5. Urban Environment

5.1. INTRODUCTION

Urban environment, in a very broad sense, consists of resources, human and other processes, that convert these resources into various other useable products and services; and effects of these processes, which may be negative or positive. The intersection and overlap of the natural environment, the built and socioeconomic environment constitutes the urban environment.

This chapter establishes the urban environment baseline situation of the Jaipur city describes the status of urban environmental quality and services, identifies environmental issues and strategies to address these issues through CDP.

5.2. NATURAL ENVIRONMENT BASELINE

5.2.1. Climate

Jaipur region falls under the semi-arid region of climatic zones and experiences a continental type of climate owing to its proximity to the desert and it being inland. It is characterized by hot summers and cold winters.

The month of May experiences the highest maximum temperature of 40.3°C and January the lowest minimum temperature of 7.8°C as is evident from **Table 5-1**. The data is based on 30 years observations recorded by the Indian Meteorological Department. Jaipur recorded the maximum temperature of 45.2°C and minimum temperature of 2.5°C in the year 2001.

	Temp (°C)		Mean Wind	Rainfall (mm)	Relative Humidity (%)		
Months	Maximum	Minimum	Speed (Kmph)		8:30A.M	5:30 P.M	
Jan	22.5	7.8	5.6	7.9	63	35	
Feb	25.7	10.7	5.5	11.7	54	28	
Mar	31.5	15.8	7.9	6.1	42	19	
Apr	37	21.4	9.7	4.1	30	16	
May	40.3	25.4	12.6	16.2	32	17	
Jun	39.3	27.2	12.5	66	52	32	
Jul	33.9	25.5	9.5	216.3	75	61	
Aug	32	24.3	8.4	231.2	82	70	
Sep	33.2	22.9	7.6	80.3	72	55	
Oct	33.4	18.6	6	22.6	51	32	
Nov	29	13.1	3.9	3.2	50	33	
Dec	24.4	9.1	3.9	3.3	61	38	

Table 5-1: Climate	Characteristics	of Jaipur Region
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Source: Climatological Tables, 1951-80, IMD

The average normal rainfall of India is about 883 mm, whereas the average normal rainfall of Rajasthan is 531 mm. Jaipur receives relatively less rainfall compared to the average amount of rainfall received by entire Rajasthan. Normal annual rainfall received by Jaipur is 563.8 mm. As

depicted in Table 5-1, August receives the highest amount of rainfall of 231.2 mm while November receives the lowest amount of 3.2 mm. The city gets its maximum share of rainfall from southwest monsoons. The maximum rainfall has been recorded in the month of August (Figure 5-1) The average annual rainfall for the year 2001 was 430.09 mm, that witnessed a drastic decrease in the year 2002 with the average annual rainfall received being 207.4 mm (Figure 5-2).¹ The reason for such a drop in rainfall was due to the drought that most of districts of Rajasthan faced in year 2002. There was a rainfall deviation of nearly -60% from the normal rain in this year in Jaipur district.²



Figure 5-1: Monthly Rainfall



Relative Humidity in the city is the highest in the month of August and the lowest in January. Table 5-1 depicts average monthly RH values over a 30-year observation period. Figure 5-3 depicts the variation in average RH over the recorded period. Relative Humidity is the highest in the month of August and the lowest in January (Table 5-1).

Wind speed is the highest in the month of May as evident from Table 5-1. The predominant wind is from Northwest direction. Figure 5-4 depicts the monthly variation of wind speed in a bar chart.



Figure 5-3: Variation in RH



Figure 5-4: Wind Speed (kmph)

² http://www.un.org.in/UNDMT/sitrep/drought/Rajasthan---Drought---SitRep081002.pdf



¹ Statistical Abstract, Rajasthan, 2002; Directorate of Economics & Statistics

5.2.2. Land Resources

(a) Topography

The city is flanked by the Aravalli hills on the north and the East. There are hillocks to the south and the west of the city but they are isolated and discontinuous in formation. Three major hill ranges belonging to Aravalli system exist in Jaipur namely Torawati hills, situated west of Sabi and Banganga rivers, range starting from sambher lake and crossing over to Singhana in Jhunjhunu district, Puranaghat, Nahargarh, Jhalana and Amagarh hills.



View of the Aravali Ranges in Jaipur

View of the city from Nahargarh Fort

The general slope of the Jaipur city and its surroundings is from north to south and then to south-east. Higher elevations in the north exist in the form of low, flat-topped hills of Nahargarh (587 meters). Jaigarh, Amber and Amargarh, which are deeply dissected and eroded. An isolated hillock called "Moti Dungari" upon which an old royal castle exists is near the Rajasthan University. Further in the south, topographical levels of the plain areas varies between 280 meters along Bandi and Dhund rivers in the south to Som 530 meters in the north east of Chomu near Samod hills. The overall trend is a decline of level from the areas bordering the hills in the north to plain in the south slopes of the plain areas are in general gentle

(B) Drainage

The general slope of the city is from north to south, which is also the direction of drainage. Nearly, all ephemeral streams flow in this direction. The southern end of the city opens out in the plains and stretches far and wide towards Sanganer and beyond. The walled city was originally located on the rocky side to provide an easy drainage system on either side of the city but the future expansion of the city took place towards the south and west.

(c) Soil

A major part of the Jaipur region is covered with thick mantle of soil, wind blown sand and alluvium.³The soil is associated with the Aravalli range. They are of arid region with clay

³ Master Development Plan 2011, Jaipur Region



accumulation formed recently.⁴ Natural vegetation is of the mixed xerophytic and mesophytic type. 60% of the region is comprised of agricultural land, 10% of the area is under forests that are witnessing a decline.

5.2.3. Water Resources

(a) Surface Water Resources

Most of the surface water sources originate from the nearby hills acting as mere drainage channels for rainwater. The region is drained by a number of seasonal rivers of which Banganga, Dhundh and Bandi are prominent.

There is no perennial surface water source in the city. Amanishah Nallah and Dhund river are two non-perennial streams which flow from north to south. The former passes through Jaipur city while the latter flows on the east of the city and is joined by Amanishah Nallah in Southeast of the city.



One of the natural drainage channels flowing hrough the city



The Mansagar lake

There is another small drainage system in the north foothills which fills up the artificially impounded lake called the Jal Mahal (Man Sagar).⁵ Among the large surface water bodies is Jal Mahal Lake or Mansagar Lake in the north of the city. It is approximately 130 ha in its full spread and has a catchment area of 23.5 sq.km. Approximately, 40% of the total catchment area falls inside dense urban area. The lake is used for the disposal of sewage. Other historic water bodies the Talkatora Lake in the walled city and the Ramgarh lake have dried up due to urbanization of their catchment areas. The Ramgarh Lake, which used to be the main source of supply more than 30 years back produces a negligible quantity today.

(b) Ground water Resources

In the case of Rajasthan, ground water resources assume great significance due to the absence of perennial surface water sources. Major part of the recharge to the ground water in

⁵ Changing urban land use and its impact on the environment (A Case Study Of Jaipur City) , Dr. K.N Joshi, Institute of Development Studies, Jaipur



⁴ Census Atlas, Census of India 1991

Rajasthan is through infiltration from rainfall. Since the rainfall received by the state is very less coupled with few perennial streams, the scope for recharge reduces considerably. This adds to the existing problem of over drafting of ground water. Nearly 92% of the population of Jaipur depends on ground water for meeting their needs. **Figure 5.5** depicts the difference in ground water levels in various parts of the city while **Table 5-2** gives the corresponding information.



Figure 5-5: Variation in ground water levels across Jaipur city

Ground water is the available at the deepest level in the walled city and Jhotwara industrial area. This could be attributed to the high population density in the walled city and it being heavily dependent on ground water. Large amounts of water get drawn everyday. Jhotwara Industrial area also faces the same problem of groundwater being available at great depth. In this case Amber is positioned very well with the water depth going upto 10-11m. Jaipur would have to depend on surface water resources to meet its future water need.

Table 5-2. Valiation in ground water levels across salpur city								
Location Depth to water level (mbgl)								
	May 2002		November 2002	January 2002				
Amber	10.96	10.50	11.27	10.60				
Chomu	-	61.23	67.60	67.60				
Walled city	42.7	46.16	48	47.25				
Jhotwara	47.30	47.0	52.57	47.90				
Mansarovar	24.55	28.75	30.15	29.55				
Sheodaspura	25.02	25.21	24.96	25.18				

Table 5-2: Variation	in ground	water levels	across	Jaipur city

Source: Ground water year book 2002-2003, RajasthanNote: mbgl = Metre Below Ground Level

5.2.4. Forest Resources

Jaipur city is flanked by reserved forests on the north and east. Nahargarh reserve forest (RF) is to the north of the city and Amer R.F is further to its north, Kilangarh R.F lies to the east and Jhalana Bani R.F is situated on the south-east of the city as seen in Figure 5.6. The forests are characterized by dry forests of Khair tree.⁶ Deforestation is resulting in soil erosion, which is exposing the rocky surface and leading to silting of drainage channels. Drainage channels are a direct sufferer of deforestation. With the water resources already being scarce, silting of drainage channels only adds to the existing problems



Figure 5-6: Forest areas in and around city

⁶ Census Atlas, Census of India 1991



5.2.5. Natural Hazards

(a) Earthquake

Jaipur city lies in low damage risk zone with MSK VI but is a little more than 100 kms away from high damage risk zone in the North .The city is less prone to earthquakes as it is located on relatively stable geological unit of Aravallis. **Figure 5.7** depicts the earthquake zones of Rajasthan.

(b) Drought

Low rainfall coupled with erratic behavior of the monsoon in the state make Rajasthan the most vulnerable to drought. Based on historical data the frequency of occurrence of droughts in the Jaipur district is once in five years Jaipur faced its last drought it faced was in the year 2000. It was a moderate drought on the severity scale. Moderate



Figure 5-7: Earthquake Zones of Rajasthan

drought is when the amount of rainfall is 25% less than the Normal. 2226 villages got affected in the Jaipur District.

(c) Floods

Rajasthan is one of the driest states in the country. Though the state is generally deficit in rainfall, it has also experienced floods in many areas during monsoon period. Rajasthan has faced situation in the past. The flash in Jaipur, Loonkransar and many other places caused heavy damage. The name of towns and villages in Jaipur district afflicted by and prone to flooding have been given in following **Table 5-3**.

Table 5-3. Towns and vinages prone to hooding in Jaipur District								
S.No.	Name of Basin Name of Sub-Basin Name of District with Important Towns/Village							
1.	Banas	Morel	Jaipur	Jaipur, Sanganer				
2.	Banas	Mashi	Jaipur	Bichun				

Table 5-3: Towns and villages prone to flooding in Jaipur District

(d) Wind

Jaipur lies in the high damage risk zone with respect to wind speed, which is categorized as wind having velocity more than 47 m/s. The city is also prone to onslaught from the desert sand. Desert sand drifts in from the Sambhar gap in Aravalli range. **Figure 5.8** depicts the wind and cyclone zones of Rajasthan.

Irrigation Department Vulnerability Atlas of India, BMTPC, 1997





Figure 5-8: Wind and cyclone zones of Rajasthan

5.3. URBAN ENVIRONMENT BASELINE

As part of urban environment baseline land use and Industrial development in the city have been analysed in detail. Other socio-economic aspects have been discussed elsewhere in the report. This section also contains a brief description of the urban services of the city, the details of which can be found in sector specific chapters.

5.3.1. Land Use

The most inevitable aspect of urbanization is horizontal growth of the town and change in land uses. **Table 5-4** shows the temporal change in land use of the city from 1975 to 1991. The area under high density has increased from 2.53 % in 1975 to 6.5% in 1991. Similarly, the percentage land area under industrial land use has increased from 9.07 in 1975 to 11.49 in 1991. Although the total forest area under forests is seen to have increased from 1975 to 1991, closer inspection reveals that the area under dense forests has gone down from 2.15 % in 1986 to 0.68% in 1991

Land Use	1975		1986		1991				
Built-up Land	Area in sq. km.	%	Area in sq. km.	%	Area in sq. km.	%			
High Density Area	9.78	2.53	17.58	4.56	24.90	6.50			
Medium Density Area	10.86	2.82	32.76	8.49	30.36	7.87			

Table 5-4: Temporal Change in land use of Jaipur city

1						
Low Density Area	20.16	5.23	23.64	6.13	24.12	6.25
	40.80	10.58	73.98	19.18	7938	20.62
		Forest I	and			
Degraded Forest	27.90	7.23	34.56	8.96	43.26	11.21
Dense Forest	0.30	0.08	8.28	2.15	2.64	0.68
	28.20	7.31	42.84	11.11	45.80	11.89
		Agricultura	al Land			
Cropped Area	129.90	33.68	141.54	36.70	129.48	33.55
Fallow land	121.68	31.53	28.68	7.43	21.30	5.52
	251.58	65.22	169.22	44.13	150.78	39.07
		Wastel	and			
Gullied land	2.52	0.66	4.14	1.07	3.78	0.98
Sandy Land	14.52	3.76	7.74	2.00	3.78	0.98
Saline Land	0.66	0.17	1.44	0.37	2.52	0.65
Rocky land	-	-	-	-	0.12	0.03
Mining spoiled land	0.36	0.09	5.52	1.43	5.64	1.46
Industrial area	18.06	4.68	18.84	4.87	15.84	4.10
	34.98	9.07	42.24	10.95	44.34	11.49
	L	and under co	onstruction			
Activities	11.88	3.08	36.36	9.43	47.70	12.36
Parks & Play ground	0.24	0.06	1.26	0.33	1.80	0.47
Grand Total	385.74	100.00	385.74	100.00	385.74	100.00

5.3.2. Industrial and Hotel Activity in Jaipur

(a) Overview of Industrial Activities in Jaipur

Direct and indirect relationships exist between the controlled disposal/treatment of industrial wastes and wastewaters and the state of public health and the protection of the surrounding environment. The industrial base in Jaipur can be considered as being made up of three separate sectors:

- regulated main industries that are located in designated Industrial Areas,
- regulated small scale industries (SSI) that are located in Industrial Areas,
- unregulated cottage industries that are located in scattered locations.

The earliest main industries to be established in Jaipur are located in the Ram Mandir area, near to Jaipur Junction, the main railway station. Industrial development spread with formation of the Rajasthan Industrial Infrastructure Development Corporation (RIICO) in 1979. The main industrial areas in the city comprise of Jhotwara Industrial Area, Vishwakarma Industrial Estate, Malviya Nagar Industrial Area, Bais Gowdown, Sudershanpura and Kartarpura Industrial Areas, Sanganer Industrial Area and Sitapura Industrial Area. The current Red Category List includes 23 industrial premises, 21 hospitals and 16 hotels. A summary of the industrial units that are located in each of the main industrial areas are given in **Table 5.5**.

No.	Type of Industry	Jhotwara I. A.	V K I. A.	Bais G/dn, Suder/pura	Malviya I. A.	Sitapura I. A	Sanganer I. A.
		SML	SML	SML	SML	SML	SML
1	Chemical Based	151	60 8 1	33	3		
2	Textiles	2	1	2	Nil		
3	Plastics	8	3	Nil	Nil		
4	Oil/Ghee	93	19 2	4	4		
5	Paper Products	1	3	6	Nil		
6	Stonework	5	Nil	2	Nil		
7	Soaps/Detergents	2	8	6	15		
8	Rubber Based	1	2	3	Nil		
9	Elect. Equipment	5	10	15	10 1		
10	Furniture/Wood	Nil	5	10	Nil		
11	Engineering	74 2 1	360 10	60	10		
	Total		8				

Table 5-5: Summary of the Industrial Base in Jaipur

Note: S = Small, M = medium, L = Large.

There are very few large water-based industries in Jaipur, and those that are located in the city are generally well regulated and monitored by RPCB. Overall, the wastewater flows and the pollution loads from the main industries in Jaipur are not significant.

The disposal methods currently practiced by industry are varied, but almost all of the main industries provide some form of on-site treatment for their own wastewater. Sewers have not been provided in the designated Industrial Areas and so industries normally discharge the effluents from their premises into the nearest street drain or nallah.

Most of the main industries are operating under extremely difficult conditions because of the chronic shortage of water. Many industries have their own tube well sources of supply to augment the PHED supplies to ensure that their factories can continue to operate. This is contributing to the lowering of the groundwater levels in Jaipur.

Overview of Hotel Industry in Jaipur

Jaipur is one of the most important tourist destinations of India. The tourism industry has a great multiplier effect on other commercial activities. One of the direct impacts of tourism is on the hospitality industry. Jaipur is dotted with hotels catering to every taste and budget. The accommodation facilities are available ranging from five star hotels to moderate questhouses spread all over the city. Table 5-6 shows the breakup of the number and types of the hotels along with the number of houses providing paying guest facilities.

Items	1997	1998	1999	2000	2001	2002			
Number of Hotels	118	157	225	228	230	242			
Number of Rooms	5153	-	6272	6350	6613	7038			
Number of Beds	9528	-	13113	13200	12952	13661			
Courses Domostors of Tourisms									

Table 5-6:	Number	of Hotels,	Jaipur
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Source: Department of Tourism, Govt. of Rajasthan.

Hotels include heritage hotels, 5 star, 5 star deluxe, 4 star, 3 star, 2 star and 1 star hotels. There are a large number of guesthouses, especially near the railway station, providing low budget accommodation.



5.3.3. Anthropogenic Hazards in the City

Fire poses as the greatest man-made hazard in the city of Jaipur. Kacchi bastis and godowns are especially prone to this hazard. Nearly 1200 fire related accidents occur in Jaipur every year resulting in loss of Rs.10-15 crores, as per the Fire Department.

The fire department in Jaipur is a part of the Jaipur Nagar Nigam. There are 8 fire stations to cater to the needs of the 24-lakh population of Jaipur. They are located at Bani Park, Vishwakarma Industrial Area, Near CM House, Bais Godaam, Mansarovar, Sitapura, Ghat Gate and Amer. There is one fire station proposed in Industrial Area on Agra Road. There are 35 fire tenders in the service of the Fire Department, all of which are not operational. The details of the fire fighting services available with the city is given in **Table 5-7**.

S. No	Туре	Capacity	Quantity
1	Water Tender	4000 litres	24 (6 are small for 10ft
			way)
2	Foam Tender	6 cylinders of 22.5kg CO2 each	5
		500 litre foam tank	
		3000 litres water tank	
3	Water Bouser	12000 litres	6

Table 5-7: Fire Tenders and their details

Source: Fire Officer, Bani Park Fire station

5.4. URBAN ENVIRONMENT QUALITY OF THE CITY

This section discusses the impact of urbanization on the natural and social environment and the resulting deterioration in urban environment quality perceived in the city. The following parameters establish the environmental health of the city and have been discussed in detail for the city.

- Air Quality
- Water Quality
- Noise
- Access to safe water
- Access to sewerage and sanitation
- Drainage
- Open spaces
- Solid waste management
- Access to housing

5.4.1. Air Quality

Ambient air quality is one of the most significant indicators of environmental health. The various pollutants in air trigger nearly all respiratory diseases. RSPCB is responsible for monitoring ambient air quality at various locations in the city on a regular basis. Following subsections detail the ambient air quality in various land uses across the city.





Air pollution due to traffic congestion and idling of vehicles



Air pollution due to congestion of vehicles in walled city

Air Quality in Industrial Area: The selected station for conducting ambient air quality monitoring is in Vishwakarma Industrial Area. As evident in Figure 5.9 & 5.10, pollution levels have reduced since 2001. 120 ug/cu.m is the National Ambient Air quality Standard for SO2 and NOx for industrial area while 500ug/cu.m is for SPM. All the three-parameter levels are within the prescribed limit in VKIA Industrial Area.





Figure 5-9: Change in pollution levels-SO2 & NOx



Air Quality in Institutional Area: Rajasthan State Pollution Control Board was the monitoring station for Institutional area. As depicted in **Figure 5.11 & 5.12**, the pollution level dipped drastically in the year 2004 but increased again in 2005. 90 ug/cu.m is the National Ambient Air quality Standard for SO2 and 91ug/cu.m is for NOx in institutional area while 200 ug/cu.m is for SPM. SO2 and NOx levels are well within the prescribed limit but the SPM levels are much higher than the standards. In cities of Rajasthan, SPM levels are viewed leniently due to frequent dust storms and fine dust flowing in from the Thar Desert.



Figure 5-11: Change in pollution levels-SO2 & NOx

Figure 5-12: Change in SPM levels

Air Quality in commercial area: The station is located at Ajmeri Gate. The area around Ajmeri Gate has a mixed land use. It is partially residential and partially commercial. 90 ug/cu.m is the National Ambient Air quality Standard for SO2 and 91ug/cu.m is for NO x in institutional area while 200 ug/cu.m is for SPM. As seen in **Figure 5.13 & 5.14**, Pollution levels have gone down over the years. SO2 and NOx levels are within the limits but SPM levels are much higher than the standards.



Figure 5-13: Change in pollution levels-SO2 & NOx





5.4.2. Water Quality

(a) Surface Water Quality

Among the surface water resources, the nallahs and Mansagar Lake are in degraded state. The Man Sagar Lake is heavily polluted at present with the city sewage flowing into it through two nallahs, Brahmapuri and Nagtalai.

Other natural drainage channels in the city, the Amanisha Nallah and the Ganda Nallah like the other nallahs have become carriers of raw sewage and refuse. Most of the nallahs are used by slum dwellers to dispose garbage.

Physio-chemical examination of water of the lake shows that water quality has exceeded permissible levels for most parameters. **Table 5-8** shows the physio-chemical examination of Manasagar lake water.

······································								
Particulars	Brahmpuri Nala	Nagtalai Nala	Nala (Amber Rd)	Lake (South of Jal Mahal)	Lake (Centre of water body)	CPCB Standard		
PH	8	8	8	8.3	8	6.5 –8.5		
B.O.D	130	85	40	35	60	<3		
C.O.D	462.88	252.48	126.24	126.24	231.44	<0.5		
Chloride	340	380	460	540	390			
Sulphate	28	38	130	60	35			
Phosphate	21.5	10.75	7	14	5.25	< 0.03		
Nitrate	44	24	30	23	36	<0.3		
TDS	1160	1760	1920	2000	1840	<400		
Total suspended solids	560	490	180	-	-	-		
Turbidity	80	34	14	-	-	-		

 Table 5-8: Phyico-chemical examination of surface water, 2000

Source: Jal Mahal Tourism Infrastructure Project, LASA,

Surface water quality is also impacted by the industrial processes in and around jaipur. The visible impact and effects of the current direct discharge of industrial wastewater to the storm

water drainage systems and to the nallahs is unsightly and malodorous conditions in the drains, conditions which encourage insect breeding, particularly mosquitoes, creating health risks and increased spending on health care,damage to the surface of roads when spilling of the waste water occurs due to blockage of the drains by garbage and other rubbish, health risks associated with downstream use of the waste water flows for domestic purposes or for agriculture and increased risk of pollution of ground water by direct seepage to the aquifer.

The impacts of the components of Jaipur industrial waste water on the operation of the North Drainage zone and on future sewage treatment works are likely to include excessive suspended solids, oil and grease, excessive BOD loading, PH extremes, solvents and detergents, heavy metals and toxic compounds

Wastewater generation is another critical aspect in the hotel industry. In most cases the wastewater is let out in the drain connecting to the sewerage network. Since most of them do not have their own treatment system, they add considerably to the existing flow

(b) Ground Water Quality

In Jaipur, ground water quality is well within the permissible limits as per IS 10500: 1991. Two parameters namely Nitrate and Fluoride exceed the permissible limit at places. The permissible limit for NO_3 is 100mg/l. Fluoride exceeds the limit or is on the verge of exceeding in Pratap Nagar. Ground water samples collected from Sector 10 and 17 have registered a concentration of 1.5 mg/l of fluoride. The permissible limit for Fluoride concentration is 1.5mg/l. **Figure 5-15** shows the locations at which ground water pollutant concentration exceeds permissible limits.

The spread of septic tanks in the city is often cited as a reason for the high concentration of Nitrates in the ground water. The wastewater from the soak pits leaches into the ground contaminating. Among the areas where ground water nitrate levels have been found to exceed permissible limits are Madrampura, Civil, Hawasarak, Civil Line, Shanti Nagar, Hasanpura, Shyam Nagar, and Jyoti nagar, Adarsh Nagar, Bani Park. The nitrate levels in these areas range between 118 mg/l and 308 mg/l. Understanding of trend of contamination of ground water is of utmost concern since nearly 92% of the population depends on ground water for meeting their potable water needs.





Figure 5-15: Locations where ground water pollutant concentration levels exceed permissible limit in Jaipur

5.4.3. Noise

Noise is among the most pervasive pollutants today. But it is an inescapable by-product of urbanization and industrialization. CPCB set standards for noise pollution in 1989 and the Ministry of Environment and Forests (MOEF) formulated Noise Pollution Rules only in 2000.Noise levels are monitored on a regular basis by Rajasthan Pollution control Board. The location of the noise monitoring stations and their associated noise levels are given in **Table 5-9**. It is clear that in all land uses, the permissible noise levels are exceeded both during day as well as night.

S.No	Time of	Residential Area			Sensitive locations				Commercial Area		
	monitoring	Civil lines, Near Rampura Colony	Raja Park, Near Hanuman Dhaba	Limit	SDMH, Near Subodh College	Jawahar Nagar, Near Blue bird school	SMS Hospital, Main Gate	Limit	Railway Station, Near Circle	Chhoti Chaupad, Near Kotwali station	Limit
1	4 PM to 10 PM	63.4	79.6	55	68.2	61.8	75.5	50	76	73.8	65
2	10 PM to 12 Midnight	59.7	72.4	45	64.4	59.1	63.2	40	69.5	68.1	55

Table 5-9: Noise levels across various land uses in Jaipur city

Source: Rajasthan State Pollution Control Board



5.4.4. Access to Safe Water

The environmental sustainability parameter of the Millennium Development Goals clearly lists amongst its targets: to double the no of people with access to safe drinking water by 2015. The chemical examination of water shows poor water quality, high level of nitrates and fluorides, high concentration of TDS.Consultations have revealed that majority of the people are not satisfied with the service levels of water supply.

Ground water in the city has been found to be contaminated due to several reasons like over extraction and seepage of wastewater, from soak pits used in the septic tank system, into the ground water. All these factors have resulted in an increase in the concentration of Nitrates and Fluorides in ground water.

Not only is quality of safe potable water an issue but quantity of water too is an area of concern. According to a study conducted by PHED during 1997-99, the 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 may become inextractable. **Figure 5-16** shows the area covered by piped water supply that can be considered to be relatively safe. The rest of the city depends upon ground water as explained earlier.



Figure 5-16: Coverage of city by water supply network

5.4.5. Access to Sewerage and Sanitation Facilities

Sewerage system was laid inside the walled city in 1930s. Since then coverage through sewerage system network has been slow and has not been able to match the growth of Jaipur. Sewer networks have been laid in a large number of colonies in the south zone prior to 1990. In



the absence of southern outfall sewer, wastewaters from these colony networks were allowed to be discharged in the natural drain Ganda Nallah. 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 RUIDP between 2000 and 2005. At present, nearly 80% of the population is covered by a sewerage network. Areas covered by the sewerage network are shown in **Figure 5-17.**



Figure 5-17: Area covered by sewerage network in the city

5.4.6. Open Spaces and Greenery in the City

Open spaces play a very significant role in enhancing the quality of urban environment. In Jaipur, parks and playgrounds are mainly maintained by Jaipur Nagar Nigam and JDA. The 1971 Master Plan had proposed around 270 hectares of land to be devoted by 1991 to open spaces, out of which, only 80 hectares was developed. In 1991,the ratio was of 0.21 ha open space area per 1000 population while it was planned to be provided at rate of 0.6-0.8 ha per thousand population. There was a shortfall by nearly 70%.





Absence of greenery along main roads in city



One of the few open spaces in the city

Among the parks maintained by JDA, Ramniwas Bagh is the oldest and was constructed way back in 1968 as famine relief work. Ramniwas Bagh measures 17 hectares in area and is the second largest Park in Jaipur. Central Park is the largest with an area of 18 hectares. Central Park was developed as a district park as envisaged in the 1971 Master Plan. It was proposed to have an area of 4-6 hectares and serve a population of 1-2 lakhs.Nearly 300 parks are maintained by Jaipur Nagar Nigam. Out of these maximum are in Sanganer Zone followed by Moti Doongri Zone. Parks maintained by JDA are 119 in number. **Table 5-10** lists the zone wise no of parks in JMC.

Zone Name	Total
Vidyadhar Zone	66
Civil Lines Zone	26
Hawa Mahal (E)	4
Hawa Mahal (W)	19
Sanganer Zone	108
Moti Doongri Zone	80
Total	303

Table 5-10:Zonewise distribution of parks maintained by JNN

Source: Jaipur Nagar Nigam

The rest of the parks in JDA area are below 1-hectare area and are spread out in the entire city. The Master Plan envisages an area of 3395 ha dedicated to open space by the year 2011. **Figure 5-18** depicts the ward wise distribution of parks maintained by JDA and JNN mainly within the JNN area. As evident, Ward 13, which coincides with the Mansarovar area has the maximum number of parks followed by Ward 3, 69,30,26 and 25.The wards, which fall in the Walled city and the periphery of the JNN area have the least number of parks.





Figure 5-18: Ward wise distribution of parks

5.4.7. Access To Housing

The residential area in Jaipur is 18.1% of the total area of Jaipur, and is about 48% of the total developed area. Out of the total residential area, walled city has 100% developed area of which 67% is used as residential use while in the rest of the city, 27% of the developed land is used as residential use. But, beyond the municipal boundary, the peripheral area is organized like rural area with only 10% of the land is used as urbanized residential areas. The percentage of katcha house is 4.5% while about 35.4% of the houses are still semi-pucca and 60% is pucca.

Jaipur has, at present 4,74,751 houses, out of which, 62,592 are vacant. There is a shortage of 3289 dwellings.



Housing condition in Kacchi Bastis

Housing in Mansarovar Area



However, as far as housing for poor is considered, the situation is alarming. There were 183 katchhi bastis in the JMC area in 2004.⁹ The biggest katchi basti in Jaipur is located east of Jawahar Nagar along bypass road where about 7000 families are residing.

The slum dwellers often get located on any vacant plot in the city convenient to them. In Jaipur, nearly 47% of the slums are located on forestland, 27% are in flood prone areas and 18% along main roads.¹⁰ The consultations revealed that these katchhi bastis lack proper toilet facilities, drains and sewerage. Solid waste management system is completely absent in these colonies and they resort to disposal of wastes in the either in the open or in the nallahs. These have a direct impact on the natural resources and result in their depletion and degradation. As evident from the location wise break up of slums, forests are the most prone to encroachment. This also implies that continuous deforestation for meeting the shelter, firewood needs is taking place. Due to poor sanitation facilities, all the wastewater and solid waste is also getting dumped on forestland leading to its degradation and reduction in its regeneration capacity.

5.4.8. Solid Waste Management

Jaipur Nagar Nigam is responsible for solid waste management in Jaipur. Some of the work responsibilities have been contracted out. As estimated by JNN, 1040 metric tones per day of solid waste was generated in 2001-02 while RUIDP estimated it to be 1239 mtpd.

JNN does not have a door-to-door waste collection system. Contractors deploy their own sweepers and house-to-house waste collectors. From various secondary information and observations, it is estimated that nearly 50,000 households in the city have been covered by house-to-house waste collection.11 Stakeholder consultations with some Residential Welfare Associations (RWAs) revealed that house to house collection was being followed. This is done through JNN's "Swasta Mitra Apke Dwar" programme. The wastes collected through this system are collected by the refuse vehicles. The zones and wards in which waste collection system works are Ward numbers 3,7 and 20 of Civil Lines Zone; Ward numbers 14 and 25 of Sanganer Zone and Ward numbers 9,10 and 68 of Vidyadhar Nagar Zone.



Indiscriminate dumping of garbage and lack of collection bins in walled city

¹¹ Jaipur Nagar Nigam



⁹ Jaipur Water Supply and Sanitation Project Feasibility Study, 1998.and JMC, 2004.

¹⁰ Jaipur Municipal corporation

However, this is not a common practice in all the residential areas in the city. The house-tohouse waste collection system does not involve segregation of biodegradable from the nonbiodegradable. Waste is collected and stored in containers or left at road corners for JNN workers to collect and transport it from there. This creates a lot nuisance with stray cattle and dogs spreading the waste. Waste management is absent in slum and kacchi basti areas where waste is dumped into nallahs.

At present, the disposal system is very poor in Jaipur. There is no sanitary landfill site for the city Solid waste collected from the city is disposed in Sewapura in the North and Mathura Daspura in the east. Earlier there were waste disposal sites at Sewage farm and Jagatpura, which have been abandoned now. One new disposal site proposed at Khori Ropara has not received the clearance from the State Pollution Control Board. . Under the RUIDP funding a new sanitary landfill site is also coming up at Lengriwasa at the east.

Figure 5-19 depicts the areas covered by primary waste collection system. It is evident that majority of the city is deprived of waste collection system.



Figure 5-19: Areas with primary collection of waste

5.4.9. Drainage

Consultations reveal that drainage situation in the city ranges from average to poor. Water logging is a very common phenomenon in Jaipur. Even with less amount of rain, roads and open areas get waterlogged. Water logging could be attributed to choking of drains with solid waste. Since there is an absence of a proper disposal system of solid waste in Jaipur, garbage is strewn around. Rain-washes this garbage, which comprises plastic, metals and paper besides other materials into drains that get choked and do not allow water to pass through.

In walled city, disposal of sullage and wastewater into surface water drains is prevalent, which causes water logging and overflowing of wastewater on to the roads

5.4.10. Social Safety

Consultations with citizens have revealed that Jaipur is no longer perceived to be a safe city. The crime rates are higher where women are concerned. As of 2002, percentage of crime against women in Jaipur to that of entire India was 3.9%. It is the 6th unsafe city for women in India.¹²

5.5. ENVIRONMENT ISSUES

The impacts on urban environment are perceived at various levels starting from household level, community level, city level and if unchecked can multiply to issues at regional or national level. This section highlights the environmental issues that need to be addressed to improve the environmental health of Jaipur city.

5.5.1. Air pollution

Air pollution in the city is localized and limited to roads, industrial areas, major junctions and the walled city. Stakeholder in consultation meetings have complained of increasing pollution levels in walled city. While pollution in walled city and along arterial roads is due to increased traffic, pollution is also a result of burning of wood and charcoal in low-income houses and kacchi bastis and small-scale industries.

5.5.2. Land Pollution

The main cause of land pollution in Jaipur are the sewerage system and improper solid waste management system. Indiscriminate dumping of garbage and the absence of a sanitary landfill site are among the reasons for increasing leachate contamination and land pollution.

The large no of septic tanks most of which are unlined or don not have soak pits are also one of ht e main reasons of land pollution in the city. In the walled city, consultations and field visits have revealed that large no of septic tanks are emptied into the open drains or that septic tanks do not have impermeable lining or. Wastewater is also disposed of directly into open drains from where it percolates into the ground and pollutes land. There are reports of overflowing of sewers from some areas in walled city, which is mainly due to absence of preventive maintenance of sewers

5.5.3. Water Pollution

The surface as well as ground water of the city are contaminated as has been discussed earlier. Water resources in the city are polluted due to disposal of sewerage directly into the surface drains or surface water bodies. Ground water contamination is essentially due to large no of septic tanks in use in the city, leakage and overflowing of sewerage pipelines, mixing of water and sewerage due to faulty lines as happens frequently in walled city etc

¹² www.indiastat.com



5.5.4. Depletion of water sources

In early stage, the city expansion was restricted to foothills of the Aravalli ranges and no drainage system was disturbed. But as the expansion took place, people started filling diverting and blocking the stream. At many places, the natural streams were used to dump the garbage. As a result, 150 streams out of which 113 1st order 37 second order and 10 are of third order stream are blocked or filled for the construction purpose due to expansion of Jaipur city. It has direct bearing on the availability of surface as well as ground water. The Jaipur water supply system is predominantly dependent on ground water. Ground water extraction rate is more than the recharge rate owing to low rainfall and absence of perennial rivers. On an average, 347 million litres per day of ground water is extracted. It is estimated that at the present rate of extraction, ground water will not be available for extraction after 2008. Ground water is estimated to be going down at the rate of 1 m per year, which is a substantial fall.

While Jaipur lies in the water deficit region,all the hotels in the city depend on ground water for their daily operation. The consumption pattern of water for big hotels is nearly 180-200 lpcd while those for smaller guesthouses is 120-130 lpcd. Coupled with higher per capita consumption and more number of customers, the bigger hotels are significant parties to ground water depletion

5.5.5. Loss of traditional water systems

As the focus of water supply shifted from decentralized community based water supply system to state controlled system, traditional water systems like baoris and Jhalaras got subjected to gross neglect. At present, most of the baoris in Jaipur are defunct. The talkatora which once recharged ground water of the city is now dry. Similarly Ramgarh lake which was once used for drinking water barely contains water. Old Check dams, which used to recharge ground water in the city constructed on adjoining hells of the city have been broken down over the years and as a result water levels in the city have decreased alarmingly.

5.5.6. Fire Hazards

While it is difficult to predict and prevent natural hazards, manmade hazards can be avoided or mitigated through preventive actions. Jaipur's vulnerability to fire hazard is likely to increase with increasing population density and as the urban fabric becomes denser, chances of fire incidences would also increase. At present, around 1200 fire accidents occur annually resulting in a loss of Rs.10-15 Crore.

According to the National Fire Advisory Committee, 1 fire station is required per 50,000 persons. As per which there should be 48 fire stations in Jaipur. The scenario in Jaipur is far below the standard. In case of big fires in the satellite towns, fire tender is sent from Jaipur city itself. The present system needs to be augmented with more manpower and fire tenders. The National Fire Advisory Committee recommends a water hydrant every 3 km. There are 15 water hydrants in Jaipur, which is again below the recommended standard.

5.5.7. Poverty

Poverty has been identified as one of the indicator to assess environment quality. Poverty forces people to exploit natural resources and cause various form of air water and land pollution. The poor do not have access to safe drinking water, sanitation and sewerage system. In Jaipur, the slum population has access to pit latrines which are unhygienic and a breeding ground for several diseases. The solid waste generated by the families is disposed off in open dumps, which pollutes land and water. Parts of forests are being cleared to meet the need of firewood, shelter and food.

5.5.8. Loss of forest and inadequate green cover

The forests around Jaipur are facing the perils of rapid urbanization. Not only are slums encroaching on forestland but other land uses are also coming up. As has been explained earlier, the dense forest area in and around the city has decreased from 1991.

5.5.9. Solid waste Management

At present, solid waste management is one of the most critical issues in Jaipur. Solid waste management has been identified as one of the most pressing urban environment issues by the stakeholders during consultations. People have asked for proper SWM facilities and infrastructure, especially efficient waste collection system. Absence of a sanitary landfill site is another critical issue related to sanitary land filling which rears its ugly head in most urban centers of India. It results in the leachates seeping down into the ground water and worsening its quality.

5.5.10. Water logging.

Water logging and improper drainage has been identified as one of the urban environmental issues during stakeholder consultations. Chocking of roadside drains due to garbage disposal, inadequate design etc are the causes of improper drainage in the city.

5.5.11. Poor living conditions in walled city

There is a lot of pressure on the infrastructure and services provision in the walled city that has resulted in poor living conditions. The design of the houses that was originally meant for less number of people is inadequate to meet today's basic needs. It results in poor ventilation aggravated by large families occupying these houses.

5.6. STRATEGIES FOR IMPROVEMENT OF URBAN ENVIRONMENT

Based on the identified issues strategies have been formulated to improve urban environ quality of the city. **Table 5-11** identifies the strategies to be taken and the likely projects as part of these strategies to improve environmental health of the city.



S.No	Sector	Issues	Strategies for environment improvement	Projects	
1	Air	Degraded air quality Congestion of walled city	Pollution reduction programs to be undertaken	Relocate pollution causing activities from walled city.	
		Poor traffic management		Tree plantation along roads and intersection	
		Increase SPM levels		MRTS for city	
				Widening/up gradation of roads	
2	Water	Loss of traditional water systems	Promotion of rain water harvesting	Incorporation of rain water harvesting in building bylaws	
		Depletion of ground water	Restoration of catchment areas of natural water bodies and nallahs	Afforestation programs along nallahs, water bodies	
		Degraded water quality	Upgrading /improving	Replacement of water pipelines I	
		Contamination of piped water with sewerage	infrastructure	walled city	
		Loss of UFW	Measures to check UFW losses	Consumer and bulk water metering to be installed	
3	Sewerage	Inadequate sewerage network	Upgrading /repairing sewerage infrastructure of the city	Replacement/repair /of sewerage system in walled city	
		Leakage of pipelines in walled city		Upgrading sewerage infrastructure of city	
4	Drainage	Water logging and	Rehabilitation /repair of	Repair of drains in walled city	
		flooding on roads etc	drainage systems to be undertaken	Drainage improvement works in city	
5	SWM	Indiscriminate dumping of garbage	Upgrade SWM infrastructure and facilities	Sanitary landfill sites for city	
		Land Pollution by leachate		Purchase of waste collection trucks and dustbins	
		Spread of vector, diseases		Public awareness and education campaigns	
				Build transfer stations	
				Compost plant/garbage to energy plant for city	
6	Green cover and	Loss of green cover and open spaces	Undertake plantation programs to Increase green cover of city	Plan for green belts and spaces in master plan	
	Open spaces	Absence of recreation spaces		Development of parks and open spaces	
				Urban forestry and plantation schemes for city	
				Remove encroachments from open spaces in walled city	
7	Fire Hazard	Large no of urban fires in city	Prepare Disaster management plan for city	Upgrade infrastructure facilities for the city	
8	Urban Poverty	Increase in slum and Kacchi bastis	Improve housing and infrastructure conditions in all	Slum infrastructure upgradation programs	
		Environmental degradation due to poor living conditions	kacchi bastis	Community toilets in slum areas Low cost housing	

Table 5-11: Strategies and projects to improve environmental health of the city



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