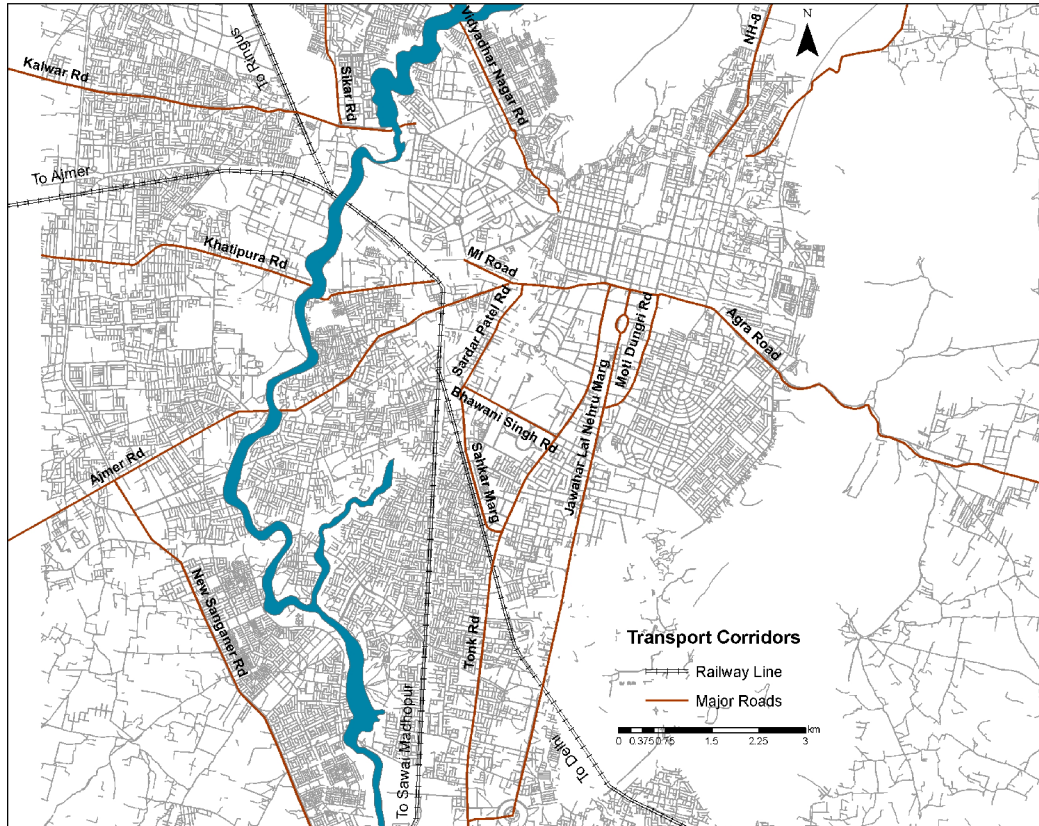


Figure 9-14

b) Outside the walled city:

Jaipur city has around 10 major arterial spines which criss-cross the entire city. Tonk road is a major arterial road that connects some of the major employment centers like Sanganer, Durgapura and Lal Kothi. The section of the Tonk road from Gandhi Nagar to Ramniwas garden is known as Sawai Ramsingh Road. MI road runs from Ghat Gate to Railway Station Road connecting high employment areas like Bani Park, Sindhi Camp and Transport Nagar. JLN marg runs straight from Jaipur circle to Ramniwas Garden and has many important sites like the Laxmi Narayan temple, Albert Hall, Rajasthan University and other institutions on its either side. Ajmer road connects Ajmer and Jaipur. It terminates in Jaipur at the intersection of MI Road and Sansar Chandra Road. Agra Road terminates at the beginning of MI Road. Khatipura Road starts from the railway station and runs towards Khatipura lying to the West of the city. The major city level roads in Jaipur city have been shown in Table 9-15

Table 9-15: Roads and their features

S.No	Name of Road	No. of lanes	Divided/Undivided
1	Tonk Road	4	Divided
2	Jawaharlal Nehru Marg	6	Divided
3	Moti Doongri Road	4	Divided
4	Sawai Mansingh Road	4	Undivided
5	Ajmer Road	4	Divided
6	MI Road	3 to 6	Undivided
7	Agra Road	4 to 6	Divided

S.No	Name of Road	No. of lanes	Divided/Undivided
8	Sardar Patel road	6	Divided
9	Khatipura Road	3	Undivided
10	Vidyadhar Nagar Road	2 to 4	Divided
11	Sikar Road	3	Undivided

Source: Consolidated Transportation Networks Ltd., Wilbur Smith Associates

A notable feature of the road network is that all the major roads have been provided with parallel roads. They are connected at an interval of 800m to 2km. The road hierarchy is shown in Figure 9-15.

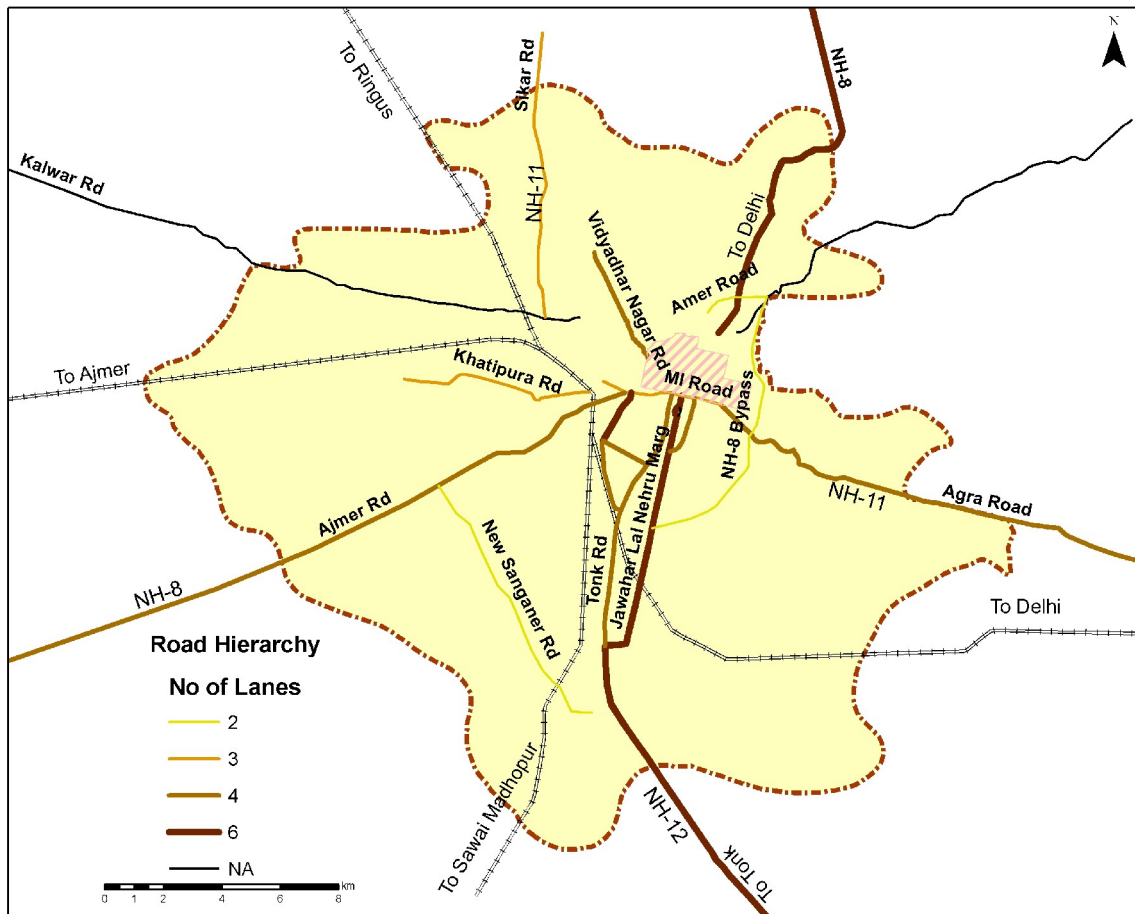


Figure 9-15: Road Hierarchy

9.5.3. Signalized Intersections

Traffic signals are relatively safe type of traffic control at intersection and have scope for provision of facilities for pedestrians and cyclist. Phasing of signals should therefore be proper indicating clearly the movements allowed at any one time and time cycle length should rationally be proportioned as per the requirements of the approaching traffic. To study the suitability of the phasing and cycle length distribution between Green, Yellow and Red phase, a study was conducted at 17 important traffic intersection in Jaipur city by Shah Consultants as shown in Table 9-16.

Table 9-16: Major signalized intersections in the city

S. No.	Name of the Intersection	Intersecting Roads
1	O.T.S.	(J. L. N. Marg/ Danik Bhasker Road)
2	Lakshmi mandir	(Tonk Road/ Sahkar Bhawan Road)
3	Rambagh	(Tonk Road/ Bhawani Singh Road)
4	Narayan Singh circle	(Tonk Road / Govind Marg)
5	S. M. S. hospital	(Tonk Road / Hospital Road)
6	St. Xaviers	(Janpath Road / Ashok Marg)
7	Kashakoti circle	(Railway Station Road/ Collectorate Circle Road)
8	Govt. Hostel	(M. I Road / Sansar Chandra Road)
9	Panchbatti	(M. I. Road/ Janpath Road)
10	Ajmer gate	(M. I. Road/ Kishan Pole Bazar)
11	Yaadgir	(M. I. Road / Tonk Road)
12	Ram Niwas bagh	(M. I. Road / J. L. N. Marg)
13	Sanganeri gate (3 legged)	(Agra Road / Johri Bazar/ Ajmeri Gate Road)
14	Sanganeri gate (4 legged)	(Agra Road / Moti Doongri Road)
15	Ghat gate	(Agra Road/ Ajmeri Gate Road)
16	Ajmer pulia	(Ajmer Road/ Ajmeri Gate Road)
17	Panipech crossing	(Rly. Station Road/ Panipech Road)

Rotary intersection

Rotary intersection (Roundabouts) are one way circulatory system around a central island. These intersections provide high capacity, cause little delay in off peak hours, result in orderly movement and require little maintenance. Cycle and animal drawn vehicle are at a distinct disadvantage and create problems on large rotary intersections. (Table 9-17)

Table 9-17: Major Rotary intersections

Sr. No.	Location	Intersection
1	Ambedhkar circle	(Bawanisingh road/ Janpath)
2	Police memorial circle	(J.L.N. Marg/ Govind Marg)
3	Sodala circle	(Ajmervroad/ Hawasadak)
4	Sahkar Bhawan circle	(Sahakar Marg / Bawanisingh Road)
5	Chomu House Circle	(Sardar Patel Road / Prithviraj Marg)
6	Ahinsa circle	(Ashok marg)
7	Subhash Chowk intersection	(Amber Road)

All these rotaries (circles) are located in prime areas of heavy traffic flow in the town, and thus important from traffic circulation point of view.

9.5.4. Traffic characteristics

The land use of Jaipur is rather imbalanced presently with the major work centers concentrated in the walled city or within 10 km radius of the walled city while the residential areas are coming up in the far flung areas of the city. This would have a significant effect on the future traffic characteristics.

a) Walled city:

The walled city accounts for 54% of the total commercial area of the city and 32% of the total workforce of the city. As on 1991 there were around 18000 retail establishments in the city.

During the consultations, it emerged that the shopkeepers in the walled city preferred traveling to their workplace in their two-wheelers. The main reason for this was given as the lack of parking space. Moreover vehicles are allowed to be parked at one location at a stretch for only 2 hours. It is more convenient to change the parking location of a two-wheeler than a car. The vehicle composition inside the walled city is heavily biased towards two wheelers.

60% of the total wholesale units of the city lie in the walled city. ⁶The presence of wholesale units is closely interlinked with goods handling in terms of loading, unloading, storage etc. Since adequate space is not available within the walled city for all these activities, it spills onto the roads increasing congestion.

Informal activities are substantially large involving migrant population to a large extent. Nearly 80% of these activities are being conducted along the road. The space occupied by them is meant for traffic and transportation purposes⁷. This is generating stress for the walled city environment. Most of the people involved in informal sector activities walk to their place of work, about 20% use cycles and the rest use public transport.⁸

The walled city is also home to many tourist attractions like the Hawa Mahal and Palace. These attract large number of tourists to the area which add onto the high travel and parking demand. Roads in the walled city have less pronounced peaks which may be attributed to variety of activities starting at different hours of the day.

b) Outside the walled city

The city is growing towards the west and south. Good road network is also supporting the growth and development. As of now, the maximum distance between residence and work place is about 12kms in Jaipur.⁹But this is likely to grow in the future with the expansion of the city. Shopping and other trips are getting localized for the residents since almost all residential areas have developed their local shopping centers catering to daily needs. Table 9-18 shows travel to work distance characteristics.

Table 9-18: Travel to work distance characteristics

Category	Distance Travelled						Average
	<1 km	1-3 km	4-6 km	7-9 km	1-25 km	>25 km	
Slum	14.3	16.8	2.4	22.9	18.9	6.7	8.7
Private Colony	8.6	5.6	26.2	34.1	22.8	2.2	9.2
Housing Board	5.8	10.5	19.6	27.6	33.5	2.9	10.4
Walled city	31.9	18.3	20.9	14.3	9.9	4.8	6.1
Outskirts	18.6	13.1	13.9	19.3	23.5	11.7	10
Total	15.6	13.5	20.3	23.5	21.3	5.8	8.8

Source: Mass transport options and recommendations for Jaipur city, Wilbur Smith

⁶ Detailed Engineering Studies for the Proposed parking Project at Ramniwas Bagh, CES

⁷ Traffic Master Plan by Shah Consultants

⁸ Traffic Master Plan by Shah Consultants

⁹ Traffic Master Plan; Shah consultants

As evident from Table 2, Maximum percentage of people residing in Housing Board Colonies travel the maximum distance to go to work followed closely by people living in the outskirts. Some of the colonies developed by Housing Board are Mansarovar, Nari ka Naka, Malviya Nagar, Pratap Nagar, Jawahar Nagar, Shastri Nagar etc.

Since the average distance to be traveled by most people is around 8-10 km and travel takes place along the main arterial roads of the city. These roads have to face the brunt of excess traffic. As seen in Table 9-19, the flow characteristics along the major traffic corridors in the city show that quite a few roads are already in a congested situation while some are on the verge of it.

Table 9-19: Flow Characteristics on Major Traffic Corridors

Sl. No.	Name of the Road	Traffic Counting Station	Peak Hour Traffic (PCU)	Lane Configuration	Travel Speed (Kmph)	Maximum Capacity (PCU/Hour)	V/C
1	Jawahar Nagar Bypass	R.A.C.Hq	2143	2(un divided)	32	21000	1.02
2	J.L.N. Marg	Poddar Institute	3130	6(divided)	43	7700	0.41
3	Tonk Road	Tonk Puliya	6721	4(divided)	33.5	5100	1.32
4	Sahkar Marg	Imli Phatak	6571	4(divided)	34.5	5100	1.29
5	M. I Road	A.I.R	4877	4(un divided)	27.5	5100	0.96
6	Ajmer Road	Sodala Thana	6646	4(divided)	33.5	5100	1.3
7	New Sanganer Road	Near Kings Road Mod	622	2(un divided)	53	2100	0.3
8	Sirsi Road	Near Khatipura Mod	1406	2(un divided)	41.5	2100	0.67
9	Sikar Road	Panipech Nalah	3867	3(un divided)	38.5	4000	0.97
10	Mount Road	Amber Road Karbala Junction	873	Single lane	39	1000	0.87
11	Amber Road	Near Amber Road Karbala Junction	2749	2(un divided)	35	2100	1.31
12	Khatipura Road	Khatipura Road	1739	2(un divided)	38	2100	0.83
13	Moti Dungri Road	Govind Marg Chouraha	1420	3(un divided)	35	4000	0.36
14	Bawani Singh Road	S.M.S Stadium	3794	4(divided)	34	5100	0.74
15	Jan Path	Secretariat	2837	6(un divided)	45	6900	0.41
16	S. C. Road	M.L.A Quarters	2738	4(divided)	39.5	5100	0.54
17	Shipra Path (Mansarovar)	Near Petrol Pump	1054	4(divided)	55	5100	0.21
18	Madhyam Marg (Mansarovar)	Kiran Path	1327	4(divided)	57	5100	0.26

Source: Master Plan for Traffic & Transportation Vol I by Shah consultants

As seen in the Table 9-19, Jawahar Nagar Bypass, Tonk Road, Sahkar Marg, Ajmer Road, Amber Road have volume/capacity ratio above 1 which implies that they are saturated and congested. MI Road, Sikar road, Mount Road and Khatipura Road are on the verge on congestion. (Figure 9-16)

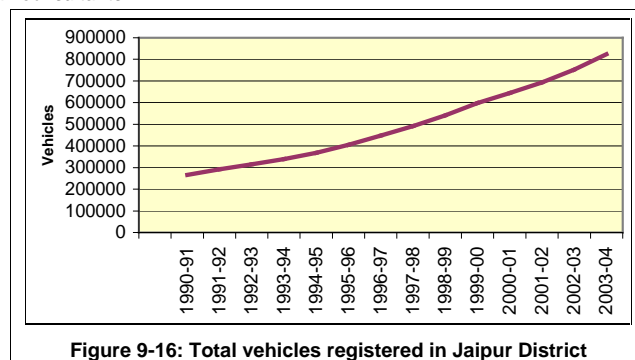


Figure 9-16: Total vehicles registered in Jaipur District

9.5.5. Modal split

The estimated modal split in the city shows a high proportion of travel by public transport including intermediate public transport. Though public transport comprised only 6.32% of the total number of vehicles, nearly 26% of passengers use it for travel. (Table 9-20)

Table 9-20: Mode wise Distribution of Person trips

S.No	Mode	% Vehicles	% of person trips
1	Bus	6.32	26
2	truck	5.23	2
3	Car/Jeep	9.73	15.76
4	Auto Rickshaw	11.54	18.53
5	Two-wheeler	29.3	26.37
6	Cycle	34.21	7.49
7	Tractor	1.11	0.11
8	Animal Drawn	0.56	3.49
9	Others	2	0.19

Source: Jaipur City investment Plan, Louis Berger International Inc, 1998

9.5.6. Vehicle growth

The travel needs in the city are catered by a variety of modes of transport in the form of buses operated by RSRTC, mini buses run by Private operators, auto rickshaws, tempos, cycle rickshaws and private vehicles such as cars, 2-wheelers and cycles. Improving socio-economic status, easy availability of vehicles, increase in population and lack of good public transport is resulting in steep growth of vehicles as seen in Table 9-21 and Figure 9-17.

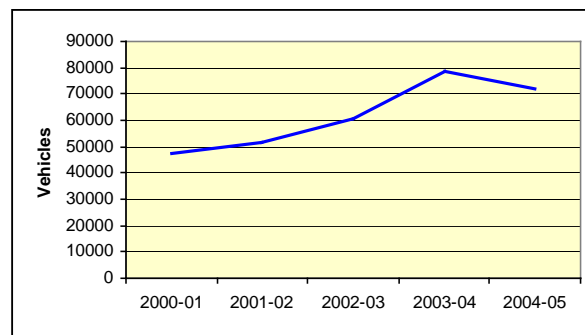


Figure 9-17: Registered vehicles in Jaipur City
Please note that data of 2004-05 pertains till Dec'04

Table 9-21: Vehicles in Jaipur District

Year	M. Rickshaw	Two Wheeler	Auto Rickshaw	Tempo		Cars	Jeeps	Tractors	Trailers	Taxi Car/Jeeps	Buses	Trucks	Others	Total
				Pass	Goods									
1990-91	55	191683	3837	886	145	23335	7609	9719	2603	2330	8554	15277	221	266254
1991-92	55	211599	3952	1041	162	25057	8427	10766	2609	2534	9327	16153	223	291905
1992-93	55	229125	4059	1128	162	26401	9068	11705	2660	2753	10164	16925	231	314436
1993-94	55	248929	4236	1149	162	28090	10109	12438	2668	2883	10801	17743	234	339497
1994-95	55	271827	4397	1170	162	30471	10992	13168	2669	3023	11227	18869	244	368274
1995-96	55	300294	4644	1239	164	34614	12070	14116	2669	3331	11673	20379	258	405499
1996-97	55	331861	5193	1235	164	39743	13884	15377	2669	3667	12386	22133	258	448625
1997-98	55	364530	5630	1245	164	43874	15929	16854	2669	3942	13202	23661	265	492020
1998-99	55	402645	6179	1248	667	48583	18069	18552	2669	4355	13816	24553	278	541669
1999-00	55	444889	6568	1253	1131	55948	20185	19930	2669	4692	14362	25647	328	597657
2000-01	55	480570	6920	1253	1496	62231	21022	20637	2669	5101	14752	26660	401	643767
2001-02	55	518530	7256	1253	1876	69284	21630	21393	2686	6148	15045	27705	475	693336
2002-03	55	564419	7815	1253	2416	77121	22621	21939	2745	7168	15424	29176	493	752645
2003-04	55	617195	8579	1253	3286	86332	25136	22655	2861	8280	15787	31698	598	823715

Source: Detailed Engineering Studies for the Proposed Parking Project at Ramniwas Bagh, CES, 2006

The registered vehicles in Jaipur District have witnessed an increase of nearly 200% from 1990 to 2003. This coincides with boom in the Indian economy and the introduction of the liberalization policy. During this period vehicles started becoming available at easy monthly installments. The purchasing power of people of Jaipur has also gone up as a result of which more people can afford a personal vehicle. Two wheelers and cars registered the maximum growth of 221% and 269% respectively. (Table 9-22 and Figure 9-17)

Table 9-22: Vehicles in Jaipur city

Type	Auto rickshaw	Bus	Mini bus	Car	Van	Jeep	Tractor	Truck	2-wheelers	Others	Total
2000-01	350	129	83	7454	626	796	890	712	36414	119	47573
2001-02	353	125	166	8615	510	709	784	1153	38761	210	51386
2002-03	403	133	283	9343	630	775	633	1543	46238	913	60894
2003-04	1123	394	166	13323	1	1130	865	4047	55287	1995	78331
2004-05	935	80	277	9391	929	977	827	2457	55122	1253	72248

Source: Office of Regional Transport Officer, Jaipur

9.5.7. Traffic volume

In 1997, daily traffic volume varied from 34000 to 1,20,000 vehicles on the roads in the East-West direction. The Chandpole Bazaar road with a total of 1,20,000 vehicles followed by Mirza Ismail road with 40,000 vehicles carried maximum traffic amongst East-West corridors. The traffic volume varied between 35,000 and 62,000 on the roads in the North-South direction. The highest volume in the North-South corridors is observed on Sawai Ram Singh Road followed by Tonk Road.

9.5.8. Parking:

Parking is a major issue in the walled city area and an emergent issue in the rest of the city. The tendency in Jaipur is of commercialization along the main roads. Initially, the plots along these roads were residential in nature but with increasing land value and traffic on these roads, they got commercialized. The commercialization led to an increase in parking demand along these roads which in turn reduced the effective carriage way.

a) Walled city

The existing parking system of Walled city of Jaipur is decentralized, unmanaged and largely dysfunctional. The parking is dominated by a large number of small parking lots. Many of these facilities are generally poorly maintained and lack basic infrastructure. Haphazard street parking in major markets reduces the traffic carrying capacity of the roads. This results in traffic bottlenecks especially in peak hours causing economic loss.

In view of improving the parking situation in walled city area, a number of studies have recommended development of well – organized off- street parking lots with modern facilities at various locations within and outside the walled city.

b) Parking Accumulation**Off Street Parking:**

The peak parking accumulation in individual lots located off street has been shown in Table 9-23.

Table 9-23: Peak Parking Accumulation in Individual Lots- Off Street

S.No.	Location	Total Vehicles		Total ECS
		Cars	Two-Wheelers	
1.	Sanjay Market	169	27	176
2.	Sanganer Gate	38	28	46
3.	Bapu Bazar	0	161	41
4.	Ramleela Ground	82	8	84
5.	Ajmeri Gate	29	0	41
6.	Ramiwas Bagh	319	37	329
7.	RCCI	143	14	147
8.	Mahila Chikitsalaya	81	139	116
9.	Kiran Kafe	9	26	16

Source: Proposed Parking Project at Ramniwas Bagh, CES, 2006.

Ramniwas Bagh, Sanjay Market, RCCI and Ramleela Ground parking lots are predominantly used for car parking. Parking lots in Bapu Bazar and Mahila Chikitsalaya are mainly used as two-wheeler parking lots.

A total parking demand of 2,596 cars and 13,327 two – wheelers was estimated for the year 2016. To meet this high growth in the parking demand, the study recommended to develop the multi – level off-street parking facilities and identified seven locations to develop such facilities (underground and/ or multi - storeyed). They are presented in Table 9-24.

Table 9-24: Identified Multi – level Off-street Parking Facilities

Sl. No.	Location of Facility	Area (m ²)	No. of Vehicles	
			Cars	Scoters
1	Ramniwas Bagh	17,000	700	-
2	Ramlila Ground	7,000	266	400
3	Bari Chaupar	8,000	180	350
4	Choti Chaupar	8,000	180	350
5	Sanjay Market	-	204	425
6	Old Pension Office	4,160	140	-
7	Rajasthan Chamber of Commerce and Industry Office	-	370	80
8	Ajmeri Gate (Old Subji Mandi)	-	50	130

c) On Street Parking:

The peak parking accumulation in individual lots located on street has been shown in Table 9-25.

Table 9-25: Peak Parking Accumulation in Individual Lots- On Street

S.No.	Location	Total Vehicles		Total ECS
		Cars	Two-Wheelers	
1.	Jauhari Bazar (South)	82	348	169
2.	Kishanpole Bazar (South)	79	246	140
3.	Chaura Rasta (South)	89	256	153

S.No.	Location	Total Vehicles		Total ECS
		Cars	Two-Wheelers	
4.	Bapu Bazar	26	737	210
5.	Nehru Bazar	58	463	174
6.	Nehru Bazar Bylane (towards Kishanpole)		69	17.25
7.	Nehru Bazar Bylane (towards Chaura Rasta)		48	12
8.	M. I. Road	34		34

Source: Proposed Parking Project at Ramniwas Bagh, CES, 2006.

Non-street parking in Jauhari Bazar, Kishanpole Market, Chaura Rasta, Bapu Bazar and Nehru Bazar is very high. The figures also show that these parking areas are used mainly by two-wheelers.

Rest of the city:

The parking situation in the rest of the city is not as grim as the walled city but would get worse with increase in vehicle numbers and commercialization along roads.

9.5.9. Public Transport System

The public transports that are available for the general public in the city are buses operated by Rajasthan State Road Transport Corporation (RSRTC), mini buses run by private operators, auto – rickshaws, Vikram (Tempos), and cycle rickshaws in the form of Intermediate Public Transport and personalized modes such as cars, two-wheelers and cycles.

The RSRTC operates a fleet of about 528 buses catering to the travel needs of the city as well as regional areas. Private and government bus operators make regular services in Jaipur. Around 40 mini bus routes operate now. There are 4 government bus depots namely, Vaishali, Sanganer, Jhalana and Vidhyadhar Nagar. At present there are 150 bus routes operating in the city.

The bus routes mainly cater to the main arterial roads of the city. RSRTC buses do not have a good coverage while the Private buses do not run on time. Autorickshaws mainly run within the urbanizable area of Jaipur. They are not reliable in terms of the fare they quote. Rickshwallahs ply mainly inside the walled city to cover short distances.

9.5.10. Issues

a) Congestion and delays

The main cause of congestion can be attributed to inadequate capacity of roads, heterogeneous traffic, and encroachments by vehicles and commercial activities. Increased congestion leads to low operating speeds, delays and environmental pollution.

Heavy congestion is observed in the walled city throughout the day. Nearly 80-85% of the vehicles plying on the walled city roads are rickshaws and two wheelers. The high percentage of these vehicles lead to poor utilization of road space and consequent congestion.

b) Parking

This is one of the most critical problems especially in the walled city area. On-street parking is done inside the walled city area. The parked vehicles take up a large amount of space resulting in decreased effective carriageway. This leads to congestion and slows down the movement of traffic. The parking problem is very serious in Johri Bazaar, Chaura Rasta, Tripolia Bazaar, Kishanpole Bazaar, Chhoti and Bari Chaupad in the walled city.

Many of the new commercial complexes that have sprouted in the city do not have adequate parking space leading to spilling out of the vehicles onto the road.

c) Encroachment

Encroachment of roads by shops and street vendors is a significant problem in the walled city. This decreases the available road width and capacity resulting in congestion

d) Traffic Management

The strongest issue which emerged during the consultations in traffic and transport sector was related to inadequate and improper traffic management. The problem stemmed from the fact that there was a lack of road sense among the drivers and the residents of Jaipur. The traffic was said to be apathetic towards cases of indiscipline with no strong penalties charged.

e) Heterogeneity of traffic

The traffic composition becomes more heterogeneous as one moves towards the walled city from the periphery. Slow moving vehicles particularly cycles and rickshaws are in significant proportion in the traffic flow. This disrupts the fast and smooth traffic movement.

The intersection performance especially the right turning movements of traffic under mixed traffic conditions are considerably affected.

f) Public transportation

There is a lack of good and reliable public transport system in Jaipur. Mainly 4 modes namely bus (public and private), auto rickshaws and rickshaws cater to the needs of the residents.

The public buses run by RSRTC are known to run on schedule but do not cover a large part of the city area and also have a low frequency. Mini buses run by private operators do not have any fixed schedule and are not reliable.

Most auto rickshaws don't run by meter and charge any amount at their whim and fancy. It becomes easy for them to con tourists since they don't know the correct price.

Rickshaws mainly ply for short distances within the walled city.

g) Pedestrian system

There is an absence of a safe and comprehensive system of pathways exposing pedestrians to risks. It also creates pedestrian-vehicular conflict zones in almost all stretches of major arterial and sub-arterial roads.

9.6. EXISTING AND FUTURE DEMAND SUPPLY GAPS OF CORE URBAN SERVICE

Table 9-26: Details of Core Urban Services

Service Heads		Levels	Proportion
Name of Town/ City		Jaipur	
Category of Local Body (A/B/C/Corporation)		A	
I	Area (km²)	288.38	
II	Population		
A	General Population		
1	1981		
2	1991		
3	2001	2322575	
4	2005	2750000	
5	2011	3584849	
6	2021	5839341	
III	Water Supply		
A	Supply Details		
1	Surface Source (MLD)	1.00	0.29
2	Sub Surface/ Underground Source (MLD)	344.80	99.08
3	Other Sources (MLD)	2.20	0.63
4	Total Gross Supply (MLD)	348.00	100.00
5	T&D Losses (MLD)	153.12	
6	T&D Losses (% to total supply)	44.00	
7	Treatment Plant Capacity (MLD)	1.00	
8	Net Supply (MLD)		
a	Domestic/ Residential		0.00
b	Non Domestic/ Commercial & Industrial		0.00
	Total	194.88	100.00
9	Average per capita supply (lpcd)	81.88	
10	Population Served	2380000	86.55
11	Planned Augmentation by design year (MLD)/ Existing Capacity	2021	
B	Storage & Distribution Details		
1	Ground Level Storage Reservoirs (ML)		
a	Nos.	64	
b	Total Capacity	100.00	66.67
2	Elevated Storage Reservoirs (ML)		
a	Nos.	78	
b	Total Capacity	50.00	33.33
3	Total Storage Capacity (ML)	150.00	
4	Distribution System (km)		
a	Transmission Mains	230.74	8.10
b	Distribution Mains	2616.28	91.90
	Total Length	2847.02	100.00
C	Connection Details		
1	Metered		
a	Domestic/ Residential	210535	84.90
b	Non Domestic/ Commercial	35872	14.47
c	Industrial	1584	0.64
	Total- Metered	247991	100.00
2	Unmetered		
a	Domestic/ Residential	5194	100.00
b	Non Domestic/ Commercial	0	0.00
c	Industrial	0	0.00
	Total- Unmetered	5194	100.00
3	Total Water Connections	282198	
4	Standposts	1170	
5	Handpumps	1845	
6	Population Covered		
a	Metered	2053579	86.28
b	Unmetered	43011	1.81
c	Standposts	109980	4.62
d	Handpumps	173430	7.29

Service Heads		Levels	Proportion
	Total	2380000	100.00
IV	Sewerage & Sanitation		
A	Underground Drainage		
1	Length of Sewers (km)	605.36	
3	Total Population covered	1299288	
4	Total Sewage Generated (MLD)	200.00	
5	Treatment Plant Capacity (MLD)	89.50	
6	Connection Details	0.00	
a	Domestic/ Residential	0	0.00
b	Non Residential/ Commercial	0	0.00
	Total Connections	200000	100.00
B	Sanitation		
1	Sanitary Facilities (no. of units)		
a	Septic Tanks	120614	99.94
b	Public Conveniences	76	0.06
c	Low Cost Sanitation units		0.00
d	Others (Dry Latrines)		0.00
	Total	120690	100.00
2	Population Covered		
a	Septic Tanks	687500	
b	Public Conveniences	7144	1.03
c	Low Cost Sanitation units		0.00
d	Others (Dry Latrines)		0.00
	Total	694644	100.00
V	Solid Waste Management		
A	Waste Generation & Collection		
1	Waste Generated (tons)		
a	Domestic	1072.00	58.55
b	Industrial & Commercial	739.00	40.36
c	Hospital	20.00	1.09
	Total	1831.00	100.00
2	Waste Collection		
a	Total Garbage Collected (tons)	850.00	
b	No. of Collection Bins	460	
c	No. of Trucks/Tractors/Tipper	270.00	
	Municipal	70	25.93
	Private	200	74.07
	Total	270	100.00
d	Conservancy Staff		
	Municipal	6728	90.58
	Private	700	9.42
	Total	7428	100.00
e	Vehicle Capacity (tons)	3.00	
3	Waste Disposal		
a	Total Waste Disposed (tons)	800.00	
b	Mode of Disposal- Qunatity (tons)		
	Open Dumping	750.00	
	Sanitary Land Fill	0.00	
	Incineration	12.00	
	Recycling	0.00	
	Others	0.00	
VI	Roads		
A	Roads		
1	Surface Type length (km)		
a	Concrete/ Rigid	66.00	1.61
b	BT/ Tar	3848.00	93.81
c	WBM	146.00	3.56
d	Earthen/ Others	42.00	1.02
	Total	4102.00	100.00
B	Storm Water Drains		
1	Drain Type length (km)		
a	Open Pucca Type	1725.00	75.00
b	Closed Pucca Type	460.00	20.00

Service Heads		Levels	Proportion
c	Kutcha Type	115.00	5.00
	Total	2300.00	100.00
C	Street Lighting	NA	
1	Type (nos.)		
a	High Mast Lamps	0	0.00
b	Mercury Vapour Lamps	0	0.00
c	Sodium Vapour Lamps	0	0.00
d	Tubelights	0	0.00
e	Others	0	0.00
	Total	95843	100.00

Table 9-27: Core Urban Service Norms

Service Heads		2005 Existing	2021 Proposed
I	Water Supply		
A	Service Level Indicators		
1	Average per capita supply (Gross- lpcd)	126.55	151.00
2	Transmission and Distribution Losses (% of total supply)	44.00	15
3	Average per capita supply (Net- lpcd)	70.87	128.35
4	Treatment Capacity (% of Supply)	0	100
5	Distribution Network length (% road length)	69	100
6	Storage Capacity Adequacy Ratio (% of supply)	43.10	40
B	Existing Augumanetation Schemes (Project Cost in INR Crores)		
	Bisalpur Water Supply Scheme		556.00
	Water Supply Rehabilitation and Expansion - RUIDP		65.71
	Bisalpur Transfer System Project		1019.50
	Total		1641.21
B	Unit Costs for Project Costing		
1	Source & Trunk line (Prop. as a % of total Rs. Lakh/ MLD)		134.50
2	Treatment Facility (Rs. Lakh/ MLD)		14.50
3	Distribution Network (Rs. Lakh/ km)		2.76
4	Storage Facility (Rs. Lakh/ ML)		25.41
II	Sewerage & Sanitation		
A	Service Level Indicators		
1	Population covered thru' UGD (% to total popu.)	47.25	100
2	Population covered thru' individual units (% to total popu.)	25.00	0
3	Population covered thru' LCS (% to total popu.)	0.00	0
B	Existing Augumanetation Schemes (Project Cost in INR Crores)		
	Sewerage Sector Inprovements - RUIDP		86.107
C	Unit Costs for Project Costing		
1	Cost of UGD (Rs. per capita)		2000.00
2	Cost of individual sanitary units (Rs. / unit)		15000.00
3	Cost of LCS units (Rs. / unit)		6000.00
III	Solid Waste Mangement (Project Horizon 2011)		
A	Service Level Indicators		
1	Waste Generated per capita (grams)	665.82	770.00
2	Collection performance (% collected to generated)	46	100
3	No. of trips made per vehicle	472.22	3.00
4	Density Adjustment Factor- vehicle capacity	0.6	0.60
5	Fleet of Vehicles (Proportion)		
a	5 Ton Vehicle- %	14.0	75.0
b	3 Ton Vehicle- %	54.0	25.0
c	1.5 Ton Vehicle- %	31.0	0.00
6	Total Waste Disposed - Tonnes/annum	292000.0	1007521.81
B	Existing Augumanetation Schemes (Project Cost in INR Crores)		
	Improvements to Solid waste Management - RUIDP		37.62
C	Unit Costs for Project Costing		
1	Cost of Trucks (Rs. Lakh/ vehicle)		
a	5 Ton Vehicle		15.00
b	3 Ton Vehicle		10.00
c	1.5 Ton Vehicle		2.00
2	Cost of Dustbins (Rs. / kg dustbin)		25.00

Service Heads		2005	2021
		Existing	Proposed
3	Cost of Processing & Disposal - Rs. /Tonne/annum		200.00
IV Roads			
A Service Level Indicators			
1	Proportion of Concrete Roads (% to Total Road Length)	1.61	1.61
2	Proportion of BT Roads (% to Total Road Length)	93.81	94.83
3	Proportion of WBM Roads (% to Total Road Length)	3.56	3.56
4	Proportion of Earthen Roads (% to Total Road Length)	1.02	0.00
5	Per Capita Road Length (m)	1.49	1.49
B Existing Augumanetation Schemes (Project Cost in INR Crores)			
	Road Sector Improvements under RUIDP	55.77	
B Unit Costs for Project Costing			
1	Upgradation/ Conversion Costs (Rs. Lakh/ km)		
a	Concrete with drains and lightings complete		350.00
b	Black Topped with drains and lightings complete		260.00
c	Water Bound Macadam with drains and lightings complete		120.00
d	Earthen roads with drains and lightings complete		80.00
2	New Formation- Capital Costs (Rs. Lakh/ km)		
a	Concrete		50.00
b	Black Topped		35.00
c	Water Bound Macadam		10.00
d	Earthen		3.00
V Storm Water Drainage			
A Service Level Indicators - % Coverage			
1	Proportion Open Pucca Drains (% to total road length)	0.00	100
2	Proportion Closed Pucca Drains (% to total road length)	0.00	0.00
3	Proportion Kutcha Drains (% to total road length)	2.80	0.00
B Existing Augumanetation Schemes (Project Cost in INR Crores)			
	Drainage Improvements - RUIDP	4.55	
C Unit Costs for Project Costing			
1	Conversion Costs (Rs. Lakh/ km)		
a	Kutcha to pucca		15.00
2	Capital Costs (Rs. Lakh/ km)		
a	Open Pucca		10.00
b	Closed Pucca		21.00
c	Kutcha		5.00
VI Street Lighting			
A Service Level Indicators			
1	Average Spacing of lights (m)	42.80	30.00
2	Percentage SV Lamps to total (%)	0.00	20
3	Percentage Tubelights to total (%)	0.00	80.00
B Unit Costs for Project Costing			
1	Tube Lights (Rs./ lamp)		4500.00
2	Sodium Vapour Lamps (Rs./ lamp)		9000.00

Table 9-28: Core Urban Services Demand Supply Gaps

Service Heads		Physical Details		
		Current	Demand	Gaps
I Water Supply				
1	Source & Trunk line (MLD)	348.00	881.74	533.74
2	Treatment Facility (MLD)	1.00	881.74	880.74
3	Distribution Network (km)	2847.02	5347.29	2500.27
4	Storage Facility (ML)	150.00	352.70	202.70
5	Total- Water Supply Project Cost			
II Sewerage & Sanitation				
1	Popu. covered by Sewerage system	1299288	5839341	4540053
2	Popu. covered by Individual sanitary units	687500	0	0
3	Popu. covered by Low Cost Sanitation Units	0	0	0
4	Total- Sewerage & Sanitation Project Cost			
III Solid Waste Management				
1	Total Waste Generated (tons)	1831.00	2760.33	929.33

2	Vehicle capacity required (tons)	3.00	1533.52	1530.52
a	5 Ton Vehicle- nos	39.00	414.05	375.05
b	3 Ton Vehicle- nos	147.00	230.03	83.03
c	1.5 Ton Vehicle- nos	85.00		
3	Total Dustbin Capacity required (tons)	850.00	2760.33	1910.33
4	Disposal Site- excl. land cost (tons)		1007521.81	1007521.81
4	Total- Solid Waste Management Cost			
IV Roads & Street Lighting				
1	Total Roads (km)			
a	Concrete	66.00	86.04	20.04
b	Black Topped	3848.00	5070.93	1222.93
c	Water Bound Macadam	146.00	190.32	44.32
d	Earthen/ Others	42.00	0.00	0.00
	Total Road Length	4102.00	5347.29	1245.29
2	Upgradation/ Conversion of Roads (km)			
a	Black Topped to Concrete			20.04
b	Water Bound Macadam to Black Topped			146.00
c	Earthen to Black Topped			42.00
d	Earthen to Water Bound Macadam			0.00
	Total- Upgradation Cost			
3	New Formation (km)			
a	Concrete			0.00
b	Black Topped			1054.97
c	Water Bound Macadam			190.32
d	Earthen			0.00
	Total- New Formation Cost			
4	Total- Road Project Cost			
V Storm Water Drainage				
1	Total Conversion to closed pucca (km)	0.00	0.00	0.00
2	Total New Formation of Storm Water Drains (km)			
a	Open Pucca	2300.00	5347.29	1708.62
b	Closed Pucca	460.00	0.00	0.00
c	Kutchra	115.00	0.00	0.00
	Total- New Formation	2875.00	5347.29	2472.29
3	Total- Storm Water Drainage Cost			
VI Street Lighting				
1	Tube Lights (nos.)	0	109387	109387
2	Sodium Vapour Lamps (nos.)	0	27347	27347
3	Total- Street Lighting Cost			

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