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Taj Trapezium Zone

PREPARATION OF VISION DOCUMENT

First Draft Report

Volume I

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1 Introduction

1.1 BACKGROUND

Concerns regarding the environmental threat to the Taj Mahal was voiced in the Hon'ble Supreme Court through a Public Interest Litigation filed by the noted "Green" Advocate Mr. M.C.Mehta. The Writ Petition No. 13381/84-M.C.Mehta V/s Union of India & others raised several issues pertaining to the environmental pressures on the monument as well as the socio-economic and physical conditions of the city. The concern regarding the environmental threat to the Taj has been articulated in the landmark judgement of Hon'ble Justice Shri Kuldeep Singh dated 30/12/96**, *"The Taj is threatened with deterioration and damage not only by the traditional causes of decay, but also by the changing social and economic conditions which aggravate the situation with even more formidable phenomena of damage and destruction."***

Originating as a result of the Writ Petition No. 13381/84-M.C.Mehta V/s the Union of India & Others, the Taj Protection Mission refers to a group of projects intended to check the deterioration of the Taj Mahal on account of the environmental pollution. The Central Pollution Control Board delineated the Taj Trapezium Zone (TTZ) in 1983, on the basis of the weighted mean wind speed in twelve directions from Agra to Mathura and Bharatpur. The boundaries of the zone were made keeping in mind the effect of any pollution source in this zone on the critical receptor- The Taj Mahal. This area was declared as an "Air Pollution Protection Area."

Preceding the 1996 judgement and following it many studies were commissioned on identifying the factors deteriorating the Taj Mahal. These studies have also indicated an improvement in air quality. First, the Court ordered that the polluting units in the vicinity of the Taj Mahal be identified. Mainly foundries; glass and bangle manufacturing units; and chemical and engineering industries were found to be using coal and other polluting fuels. The court also ordered that the Gas Authority of India Ltd would supply cleaner fuel—natural gas—to these units.The court, in its 1996 judgement and subsequently, asked for many other things to be done such as creating a green belt; building a bypass for heavy traffic; ban on brick kilns within 20 km from the Taj; supply of uninterrupted power so that the use of generators is negated; and ban on diesel-driven, light-duty vehicles and three-wheelers within 500

metres of the monument. The court-ordered air quality-monitoring stations, located both near the Taj and in the industrial outskirts of the city, to prove the difference.

Inspite of the above efforts the Taj Mahal and its environs is still under threat. It needs to be assessed if there are new sources of pollution that were not accounted for; or is it because of non-implementation of the directions of the court,or is it because the new sources of pollution, development pressures and activity intensity thatis threatening the monument.

the Hon'ble Supreme Court of India has again upheld the protection of Taj and its environs, in its Order dated 08.12.2017:

"……*In our opinion, a detailed and comprehensive vision document and plan with a futuristic perspective which can protect and preserve the Taj and its environs and indeed the Taj Trapezium Zone spread over six districts of Uttar Pradesh and District Bharatpur in Rajasthan for a few hundred years at least should be prepared. This exercise will require expertise from all stake holders including those concerned with cultural heritage, historical heritage, environment and wild life, etc. etc. and of course, prevention of pollution. The concerned authorities will consult not only officials but also persons from the civil society including the petitioner Mr. M.C.Mehta, who has spent more than 33 years in making efforts to protect the Taj and its environs…..*"

1.2 INTRODUCTION TO TTZ

The Taj Trapezium Zone (TTZ), which is in the form of trapezium, is bounded between $26^0$45'N & $77^0$15' E to $27^0$45'N & $77^0$15'E in the west of Taj Mahal and in the East of Taj Mahal between $27^0$00'N & $78^0$30'E to $27^0$30'N & 78^0 30'E. The TTZ is spread over 6 Districts:

1. Agra: State of Uttar Pradesh
2. Mathura: State of Uttar Pradesh
3. Firozabad: State of Uttar Pradesh
4. Hatras: State of Uttar Pradesh
5. Etah: State of Uttar Pradesh
6. Bharatpur: State of Rajasthan

The Taj Trapezium zone also includes small parts of Aligarh and Dholpur. The region as a whole encompasses an area of 10,400 sq. kms..Each of these regions has its own importance in the contribution to the region's economic growth. The natural and

cultural setting in each administrative unit varies widely and promotes sectoral development accordingly. The region covers sensitive areas such as the Taj Mahal in Agra, Keoladeo National Park in Bharatpur, Soor-Sarovar bird sanctuary in Agra, and Mathura&Vrindavan are important religious destinations.

In view of the above court order, the Department of Tourism, Government of Uttar Pradesh, vide its Letter D.O. No. 989/ Agra-TTZ/ 2017 dated 27th November 2017 has invited the School of Planning and Architecture, New Delhi to prepare the Vision Document and Comprehensive Action Plan for protection of Taj Mahal and its surrounding Environment. An agreement was signed between the Taj Trapezium Authority, Agra and School of Planning and Architecture, New Delhi on 15th March 2018 for preparation of a vision document for sustainable development, environmental and heritage protection of the area along with a comprehensive action plan in reference to the environment and other matter based on the principles of "Sustainability". A draft Vision document was to be submitted within four months after signing of contract followed by the Final Vision Document within two months after incorporating the suggestions.

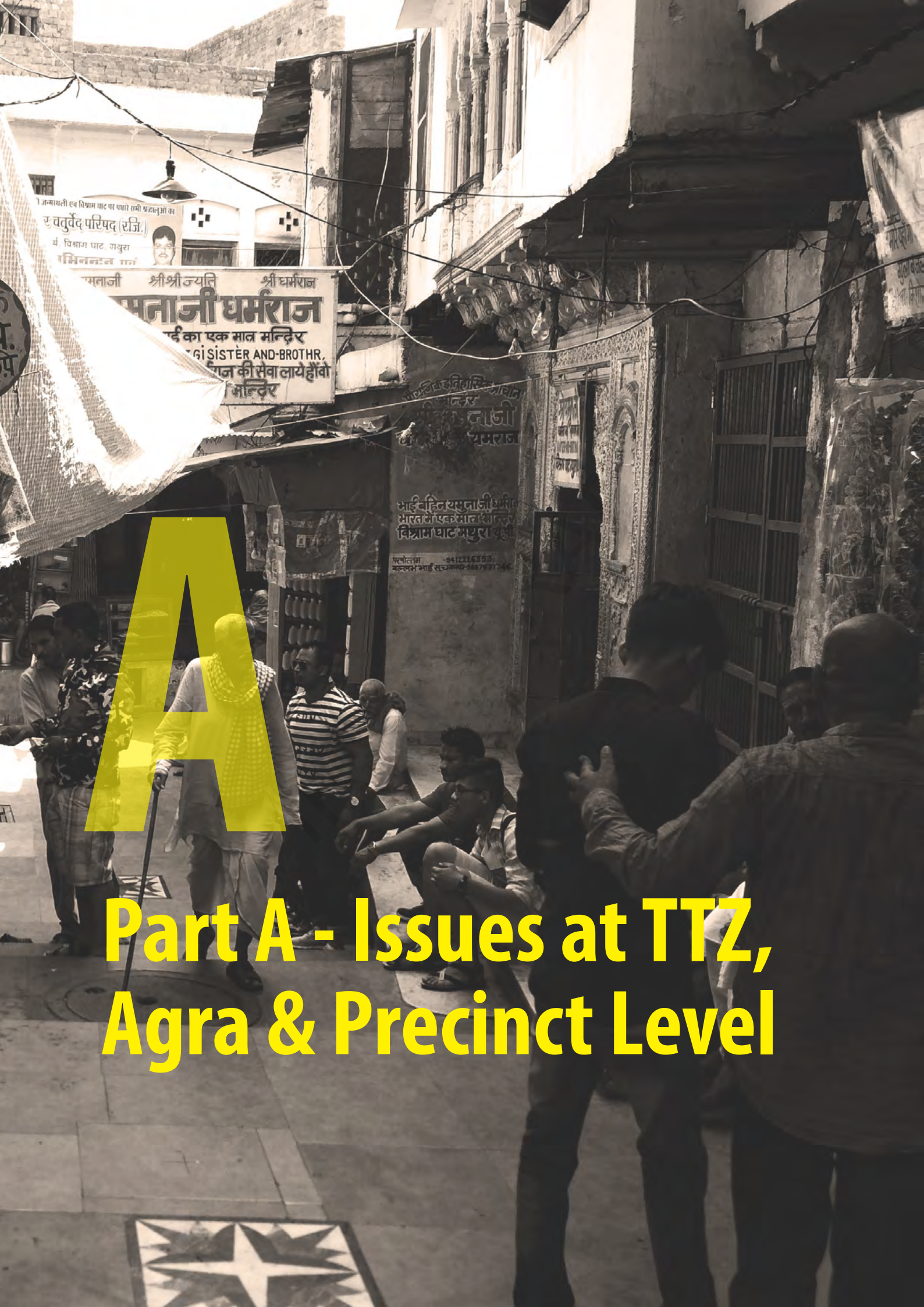
1.3 OBJECTIVES, SCOPE AND METHODOLOGY

The task of preparation of the Vision Document for protecting the Taj Mahal for a couple of hundred years, assumes an understating and somewhat scenario building of the nature of development that would take shape in a hundred years. Even though an ambitious task, it needs to be undertaken as the current trends of growth and development indicate a rapid decline of natural and cultural resources, thereby deterioration of living conditions and inevitable neglect of built heritage. The Taj Mahal is a metaphor, and any vision to protect it also means a vision for sustainable development for a couple of hundred years. The team at the School of Planning and Architecture, New Delhi (comprising of five disciplines of Environment Planning, Urban Planning, Transport Planning, Heritage Conservation and Urban Design) humbly acknowledges that even though this is a mammoth task, the present document takes the initial steps to develop a comprehensive and integrated action plan, based on field visits, stakeholder consultations, review of ongoing/proposed projects/plans in the region (Refer Annexure 1.1 for appraisal of the projects/plans) and factual assessments to address the protection of degraded ecosystems and improve the quality of life in human settlements and thereby ensuring the protection of the Taj Mahal. As part of methodology, assessment has been undertaken at three

levels, TTZ level, Agra level and Immediate Taj Precinct level across above-mentioned five disciplines to generate multi-sectoral as well as inter-disciplinary perspective for issues at various scales.

The study is a framework document, limited by data made available within the time period, short field visits and rapid overview of documents. It indicates a development strategy towards sustainable development with broad suggestive action plans and not detailed assessments or project reports.

This report is a first draft requiring further editing to iron out the overlaps and minor restructuring of the content in order to address the Terms of Reference adequately.



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Part A - Issues at TTZ, Agra & Precinct Level

2 Environment Issues at Regional Level

2.1 GENERAL

2.1.1 Administrative boundaries

Taj Trapezium Zone (TTZ) is a trapezoid shaped, defined area of 10,400 sq km around the Taj Mahal. The Taj Trapezium which is in the form of trapezium bounded by Longitude 77°15'E on the West 78°30'E on the East and lines joining Latitude 27°45'N to Latitude 27° 30'N on the North and Latitude 26°45' to 27° 00'N. The TTZ constitutes 6 districts- Agra, Mathura, Hathras, Etah and Firozabad districts in Uttar Pradesh and Bharatpur district in Rajasthan, 20 tehsils and 38 blocks which are further divided into gram panchayats and villages. Total Urban population is 2055724 and Rural Population 4043993. Many tehsils do are entirely rural, some with Census Towns, with having statutory urban areas. Village sizes vary from below 500 to more than 5000 population and show unbalanced growth with villages near corridors growing at a faster rate.

2.2 DEMOGRAPHIC PROFILE

2.2.1 Population Distribution and Density

The population of the area constitutes 53.48% males and 46.52%% females and has been increasing at a rate of 21%. The total population of 10 million is spread over an area of 10,400 sq. km with a gross density of 965 persons per sq. km. with varying urban and rural densities.

TTZ, State and India:

Name	Decadal growth rate	Density	Literacy	Average household size
India	17.64%	382	74.04%	4.91
Uttar Pradesh	20.10%	829	67.68%	6.06
Rajasthan	21.40%	201	66.11%	5.45
TTZ	21.67%	965	70%	6.04

Source: Census India 2011

Above table reveals that with the comparison of National and both UP and Rajasthan state figures the decadal growth rate and the density of TTZ is higher than the national and state with 21.67% and 965 respectively. But the literacy rate is lower than the national level. Average household size is likely equal to UP state level with 6.04.

Demographic Profile of TTZ:

District	Tahsil	Population 2001			Population 2011			% decadal variation 2001-2011			Percentage urban pop.	
		Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	2001	2011
Agra	Etmadpur	315273	295850	19423	367441	336919	30522	16.55	13.88	57.14	6.16	8.3
	Agra	1753818	379325	1374493	2186655	412425	1774230	24.68	8.73	29.08	78.37	81.1
	Kiraoli	416362	348611	67751	506777	411721	95056	21.72	18.1	40.3	16.27	18.8
	Kheragarh	390297	362697	27600	466809	433764	33045	19.6	19.59	19.73	7.07	7.1
	Fatehabad	379184	332378	46806	460592	404170	56422	21.47	21.6	20.54	12.34	12.2
	Bah	366768	335132	31636	430523	395603	34920	17.38	18.04	10.38	8.63	8.1
Mathura	Mathura	967953	501076	466877	1187244	615075	572169	22.66	22.75	22.55	48.23	48.2
	Mahvan	252096	252096	0	351792	296444	55348	39.55	17.59	0	0	15.7
Firozabad	Tundla	274876	220300	54576	361489	296583	64906	31.51	34.63	18.93	19.85	18
	Firozabad	769727	336861	432866	956082	351868	604214	24.21	4.45	39.58	56.24	63.2
Etah	Jalsaner	3,07,541	2,61,120	46,421	3,51,557	3,02,444	49,113	14.31	15.83	5.8	15.09	13.97
Hathras	Sadabad	332386	292677	39709	384319	334473	49846	15.6	14.3	25.5	11.9	13
	Hathras	464874	314978	149896	551540	356528	195012	18.6	13.2	30.1	32.2	35.4
Bharatpur	Bharatpur	372876	167641	205235	453015	200177	252838	21.49	19.41	23.19	55.04	55.81
	Rupbas	211147	211147	0	257952	257952	0	22.17	22.17	_	_	_
	Kumher	175418	155122	20296	201341	177801	23540	14.78	14.62	15.98	11.57	11.69
	Deeg	195721	154862	40859	226710	181711	44999	15.83	17.34	10.13	20.88	19.85
	Kaman	157766	126973	30793	203949	165909	38040	29.27	30.66	23.53	19.52	18.65
	Nabdai(half)	182094	160445	21649	215136	188725	26411	18.15	17.63	22	11.89	12.28
	Bayana (half)	225348	191632	33716	269512	225144	44368	19.6	17.49	31.59	14.96	16.46
TTZ		82,03,984	51,39,803	31,10,602	1,00,38,878	60,42,992	39,95,886	21.674	18.6	23.4	23.4	25.1

Source: Census India 2011

The decadal population growth in this area is 21.6% in total where as 18.6% in rural and 19.94 % in urban population growth rate respectively. The percentage of urban population is 25% of total population in TTZ area.

District Wise Class (population range) of Settlement:

Name of the District	Settlement Class and Number						
	<500	500-1000	1001-2000	2001-3000	3001-4000	4001-5000	>5000
Agra	60	146	256	175	77	66	137
Etah	85	142	225	110	38	21	40
Firozabad	78	184	254	123	64	26	71
Hathras	81	144	223	93	53	28	46
Mathura	103	114	190	131	71	37	110
Bharatpur	285	394	445	170	75	30	44
Total	**692**	**1124**	**1593**	**802**	**378**	**208**	**448**

Source: Census India 2011

The settlements has divided into seven classes ranging from<500, 500-1000, 1001-2000, 2001-3000, 3001-4000, 4001- 5000 and >5000. The highest number of settlement is seen in class three which ranging from 1001-2000 population and then 500-1000, 2001-3000, <500, 3001-4000, > 5000 and 4001-5000 respectively. The lowest settlement number is in sixth class ranging from 4001-5000 population.

Work Force Participation Rate:

District	Tehsil	Working Population (2011)			
		Main workers	Marginal workers	Total workers	Non workers
Agra	Etmadpur	22.30%	9.16%	31.46%	68.54%
	Agra	24.83%	7.23%	32.06%	67.94%
	Kiraoli	22.02%	9.30%	31.32%	68.68%
	Kheragarh	23.18%	7.55%	30.72%	69.28%
	Fatehabad	22.98%	6.23%	29.21%	70.79%
	Bah	23.26%	8.47%	31.73%	68.27%
Mathura	Mathura	22.95%	11.60%	34.55%	65.45%
	Mahvan	23.22%	7.46%	30.68%	69.32%
Firozabad	Tundla	4.84%	4.36%	9.20%	90.80%
	Firozabad	9.31%	6.60%	15.91%	84.09%
Etah	Jalsaner	23.22%	6.71%	29.93%	70.07%
Hathras	Sadabad	5.55%	8.58%	14.13%	85.87%
	Hathras	4.91%	5.26%	10.18%	89.825
Bharatpur	Bharatpur	7.64%	11.38%	19.02%	80.98%
	Rupbas	28.41%	16.21%	44.62%	55.38%
	Kumher	23.81%	18.96%	42.77%	57.23%

	Deeg	25.29%	17.55%	42.83%	57.17%
	Kaman	29.15%	10.05%	39.20%	60.80%
	Nabdai(half)	29.09%	17.54%	46.63%	53.37%
	Bayana (half)	27.48%	14.15%	41.63%	58.37%
TTZ		20.17%	10.22%	30.39%	69.61%

Source: Census India 2011

The total working population of TTZ area is 30.39% where main worker 20.17 % and marginal worker is 10.22% and non-worker is 69.61%. A huge variation in main worker has seen in different tehsil as Tundla, Firozabad, Sadabad, Hathras has only 4-5% of main workers.

2.3 NATURAL RESOURCES

2.3.1 Land Utilization

Land is one of the most important natural resources on which all man's activities are depended upon, and a thorough knowledge of it, which includes the land use/ land cover is essential for a number of Planning & Management activities. Land degradation is observed with areas affected by salinization.

The Land under TTZ area includes various Land use. Some of the prominent ones are Crop Land, Fallow, Built-up Urban and Rural. On comparing the Land use of TTZ (considering the whole district) of 2005-06 and 2011-12, we found various changes in its pattern such as:-

1. A Growth can be seen in Agricultural Crop Land that is from 78% to 81%.
2. The Land for Agricultural Fallow had shrieked to 3% from 6%.
3. Land under Agricultural Plantation shows an increase from 0.1% to 0.25%.
4. The area under water bodies have also expanded. These includes:
   4.1 Inland Wetlands – 0.13% to 0.15%
   4.2 Reservoir, Lakes & Ponds – 0.17% to 0.24%
   4.3 River/ Stream & Canals – 0.99% to 1.28%
5. Land under Urban Built-up shows an increase of 0.01%.
6. Area under Rural Built-up shows a rise of 0.43%.
7. In Scrub Forest, there is a growth from 1.68% to 1.69%.
8. In Deciduous Forest, there is a decrease in area from 1.31% to 1.22%.
9. In 2006, there was no forest plantation whereas in 2012, there is 0.0012% of land under forest plantation.
10. The percentages of land under mining have gone up from 0.005% to 0.009%.
11. There is a fall in Grazing Land from 0.08% to 0.05%.
12. There are also five type of Land Use that comes under the category of Barren Land.
    12.1 Salt Affected Land shows a fall from 1.33% to 1.19%.
    12.2 Scrub Land shows a fall from 1.80% to 1.79%.
    12.3 Ravenous Land shows a rise from 1.23% to 1.56%.
    12.4 Barren Rocky Land had a fall from 1.76% to 0.87%.
    12.5 Sandy Area had a fall from 0.06% to 0.04%.

2.3.2 Types of Wetlands (Fresh Water Lakes, ponds, reservoirs)

There are mainly two wetlands are located in TTZ area one is Keetam in Agra-Mathura and another is in Bharatpur.

Sur Sarovar Bird Sanctuary

Located just 30 km away and in midst of Mathura & Agra Sur Sarovar Bird Sanctuary, also known as Keetham Lake, was established in 1991 by the Uttar Pradesh Forest Department. It is home to more than 165 species of resident birds & migratory birds. The sanctuary also has the population of more than 300 of pythons. It is also one of the biggest bear resue centre of India for dancing bear. It is a small, but important bird sanctuary of Uttar Pradesh. It comprises of fresh water wetland, popularly known as Keetham jheel. Seeing the large number of migratory as well as resident birds arriving in this wetland year – after- Year, the area was declared a Sanctuary in 1991.

Keolodeo Ghana National Park in Bharatpur

It is an important international bio-sphere known for its large and varied avifauna, both local and migratory. By building small dykes and dams and diverting water from an irrigation canal, he converted this low lying area into a fine wild fowl shooting preserve. In a few years, the new wetland surrounded by marginal forests was able to support thousands of water-birds. Commonly referred to as Bharatpur, the Park is a delight for bird watchers.

Over 300 species of birds are found in this small park of 28.73 sq. kms. of which 11 sq. kms. are marshes and the rest, scrubland and grassland. Here and raised paths, camouflaged by babul trees and undergrowth make viewing easy. A quiet ride by boat in the early hours of the morning is also an unforgettable experience. Every year Bharatpur waits with bated breath for the arrival of the Siberian cranes. You can see the Indian sarus.

2.3.3 Flood Plain

TTZ belongs to Yamuna Flood plain.

Yamuna plain: The channel pattern of the Yamuna changes from braided to meandering, after 35 kilometre on entering into the plain. In this area the river slightly cut the plain and guided by the southern boundary of Yamuna fault. There are two soil geomorphic units: one the old Yamuna plain and the second one is the young Yamuna flood plain. The old Yamuna plain is flat and lies in western parts of this geomorphic unit. The old plain is characterize by weakly developed soil and salt efflorescence at few places. Young flood plain is characterize by newer alluvium and numerous abandon channels.

Geology and Soil Type:

The area is part of the western fringe of Ganga alluvial plain and slopes gently towards east and along the drainage lines.

The main three geomorphic units identified in the district are:

1. Younger Alluvium Plain

2. Older Alluvium Plain

3. Relict Mountains, Hills and Ridges

1. Younger Alluvium Plain: Younger alluvium plain is mainly restricted to present river course and mainly represented by sand and loam. It is further divided into (a) Present flood plain and (b) Old flood Plain. The present flood plain has two main land forms i.e. present river course and sand plain sand bar. Similar the old flood plain is characterized by flowing land forms which are represented by loamy sand. The land forms are: i. Abandoned Channel ii. Meandering Scar iii. Black- swamp

2 Older Alluvium Plain: This unit is mainly characterized by yellow clay, kankar and Reh. It is represented by following land forms. i. Alluvium plain ii. Salt affected plain iii. Water logged plain

3. Relict Mountains, Hills and Ridges: These relict mountains are present at Goverdhan, Barsana etc. and belong to Delhi Super group. Here slopes are very high and they form mostly run off zone. Besides these mentioned land forms, these are some wind-blown Aeolian land forms i.e. sand dunes and sand sheets at reported by Mukherjee, A. Etal (1988).

Soils

The soils of the TTZ which forms a part of the Indo- Gangetic alluvium (consisting of sand, clay, kankar and reh) have remarkable diversities in different areas. (i) In the Bangar in uplands the soils varies from ‘Dumat’ (rich loam) to ‘Bhur’ which is constituted of deposits of blown sand and fine silt.

Bangar Belt: The Bangar belt is uplifted area in inter-fluvial zone above the flood plain. It is composed of older alluvium, which forms the terrace of the flood plains of the rivers. The formation of concretion occurs in the bangar belt.

Khadar Belt: The Khadar belt lies downward to the Bangar belt and comprise deposit of clay, fine silt and sand particles, which is renewed by the recurrent flood in the Streams regularly.

2.4 FOREST RESOURCE

2.4.1 Distribution of Forest Cover

District wise forest cover (Area in sq.km.) 2017

District Name	Geographical Area	2017 Assessment				% GA	Change	Scrub
		V. Dense Forest	M. Dense Forest	Open Forest	Total			
Agra	4041	0	63	209	272	6.73	4	64
Etah	2431	0	1	30	31	1.28	-3	0
Ferozabad	2407	0	5	44	49	2.04	0	24
Mathura	3340	0	4	56	60	1.8	5	3
Hathras	1840	0	1	22	23	1.25	-1	0
Bharatpur	5066	0	22	207	229	4.52	13	79

2.4.2 Protected areas

Forest Produce

1. Wood: Sheesham wood is mainly used for making doors, windows and furniture. It is exported as laths and gilts. According to the market demand, the production of low-grade laths is beneficial. Jamun mango and neem frames and straps are used in the construction of cheap buildings. In these divisions, Prosopis julipllora, eucalyptus and Acacia are the main species used in the manufacture of bullock cart axle and other agricultural equipment.

2. Fuel: trees are also Domestic fuel Primarily Acacia, Prosopis juliflora, Jungle Jalebi, Eucalyptus, Cirrus etc. species are used as fuels.

3-.Minor forest produce: Neem, Acacia, Cirrus etc. are there for the fodder leaf. Fruit gardens get good prices. Acacia bark is used in leather factories.

2.5 SURFACE WATER RESOURCE

Yamuna is the major river and there are no major canals apart from Agra Canal and its distributaries in the stretch within TTZ, and there are two barrages in the stretch. Ponds, Wells, tube wells dot this area. The environmental flow of the river is not maintained due to extraction upstream and all along.

2.5.1 Yamuna

River Yamuna originates from Yamunotri Glacier in the Lower Himalaya at an elevation of about 6380 m above mean sea level. The river with its flow length of 1376 km travels through a number of historical, religious and big cities as Saharanpur, Shamli, Baghpat, Ghaziabad, Mathura, Agra, Firozabad, Auriya, Etawah, Jalaun, Kanpurdehat, Fatehpur, Hamirpur, Banda and merges into river Ganga at Allahabad. The Marhura and Vrindavan towns situated on the right bank of river Yamuna are one

of the most important pilgrimage center of the country and have a large number of temples and ghats for taking holy dip. Despite such importance, in the catchment downstream of Okhla barrage, most of the treated/untreated domestic and Industrial waste generated from the cities like Delhi, Noida, Faridabad, Ballabhgarh, Palwal, Hodel, Chhata, Kosi industrial area and 52 drains carrying waste of Mathura and Vrindavan discharge directly in the river and it becomes as one of the most polluted river in India.

All the water available in Yamuna River is diverted into canals from Hathnikund Barrage at the border of U.P. From downstream of Hathnikund barrage , only the domestic and industrial waste generated in and around Delhi flow in Yamuna river, that too is diverted in Agra Canal from Okhla Barrage and Yamuna practically remains dry specially during the non-monsoon period. U.P. Jal Ngar Nigam & State Pollution Control Board have conducted testes for the quality of treated water by the existing STP'S and result shows that the BOD of treated water varies from 52 mg /l to 64 mg/l which indicated that the treated water is not even suitable for irrigation.

Under Ganga Rejuvenation Plan of Government of India, the Ganga river basin including its major tributary river Yamuna, having on its banks the old and historical cities like Delhi, Vrindavan, Mathura and Agra, is being planned for rejuvenation.

From Okhla Barrage to Taj mahal at Agra, the General Hydrology shows that during the year, river has low discharge ranging from practically nil to few thousand causecs at different locations. The water for nine months is about only 100,600 and 1100 causecs, at Okhla Barrage, Mohna Bridge and Gokul barrage & Poiya ghat respectively and for balance three months the water varies from 1 lacs Cusecs. It reveals that the river carries adequate discharge during monsoon from July to October month.

2.5.2 River in Bharatpur

Bharatpur comprises of Ruparail and Banganga basin. Ruparail River & Gambhir Basin covers 3,855 km2, i.e. 1.1% of the state area, in Alwar District (71%) and Bharatpur District (29%). About a third of these area drains northwards into the State of Hriyana, while the remaining part drains northwards towards Banganga River basin, intercepted on the way by Sikri Bund. There are 34 dams in Bharatpur with the capacity of 675.33 lakh that can irrigate 174.64 Ha of land.

Banganga River Basin covers 8,878 km2 in the north-eastern corner of Rajasthan where 31% in Bharatpur district but presently none of these rivers are flowing in Bharatpur because of both natural and anthropogenic reasons. It is said (conversation with learned local people and irrigation departmental officers) that there has been an agreement between with the river sharing states to allow a certain percentage of water to flow into Bharatpur. But due to the increased demands in their own area it has been

stopped now. However, the natural reasons for more significant as the base flows of these rivers are no more maintained. The ground water tables has fallen far beyond te base flow level (ranging from <5 mgbl to >15 mgbl in pre-monsoon season. The Banganga River debouches in the natural depression of Ghana Bird Sanctuary near Bharatpur by flowing southeast. The Bandi River flows due southeast and meets Chambal River before finally joining the Yamuna. The Ruparail River rises in Aravalli hills near Thana Gaji in Alwar district. It passes through the Alwar tehsil and terminate at Sukri bund. The Ruparail River used to cause floods in Alwar and Bharatpur districts before the construction of a diversion channel on its channel for water to Ghana Bird Sanctuary near Bharatpur.25 They have the internal drainage patterns and flow according the natural slopes of the land and disappear into sand dunes. All of these river are non-perennial and rain fed.

2.5.3 Watershed Area

The TTZ area is located in Ganga basin and Yamuna Middle sub basin. The total area of Yamuna sub basin is 34586.39 sq. km. where average size of watershed is 804.33 sq.km. total number of dam and Reservoirs are 19 and 22 respectively.

2.5.4 Prevention of Pollution in River Yamuna

The activities along the river should be stopped and the polluting activities like disposal of sewage, dumping of garbage along the riverbank should be prohibited. Strict norms should be enforced.

Proper solid waste disposal sites should be identified so that garbage is not dumped. Minimum flow of the river should be maintained for reducing the pollution levels. This requires proper study and analysis related to the depth, velocity of flow, etc. Public awareness needs to be enhanced for action against activities related to the pollution of the river. Regular cleaning and maintenance of the river is also desirable. Reuse /recycle of treated wastewater needs to be considered and holistic plan developed. No untreated sewage be discharged into the river.

In order to improve the water quality, R&D studies on estimation of environmental flow in river Yamuna is necessary and the water releases accordingly regulated. Necessary corrective measures need to be identified based on R&D studies for delineation of assimilative capacity of different stretches of river in different seasons and the discharge of treated effluents regulated accordingly. A complete waste load allocation strategy and maintenance of environmental flows in river is expected to maintain the quality to CPCB Class-C/B category at the least.

Pollution in River Yamuna is an Inter-State issue because the water quality of Yamuna River is already degraded before entering in the State of U.P. The flow in River

Yamuna is also limited in the stretch from entrance of U.P. to the confluence point of River Chambal.

2.6 GROUND WATER RESOURCE:

2.6.1 Status of Ground Water

The stage of development of Ground water in most of the blocks has reached critical stage with decline in recharge and increase in extraction. The pre-monsoon and post-monsoon levels of ground water are showing a declining trend with increased salt concentration near industrial areas.

2.6.2 District Wise Ground Water

2.6.3 Depth to Water Level

Agra

As per the data of NHS during year 2012, depth to water level in phreatic aquifer varies from 2.19 to 45.58 mbgl during pre-monsoon period. In the western parts of area including Fatehpur Sikri, Achhnera and Jagnair. The water level rests at a depth ranging from generally 2.00 to 10.00 mbgl .The influence of canals has been observed in the canal command areas of Achhnera and Fatehpur Sikri blocks where the depth to water level is comparatively shallower which may be due to the subsurface infiltration from canal. Such conditions are also prevailing in some pockets along canals. The depth to water levels in hard rock terrain of Jagnair block generally range between 7 and 10 mbgl. In the eastern and southeastern parts of area specially in the vicinity of Yamuna river i.e. in Bichpuri, Shamsabad, Fatehabad, Pinhat, Bah, Jaitpur Kalan, Khadauli and Etmadpur blocks deeper depth to water level conditions exist and depth to water levels in these areas generally varies from >10 to >35 mbgl. The deepest depth to water level has been recorde in Yamuna-Chambal doab in the Shamsabad & Fatehabad areas. In the southeastern ravinous parts of the younger alluvium along Chambal river water levels generally rest at more than 30 meters depth range below ground level.

Etah

The Ist aquifer group, occurring just below the top clay layer is regionally extensive with variable thickness attaining the maximum thickness of 80 metres, The IInd aquifer group occurring generally110 160 mbgl consist of fine to coarse sand admixed with kankar and The IIIrd aquifer group, lying generallygravels and 240 (±20) m, to 290 (±20) comprises fine to coarse sand admixed occasionally with kankar and Gravels respectively. During the pre- monsoon the depth to water level ranges from 4.25 mbgl

(at Baghwala I) to11.88 mbgl (at Jalesar) and in post-monsoon water level ranges from 3.32 mbgl (at Bhagwala) to 11.02 mbgl (at Jalesar).

Firozabad

Alluvial tract of Firozabad district is underlain by sands of various grades, gravels, silt and clay (Plate-II). The result of exploratory drillings indicate that in the south-western parts of the district, where Vindhyan sandstone has been encountered at different depths as basement, the alluvium sediments attain the minimum thickness. The depth ranges from 0-80 meter in Ist Aquifer, 100-140 meter in 2nd and 180-300 meter in 3rd Aquifer.

Hathras

The top silty/ sandy beds mixed with kankar are the top most parts of the Aquifer Group – I, down to depth to about 30 mbgl generally supports the dugwells. The ground water in the zone occurs under water table unconfined conditions. In II (depth ranges 115.0 to 200 mbgl) and III (depth ranges 230 to bedrock) Aquifer Groups the ground water occurs under semi-unconfined, semi-confined to confined conditions.

Mathura:

The shallow aquifer group occur down to depth of 50.0 mbgl where as deep aquifers group exist between the depth ranges of 135 - 185 mbgl. The aquifer material is generally composed of fine to medium grained sand. Kankars are invariably associated with sand and clay in older alluvium plain. Ground water occurs under unconfined to semi-confined conditions in the shallow aquifer group and semiconfined to confined condition in the deep aquifer group.

Bharatpur:

Groundwater usually occurs at shallow depths ranging from 25 – 30 m to less than 5 m and at places almost at ground level after rainy season. In most of the area, groundwater is phreatic, but semi confined conditions occur in the central and eastern parts of the district. These major ground water potential units separated by two major aquicludes are referred to as 1st, 2nd, and 3rd aquifers. The thickness of alluvium in Banganga basin varies from 120 to 180 m. In the southern part (Gambhiri River basin), generally single phreatic aquifer is encountered. The thickness of alluvium ranges from 60 to 100m. The maximum thickness of aquifer tapped is 18m in the depth range of 36 to 100m.

2.6.4 Water Level Fluctuation

Agra

The NHS data for the year 2012 shows that the water level fluctuation between pre and post-monsoon period varies in general from 0.28 to 7.75 meters Rise, and 0.14 to 0.76 m fall. The seasonal rise in water levels are more prominent in the hard rock terrain of Jagnair block and also in Achhnera & Fatehpur Sikri blocks under canal commands.

Etah

The seasonal fluctuation in water level varies from 0.06 m to 1.62 m. The maximum fluctuation is observed at Jaisukhpur (1.62 m).

Firozabad

The pre-monsoon water level varies from 2.42 to 25.10 mbgl. In post-monsoon period depth to water varies from 1.55 to 25.25 mbgl. Water level fluctuation varies from 0.23 to 1.38 meters. Shallow water levels are observed in canal command areas. Water level is deeper along the bank of Yamuna (Plate-III & IV).

Hathras

The depth to water level during pre-monsoon period varies from 3.54 to 17.03 mbgl while during post-monsoon ranges between 1.82 and 17.70 mbgl.

Mathura

In Mathura premonsoon water level varies from 2.65 to 14.34 mbgl in postmonsoon period depth to water varies from 1.33 to 14.00 mbgl. Seasonal water level fluctuation varies from -0.15 to 3.85 m.

Bharatpur

During pre-monsoon (May, 2011), depth to water level in the district varied from 1.6 to 24.48 mbgl. Generally, over major part of the district, the depth to water level varies between 5 and 20 mbgl. During postmonsoon (November, 2011), depth to water level varied from 0.34 to 28.08 mbgl. Depth to water level upto 10 mbgl has been observed in Kaman, Nagar, Deeg, Kumher, Sewar, Bayana and Roopwas blocks. Major part of the district has recorded rise in water level up to 2m. Rise of more than 4 m has been observed in Bayana block. Decline of upto 2 m in water level has been observed in Nagar, Weir, Deeg, Kumher, Sewar, Nadbai and Roopwas blocks. Decline of 2 to 4 m was observed from small pockets in eastern parts of Deeg, Kumher and Sewar blocks and northern parts of Nagar block.

2.7 AIR POLLUTION

2.7.1 Air Quality

In compliance with the Hon'ble Supreme Court's Orders dated 7.11.2000, the CPCB has set up and is operating four ambient air quality monitoring stations at Taj Mahal, Itmad-ud-Daulah, Nunhai and Rambagh.

UPPCB has also established regional laboratories in Agra, Mathura and Firozabad. These laboratories play an important role in monitoring of water and air quality and pollution levels from industries in TTZ area.

Agra:

In all, there are 8 ambient air quality monitoring (AAQM) Stations operational in Agra city.

2.7.2 *Air Quality Monitoring Stations in Agra City*

Sr. No.	Monitoring Agency	Number of Stations	AQ M Locations	Type of Location/ Area	Parameters Monitored
1.	CPCB, RO, Agra	4	Taj Mahal,	Sensitive area	SO_2, NO_2, RSPM & SPM
			Etmad-ud-daulah	Sensitive area	
			Rambagh	Residential/ Commercial	
			Nunhai	Industrial area	
2.	ASI, Agra	1	Taj Mahal	Sensitive area	SO_2, NO_2, RSPM & SPM
3.	UPPCB RO, Agra	2	Bodla (UPPCB building)	Residential area	SO_2, NO_2, RSPM & SPM
			Nunhai	Industrial area	
		1 (automatic)	Agra Nagar Nigam Office	Residential area	SO_2, NO_2, PM10

Out of 8 air quality monitoring stations, 7 are monitored using manual systems, whereas one station is equipped with continuous analyzer, which is installed at Agra Nagar Nigam Office. The automatic station is operated and maintained by M/s Envirotech Ltd., New Delhi.

AQM Stations location

2.7.3 Observations

It is important to note that whole of the TTZ Area is considered under the sensitive area category of CPCB Standards.

- By considering the whole TTZ area to be under sensitive zone, levels of SO2 are found to be well below the corresponding CPCB Standard value of 20 µg/m3, whereas NO2 levels are approaching the Standard value of 30 µg/m3.
- PM2.5 and PM10 levels are substantially high (4 times) than the prescribed Standard value of 40 µg/m3 & 60 µg/m3.
- SO2 and NO2 levels are found to be high in winter than in summer and this may be attributed to the burning of coal and other materials for heating purpose during winter.

In addition, Benzene, Toluene and Xylene (BTX) are also monitored simultaneously along with PM10, SO2 and NO2 at the Agra Nagar Nigam site using continuous air monitoring system. Air quality standards promulgated by CPCB for benzene is 5 µg/m3 (annual average). The benzene levels recorded were found much below the CPCB standards for benzene. National standards for toluene and xylene are not available at present.

SO2 & NO2 levels are found to be high in winters than in summer. This may be attributed to mainly low wind speed and inversion phenomena resulting out of drop in temperature.

Nunhai Ambient Air Quality Monitoring Station is located in industrial area and results indicate higher values of NO2. These higher values of NO2 may be attributed to the

use of CNG in the industries and the operation of heavy DG Sets in the industrial cluster of Agra.

Agra City

- The annual average SO2 level in any year was much below the CPCB Standard of 20 µg/m3 for the sensitive area category.
- AQ Data indicates higher levels of NO2, PM2.5 and PM10 at Nunhai when compared with that of other four locations where the annual average NO2 level in any year was found to be below the CPCB Standard of 30 µg/m3 for the sensitive area category.

Firozabad City

- Air quality data is being monitored at three locations in Firozabad city. These locations are Raja-ka-Tal (residential area), Tilak nagar (mixed use area) and CDGI (industrial area).
- Analysis of air quality data indicates similar pattern in variation in gaseous pollutants (SO2 and NO2) and particulate matter. In general, highest pollution is observed at industrial area site followed by the residential area and the lowest at the mixed used area site. This pattern is more or less similar for all the pollutants.
- In general, highest levels of pollutants are observed during winter (December-March), followed by the summer (April-June), and the lowest during monsoon (July- September).

Mathura City

- The figures indicate that gaseous levels are much below the standards (each 80 µg/m3), whereas PM10 concentration levels are much above the standards (100 µg/m3).

Bharatpur City

Analysis of data indicates that NO2 levels were much below the applicable CPCB standard (80 µg/m3), maximum being 26 µg/m3, whereas PM2.5 and PM10 levels were found to be almost all the time above the standard (100 µg/m3), ranging between 180-250 µg/m3.

2.7.4 Sources & Issues of Air Pollution in TTZ Area

Comprehensive Action Plan for Reducing Air Pollution as per the guidelines of Central Pollution Control Board has been made and enforced in Agra for strict control of air pollution. In the said action plan detailed department wise action points are laid down based upon the prevailing air quality index. The District Magistrate regularly monitors

the progress of the implementation of action plan. A web portal (www.upecp.in) is also functional wherein regular progress and action taken report by 20 departments is updated.

Directions have been issued by Chief Secretary, State of Uttar Pradesh vide letter dated 25.01.2018 for strict enforcement of Action Points as elaborated in the Comprehensive Action Plan for Reducing Air Pollution.

Direction Under Section-31A of Air (Prevention and Control of Pollution) Act, 1981 have been issued to RTO, Vice Chairman Agra Development Authority, Superintendent of Police and Municipal Commissioner of Agra for prevention and control of air pollution in Agra City by U.P. Pollution Control Board.

Industrial Sources

- The major air polluting industries (127 units) in Agra include Cupola, Induction furnace, Rubber, Chemical and Engineering industries, which are currently using CNG supplied by GAIL and are reported to comply with the standards laid down by MoEF. Appropriate air pollution control systems (APCS) have been installed in all these air polluting units.
- There are about 180 glass-based industries manufacturing mainly glass bangles, glass beads, glass rods, glass tubes/shell, glass wares and glass blocks. DG sets are installed in almost all the glass industries in Firozabad District, which are mostly based on natural gas.
- Mathura Refinery is the largest source of air pollution in Mathura. Besides, there are other small & medium scale industries in the region.
- Due to proximity to the Keoladeo National Park, industries could not be developed in the Bharatpur region. Presently, Perfect Sanitary Pipe and other small and medium scale industries manufacturing/producing agricultural equipment, tin container, animal fodder etc. are operating in Bharatpur.
- Apart from the organized sectors of air pollution, there are a large number of small scale/ cottage/household activities which contribute towards air pollution. As in Agra, besides Foundries, there are nearly 120 Petha (sweet item) manufacturing units, and also more than 2000 halwaiis, 500 kumhars and bharbhujas, which use coal, cow dung, wood and agro-wastes. Average wood consumption in each Petha unit is found to be 5 kg/day, whereas coal used is about 4 kg/hr. Thus, the total daily consumption of all the Petha units is estimated to be about 500 kgs of wood and 4.7 tons of coal.
- Mathura refinery has installed all required air pollution control system along with adequate stack height as per the norms under the Environment (Protection) Rules. The stack emissions monitored earlier have been found to be meeting the prescribed norms.
- As confirmed in the minutes of 42nd meeting of TTZ Authority dated 06.06.2018, no petha unit is operational on coal as fuel. Further, it is also recorded that random inspections are carried out and any coal based such units if found, is closed immediately.

- Besides above, almost 95% Halwaiis are using commercial LPG as fuel to control the air pollution.
- District Administration has formed inspection teams comprising of officers from Nagar Nigam Administration, Police and Pollution Control Board. Regular drives are carried by the inspection team which take action onsite against such defaulter units.

Vehicular Sources

- Other than industries, vehicular population is the major contributor to air pollution in Agra. As per the records of RTO, Agra, total number of vehicles in Agra district have increased from about 4.0 lakhs to 6.4 lakhs in a span of 8 years (from 2003-04 to 2010- 11) with an overall annual average growth rate of about 7.6%.
- Besides the movement of registered vehicles in the Agra and TTZ area, a large number of all categories of vehicles come from nearby states/cities like Delhi, Rajasthan (Jaipur, Alwar, Dholpur etc.), Madhya Pradesh (Gwalior), UP (Mathura, Firozabad, Aligarh etc.). Movement of all these vehicles for tourist as well as commercial activities also result in significant air pollution through vehicle exhausts.
- According to the study carried out by CRRI (2002), the total number of vehicles entering and leaving the Agra city was 72300 (81%), whereas 19% vehicles (16950) passed through the city. The total pollution load generated from the vehicles in 2002 was estimated to be 17.93 tons/day of CO, 10.28 tons/day of HC, 3.61 tons/day of NOx and 0.91 tons/day of PM. This was observed to be much less as compared to the other mega-cities like Delhi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad and Kanpur.
- Traffic Volume Count figures indicates high movement of vehicles at Kotwan (Mathura), as compared to Fatehpur Sikri and Saiyan. Secondly, movement of trucks is also high, particularly at Saiyan and Kotwan.
- The conditions of the roads in the TTZ, in general, are either not adequate or not in proper condition, thus movement of traffic on such roads leads to significant dust pollution.
- Comprehensive Action Plan for Air Pollution Control as per the guidelines of Central Pollution Control Board has been made and enforced in Agra for strict control of air pollution. In the said action plan detailed department wise action points are laid down based upon the prevailing air quality index. The District Magistrate regularly monitors the progress of the implementation of action plan. A web portal (www.upecp.in) is also functional wherein regular progress and action taken report is updated.
- For the control of vehicular emission, BS-4 emission norms are implemented in Agra and only BS-4 complying vehicles are registered.
- Also, Cleaner Fuel CNG is being supplied in Agra for vehicular, commercial and industrial use. Presently 90,000 kg/day CNG is dispensed for vehicular purposes in Agra.

- By Ministry of Road Transport and Highways order No. S.O.2812(E), dated 30.08.2016 E-rickshaw has become conditionally free the boundation of permit as per Motor Vehicle Act 1988, Section-66, sub-Section (1).
- CNG A/R above 8 years is being scraped in office premised to ensure pollution control & three Registration No. being cancelled.
- Playing of EURO-II loader vehicles (Diesel) from registration date 01.04.2005 to 31.03.2006 & 01.04.2006 to 31.03.2007 & 01.04.2007 to 31.03.2010 prohibited to ply in Agra Municipal Area w.e.f. 01.11.2016.
- Private vehicle above 15 years old are not Re-registering w.e.f. 01.01.2016.
- As confirmed in the minutes of 42nd meeting of TTZ Authority dated 06.06.2018, 44 Jugad Vehicles have been closed by Transport Department. All the OLA Taxies have been converted on CNG.

DG Sets

- Use of DG Sets, in whole TTZ area, especially in Agra is considered as a major source of air pollution. Irregular supply of electricity in the region forces the consumers to use DG sets for commercial as well as domestic purposes.
- As per the Environmental Management Plan of CPCB (2002) of Agra, it was estimated that about 32000 DG sets are operated in the city.
- DG sets are installed in almost all the glass based industries in district Firozabad.
- DG sets are also deployed as alternative electricity source in many Health Care Facilities (HCFs), which include all types of hospitals, nursing homes, clinics, pathological labs etc. DG Sets are also installed in some commercial places such as banks and hotels. All these DG sets deployed in HCF and commercial sectors are used as standby, to be used in case of power break down/ power failure. All these DG Sets are operated on diesel, commercially available in the open market.
- In Mathura, it is estimated that nearly 1000 DG Sets are installed/are being installed in Industries and commercial/residential premises like schools, hospitals, complexes and hotels etc. Further, details relating to the capacity of DG Sets and exact number are not available at present.
- The concentration levels of PM are much higher at all the sampling locations throughout the TTZ area. High levels of PM may be attributed to various other unaccounted sources of air pollution than the identified sources like industries, vehicles and road dust re-suspension. Therefore, efforts are required mainly to control the pollution due to particulate matter throughout the TTZ area.
- The DG Sets are an essential component of industrial/commercial setups. DG sets are used as a source of standby power supply.
- Uninterrupted power supply is being monitored by TTZ Authority in compliance of orders passed by Hon'ble Supreme Court.
- The Environment (Protection) Rules lays down the norms for emission limits of gen sets run on natural gas/ liquid petroleum gas/ diesel/ petrol.
- In Agra, Mathura and Firozabad the DG Sets installed in industries are gas based, meeting the norms, prescribed E(P) Rules.

- The DG Sets in above districts installed in commercial and other places use diesel as fuel, but are as per the norms, prescribed in E(P) Rules.
- Regular drives are carried to take onsite action against DG Sets which are not as per the provision of E(P) Rules.

Though several measures have been taken in the past to control air pollution in the TTZ area, however with the growth in residential as well as floating population in the region shall continue to result in enhanced activities, thus putting pressure on the environment of the TTZ area.

2.8 WATER POLLUTION

2.8.1 Water Quality of Yamuna in TTZ

In the first phase during the Ninth Five Year Plan, 10 projects were approved and are being implemented. Four of these pertain to water and sewerage sector. These are:

- Water supply (Agra)
- Water Supply (Mathura-Vrindavan)
- Gokul Barrage
- Storm Water Drainage System (Agra)
- Improvement in Electric Supply at Agra
- Improvement in Electric Supply in and around the rural areas of Agra and Fatehpur Sikri
- Solid Waste Management
- Construction of one part of Agra bye-pass
- Widening of Agra Bye-pass
- Improvement of Master Plan of Roads of Agra City
- The quality of water in the River Yamuna deteriorates in the upstream, before the river enters the State of U.P., which is reflected from the report of the Central Pollution Control Board, New Delhi with regard to “Water Quality of River Yamuna 2017”. The aforementioned report shows that the levels of Dissolved Oxygen in the River Yamuna devoid of Dissolved Oxygen by various points where samples had been taken in the State of Delhi, just before the river enters the State of U.P. For ready reference, a true photocopy of the report sent by the Central Pollution Control Board, New Delhi on the subject “Data of River Yamuna” and giving particulars of “Water Quality of River Yamuna 2017”.
- As evident from the data of Water Quality of River Yamuna, the Dissolved Oxygen levels, which clearly indicate that at the point of entry of the River Yamuna from upstream States into the State of U.P., at Shahpur, the levels of Dissolved Oxygen are the lowest, and further downstream at Vrindavan (Kesi Ghat and Gokul Barrage), the Dissolved Oxygen show an increasing trend. The River Yamuna enters the State of U.P., namely Shahpur Kosi Kala and the sampling point was also very close to the “Gucchi Drain” and upon said sample being tested, the level of the Dissolved Oxygen. The report of the U.P. Pollution Control Board, Lucknow, referring to a report of the Central Pollution Control Board, New Delhi, states that

the Dissolved Oxygen levels range between 0.5-1.4 at Okhla after meeting Shahdara Drain in the State of Delhi as per the reports of the year 2017, which clearly indicates the carryover of pollution load into Mathura from the upstream States.

- The water quality of River Yamuna improves after entering the State of Uttar Pradesh. The regular monitoring carried out by UPPCB shows that the water quality improves mainly because of addition of 150 cusec Ganga water from Palada through Harnaul Scape Canal in the upstream of Gokul barrage and Sikandra Water Works, Agra. The water quality of River Yamuna further improves in the down streams particularly after confluence of River Chambal.
- For improving the water quality of river Yamuna and formulating an action plan to this effect it should be appreciated that the water quality of river Yamuna in the state of Uttar Pradesh depends upon the quality and flow of water received from upstream. Therefore, it seems appropriate to adopt a holistic and integrated approach for abatement of pollution and restoration of water quality of River Yamuna by the concern States. Regarding study of E-flow of Yamuna and its maintenance, intervention of Ministry of Water Resources, Government of India is required.
- In Agra, all the water polluting units have adequate effluent treatment plant.
- In Mathura, the Indian Oil Corporation Refinery has installed adequate effluent treatment plant and sewage treatment plant and the most of treated effluent is used for irrigation purpose.
- In Agra, 09 STPs of cumulative capacity of 220 MLD are setup. Out of these 08 STPs of total capacity 184 MLD are operational and 01 STP of 36 MLD capacity is installed but not yet commissioned.
- In Mathura there are 06 STPs of 59 MLD cumulative capacity are setup. Out of these 04 STPs are oxidation pond and 02 are UASB (Up flow Anaerobic Sludge Blanket). The average capacity utilization of STP infrastructure is approximately 50%. The major issue is under utilization of STP capacity because all the drains are not diverted to the STPs.
- In Firozabad 01 STP of 67 MLD capacity is under construction.
- The major issue related to sewage pollution is improper tapping of sewage drains which results in discharge of untreated sewage.

2.8.2 2010 (Observation)

- The storm water drains were half a century old.
- The existing structural conditions of the drains are not good. These drains are not functioning properly due to silting and accumulation of solid waste, which are not cleaned regularly by the authorities.
- There is no arrangement at outfall location drains/nallas for holding the solid waste, which finds its way finally into the river Yamuna. Also the outfalls of the drains are not provided with control structure to avoid back flow from the river.
- In the absence of comprehensive sewerage management system, the storm water drains carry raw sewage laden with solid wastes.

- The flow in the river downstream has been impacted as a result of the impoundment, and the characteristics of the river Yamuna has changed due to reduced flow conditions downstream.
- However, based on the UPJN report on ground water availability at site, the data indicates that depth of groundwater availability is increasing since the project completion. This may be due to increased abstraction of ground water in the area.
- The existing drainage system, as per the data available with UPJN, indicated that the drainage system in the city has been classified into 11 major catchments/zones and a number of kacha open drains. Around 21 major open drains spread across the entire Agra city, collect and convey the storm water finally into river Yamuna. However, no data is available on the details of the catchment area served by the drains. The table below presents the 21 major drains in the city and the coverage areas (names) of the respective drains with discharge points. Mantola and Bhairon drains are the largest drains. In addition, there are several medium and small drains which discharge into the major drains.

2.8.3 2013 (Observation)

- The sources available for supply of water to Agra city are surface water (Yamuna River, Gokul Barrage, Kitham Lake) and groundwater.
- The groundwater quality is fit for drinking purpose as indicated by the water quality reports from UPJN.
- Moreover, the groundwater table is receding at high rate. The dependability on groundwater for water supply is thus jeopardized and alternate sources have to be found.
- There is extreme shortage of raw water in the river Yamuna during summers, the lowest discharge has been observed as 101.7 mld. Out of this discharge the average summer drawl of raw water is of the order of 99 mld.
- Due to high pollution level in Yamuna water the demand of drinking water of Agra, which is presently 142 cusecs and projected to be 276 cusecs in the year 2036 could not be met from this source. Foreseeing the shortfall in River Yamuna, the Central Govt. has earmarked 140 cusecs raw water for Agra and 10 cusecs from Tehri reservoir. This 150-cusec raw water will be conveyed up to Palra fall of Upper Ganga canal through its system and then it has to be brought to Agra.
- A rubber Barrage has been proposed downstream of Taj Mahal by Irrigation Department, GoUP. Appropriate Feasibility Study to be carried out.

2.9 HEALTH

Water brone and air brone diseases in the area show increasing trends due to insanitary conditions and high levels of particulate matter in the air.

- All the operational electroplating units have installed effluent treatment plants.
- 30 Dhol and vibratos units (silver polishing and washing units) operational in residential area have been closed and being directed to shift to industrial area with proper pollution control system.

- In Agra, 09 STPs of cumulative capacity of 220 MLD are setup. Out of these 08 STPs of total capacity 184 MLD are operational and 01 STP of 36 MLD capacity is installed but not yet commissioned.
- In Mathura there are 06 STPs of 59 MLD cumulative capacity are setup. Out of these 04 STPs are oxidation pond and 02 are UASB (Up flow Anaerobic Sludge Blanket). The average capacity utilization of STP infrastructure is approximately 50%. The major issue is under utilization of STP capacity because all the drains are not diverted to the STPs.
- In Firozabad 01 STP of 67 MLD capacity is under construction.
- The major issue related to sewage pollution is improper tapping of sewage drains which results in discharge of untreated sewage.
- The STP under construction in Firozabad is based on the aerobic technology and one STP of Agra of 36 MLD capacity to be commissioned is also based upon latest Sequential Batch Reactor (SBR) technology.
- All the 08 operational STPs in Agra are achieving the standards. In Mathura & Vrindavan out of existing 06 STPs, 02 STPs (01 in Vrindavan and 01 in Govardhan) are achieving the prescribed norms. The remaining 04 STPs (02 in Mathura, 01 in Vrindavan and 01 in Govardhan) are based on oxidation pond technology and they need to be upgraded.

2.9.1 Industrial Effluent Discharges

Based on the information collected regarding the pollution from industrial effluents in the TTZ, it is understood that majority of the industries are dry in nature or discharge less effluents. Also, the effluent management systems have to be commissioned for dairy, peta and tanneries. Since these units have higher organic concentration, efforts should be directed for energy recovery through methane generation and subsequent utilization for power generation. Plans are afoot to change effluent management in electroplating industries in Agra from conventional treatment to ion-exchange based technologies. Advanced treatment for water recovery through membrane filtration systems may be adopted to reduce freshwater consumption and reuse treated water in electroplating units. The major industry in the TTZ is Indian Oil Corporation's Mathura Refinery. The effluents are treated in ETP and part of the treated wastewater is recycled into the industry for power generation. The refinery may reduce wastewater generation through reuse of treated domestic sewage from Mathura & Vrindavan thus reducing freshwater consumption from Yamuna River.

2.9.2 Wastewater Management in TTZ Area

Comprehensive wastewater management plan formulation is necessary for environmental improvement in the TTZ and it should include initiating activities on storm water management, domestic and industrial wastewater management through construction of drainage/sewer network systems, sewage and effluent treatment plants. The following section provides the status on sewerage, storm water and industrial effluent discharges in the TTZ area.

2.9.3 Status of Sewerage and Sewage Management in the TTZ

The existing status of wastewater management in the TTZ comprising Agra, Mathura, Vrindavan and Firozabad is discussed in this section. The percentage of population covered by sewerage system in the TTZ is very low and varies from nil to 25%. Large number of activities have to be undertaken to improve the overall situation in the TTZ with respect to the water environment. Several areas in the TTZ are not covered by the sewerage network for collection of domestic, commercial and industrial effluents. The latest census data (2011) was not available in the public domain for assessment. Hence Information based on the available data was used. The status of TTZ wrt wastewater would improve significantly if it meets the current or 2010 waste water generation of 260, 50, 8, 67 MLD in TTZ. The information on all aspects of wastewaters have increased in the last few years due to improved reporting and recent information which was available in public domain. Many low lying areas are severely affected during monsoon due to overflow of sewage on the roads and open plots adjoining the building blocks due to the presence of solid waste choking the sewer lines. In the absence of sewerage system, majority of the houses have septic tanks and those that do not have, discharge into nearest drains posing a threat to the public health and causing bad odor. The untreated effluents reach Yamuna River through the various storm water drains. The Yamuna River also receives industrial and domestic discharges from Faridabad, Paliwal, Kosi, Vrindavan and Mathura before reaching Agra. The flow in the river is mainly sewage except during monsoon. All the above towns discharge domestic wastewaters into Yamuna River of varying quantities. Yamuna, in its course of 10 km in Agra, receives wastewater of 105 MLD at 28 points where 57.5 MLD is from domestic sources, 5.3 MLD from industrial areas and 42.4 MLD from mixed sources (CPCB-2002). The total pollutant load in terms of BOD and SS discharged through these drains is 32 t/d and 40 t/d respectively as per the CPCB report10. The major drains in Agra discharging into Yamuna is Mantola (BOD - 27 t/d) Bhairon (BOD - 1.4 t/d) and Etamudulla (BOD- 1t/d), respectively. The STPs design and operated in the TTZ are based on anaerobic and natural oxidation treatment route. The treated effluent quality from all the STP at Agra, Vrindavan and Mathura does not meet the inland surface water discharge standards, Additional treatment sequence is required to reduce the organic pollutants before discharging into river. The treated effluents from the STPs are partially used for farm irrigation near the river bed in Agra. The quantum of E-Coli discharged through treated effluent from STPs into the Yamuna River ranged between 2 x 103 to 6.54 x 106 MPN /100 ml. The treated effluent quality status of STPs in TTZ. About 300 out of 800 hectares is used for irrigation10. The details of greenbelt development in Mathura, Vrindavan, Firozabad, Fathepur Sikri and Bharatpur using treated effluent are not available for comment.

Status of Sewerage Network in the TTZ

Area	Pop. in lakh (2001)	Wastewater Generation+ 2010, MLD	Sewer Coverage, %	Sewer Districts	No. of STP Quantity, MLD					
					Total	O (Operational)	NOP (Non operational)	UC (Under construction)	NRCP (Sanctioned under NRCP for GAP and YAPs)	TF (Treatment route.)
Agra	12.42	260*	17	8	5(144) 3 under YAP I 2 under YAP II	3 (90.25)	–	1(40)	1(14)	UASB, OP
Mathura	2.99	50		25	7	2(28) 2 under YAP I	2(28)			WSP
Vrindavan	1	8	na	na	2(9.5) 2 under NRCP	2(4.5)	1 (0.5)	–	2(4.5)	OP
Firozabad	3.97	67 (2001)	na	na	nil	nil				nil
Fathepur Sikri	0.288	3.2	na	na	nil	nil				nil
Bharatpur	2.05	23	na	na	nil	nil				nil

Source: UPPCB; CPCB Report 2013

*(Assumed @140 litres per capita day as water consumption and 80% as waste water generation. + Wastewater generation in 2010. *Estimated value is 240 MLD calculated at above assumption. However recent data indicates 260 MLD based on CPCB report, 2013, UASB- Upflow Anaerobic Sludge Blanket; OP – Oxidation Pond; WSP – Waste Stabilization Pond.)*

2.9.4 Proposed Projects on Sewerage System

Agra

A project is proposed for replacement of existing outdated inner city sewer network and construction of new sewer, pumping stations and construction of new STP's (1, 2, 3). The extent of area of coverage of the project is 1400 hectares costing Rs. 1240.82 crores.

Mathura and Vrindavan

A project was submitted by UPJN under the JNNURM Programme for the construction of sewerage system and an STP of 16 MLD capacity for sewage treatment in Mathura costing Rs. 6035.77 lakhs (4). Another project was submitted by UPJN under the same programme for construction of sewerage system and an STP of capacity 8 MLD at Vrindavan costing Rs.9181.16 lakhs.

Firozabad

NPP, Firozabad proposes to lay sewer system with STP under the JNNURM programme at a cost of Rs. 8692.00 lakhs.

Bharatpur

Proposals for laying of sewer lines and construction of STP in Gopal Nagla Village were submitted and District Office has issued "No Objection Certificate" for the STP construction last year. There are no protected areas, wetlands, mangroves or estuaries at the project sites.

Fatehpur Sikri

There are no proposals for laying the sewerage system in Fatehpur Sikri.

(Status of Sewerage Projects in the TTZ is mentioned in Annexure.)

2.9.5 Storm water Management in the TTZ

The storm water network designed in the TTZ is inadequate and most of the drains are natural drains which usually collect domestic and industrial effluents and run off during precipitation. However, during the last 2 decades, increase in population had resulted in increased discharge into these drains. The number of natural drains in the respective urban agglomeration.

Status of Sewage Management Systems and Treated Effluent Quality in TTZ

Area	STPs Name	Capacity, MLD	Treatment Type	Existing flow, MLD	pH	BOD(mg/L)	COD(mg/L)
Agra	Burhi Ka Nagla	2.25	OP	2.25	6.4-7.4	37-149	214-514
	Peela Khar	10	OP	8	7.1-7.7	42-98	210-411
	Dhandupura	78	UASB,FP	50	7.3-7.7	38-120	173-424
240 (Total) – 90.25 (Treated) = 150.75 MLD(Untreated)							
Mathura	Masani	13.59	OP	13.5	5.3-8.4	64-145	400-720
	Bangal Ghat	14.5	WSP	13.5	6.3-8.8	58-175	384-768
50 (Total) – 28.09 (Treated) = 21. 98 MLD(Untreated)							
Vrindavan	Kali Deh	0.5	OP	NOP	6.3-7.2	60-180	432-752
	Pagal Baba Mandir	4	OP	8	6.3-7.2	52-175	352-752
8 (Total) – 4.5 (Treated) = 3.5 MLD (Untreated)							

Source: UPPCB; CPCB Report 2013

Effluent Management System

ANP –Anaerobic ponds; FP – Facultative ponds; UASB – Up-flow Anaerobic Sludge Blanket; PP - Polishing ponds;

NOP- Non Operational

All the storm water drains in the TTZ finally discharge into Yamuna River. Large parts of the urban agglomeration comprising residential and commercial areas are bereft of sewer network, particularly in Agra, Mathura and Vrindavan leading to discharge into the storm water drains. Discharge of solid waste into the storm water drains results in choking of the storm water drains leading to water logging, stench and groundwater pollution. The situation also aggravates growth of aquatic weeds and disease causing vectors (mosquito). The storm water drainage system in TTZ area is in a very bad condition. The system comprises of natural and man-made drains that the ultimately discharge surface run off and waste water generated in the TTZ. The quality of water flowing in the drains located in Mathura. The water quality status of Agra, Vrindavan, Firozabad, Fathepur sikri and Bharatpur are not available.

Status of Storm Water Network in the TTZ

Area	No. of Natural Drains	Storm Water Coverage in the UA, hectares
Agra	20	17730.68
Mathura	19	2707.12

Vrindavan	**18**	**na**
Firozabad	**2**	**na**

Source: SWDP, Agra City, UPJN, 2011; CDP of Mathura-Vrindavan, JNNURM-NPP, 2006

The major Sectoral (Water Supply, Sewerage and Drainage) issues evolved from the city assessment, as reported in the CDP, are as follows:

- The area covered by piped water network is only 85 per cent.
- Poor raw water quality.
- Catchment area of the Zonal Pumping stations is not clearly segregated.
- Depletion in ground water table.
- Only 17 per cent of the total area of the city is covered by the sewerage system.
- The sewer lines have been laid in the year 1976 in certain parts of old city area and out of it about 50 per cent of the sewerage system is not in working condition.
- Mostly the sewage goes into the open drains. The system is badly silted, choked and damaged at number of places and overloaded due to the growth of population the city.
- The STPs are made to perform beyond capacity, but still treat only 10% of the sewage they receive. Meanwhile, the Dhandupura STP (78 mld) remains underutilized.
- Improper means of disposal of wastewater has also resulted in environmental pollution and creates unhygienic conditions.
- Treatment capacities being inadequate, results in discharge of untreated sewage into water bodies, particularly river Yamuna and other nallahs.
- The STPs at Dhandupura treats city sewer and discharge of 17 nallahs whereas STPs at Pila Khar and Magla Budi treats only discharge coming from nallah water.
- The drainage systems of Agra were laid about 55 years back and are in bad condition. The city is facing big problem of Storm Water Drainage due to its malfunctioning.
- Buildings have come up just over the drains resulting in water-logging / flooding of nearby areas.
- Lack of Integrated Drainage Plan
- Malfunctioning of drainage system

As per the status of the sewage management system, we can see that an overall 176.2 MLD of waste water is untreated which ultimately gets drained into Yamuna River. The functional capacity of the STPs should be maximized or new STPs should be identified. Techniques such as constructed wetlands can be brought up since a large portion of area within TTZ falls under agricultural land and such initiatives can help in water demand for irrigation purposes and also for ground water recharge.

Water Quality Status of Drains in Mathura in TTZ

Drains in Mathura	Pollutant Drains in Mathura Parameters, mg/l					
	pH	DO	BOD	COD	TDS	CL
Goochi Drain	**6.3-8.1**	**4.6-6.8**	**13-36**	**40-288**		
Goverdhan Drain	**6.3-7.3**	**_**	**24-40**	**96-492**		

Mansi Ganga Goverdhan	6.2-9.1	1.7-7.8	16-6	12.0-80		148-240
Refinary Drains	6.1-7.5	7.4	18-42	72-288	1840	

Source: UPPCB

Important Observations:

- B.O.D values are exceeding the desired quality from 2003-2017 as they show an increasing trend.
- B.O.D value varies between 4.8 to 36 mg/l from 2003 to 2017. B.O.D level exceeded the desirable criteria from Mathura U/S to Agra D/S.
- B.O.D level remains constant from the stretch Mathura up to Agra U/S. However, downstream of Agra the water quality is degraded to a very high extent due to the discharge of untreated waste water inflow from Agra City and non-availability of considerable dilution effect.
- The longitudinal profile of B.O.D reflects that the water quality of river is in deteriorated condition between Mathura to Agra.
- The stretch of river from Delhi is excessively polluted with the discharges of waste water from domestic and industrial sources through 14 major drains from urban areas of Delhi. Another reason of pollution in the river is the over-exploitation of fresh water from the river which is essentially required to maintain self-purification capacity of the river.

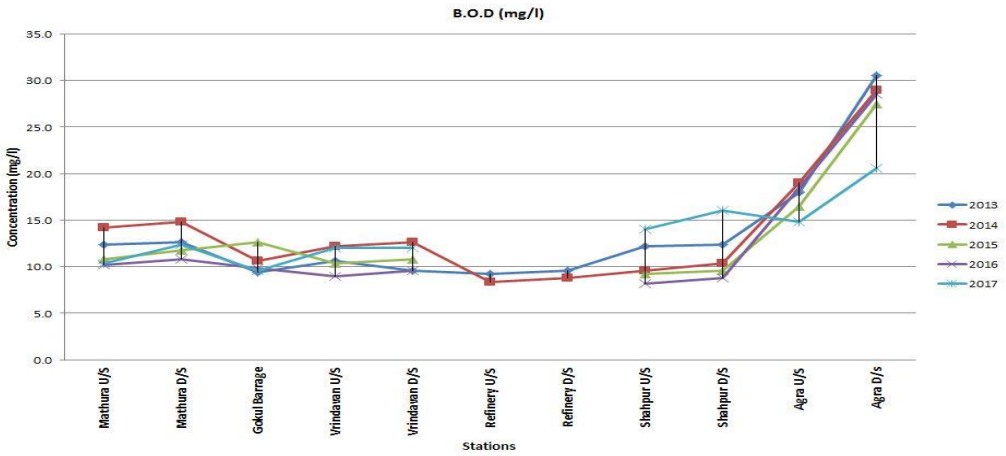


Figure 1: Longitudinal profile of B.O.D concentration from 2012-2017

Non-conforming data regarding Air Quality among the administration can lead to mis-leading outcomes.

2.10 WASTE

2.10.1 Solid Waste Management in TTZ Area

Type of Waste:

Solid waste generated in TTZ zone can be broadly classified into three categories:

- Municipal solid waste
- Industrial solid waste
- Biomedical waste

- Miscellaneous wastes like food processing waste and construction and demolition waste

2.10.2 Existing Status of Municipal Solid Waste Management in TTZ Area:

previous dump site in Shahdara, Agra is being capped. The plantation and greening activity of this site is proposed with the help of CSR funds.

Agra

Agra has an area of 141 sq.m. which falls under the jurisdiction of Agra Nagar Nigam. At present, as reported about 708 tpd of MSW is generated in Agra. Agra Nagar Nigam (ANN) is the nodal agency which looks after overall MSW management.

Main Observation in Agra:

- For solid waste management purpose, the city is divided into 19 sanitary wards.
- Each ward is headed by a sanitary inspector
- The waste is temporarily dumped at a specified area. The previous dumpsite at Shahdara is no longer in use.
- A sanitary landfill site along with composting facility has been developed at Kuberpur. The site is located at approximately 16 km from Nagar Nigam

Quantity and Characteristics of MSW in Agra

Waste Characteristics	Quantity Generated (tpd)	Percent of Total Waste
Recyclables	150	21
Organic matter including Petha waste	311	44
Construction debris	114	16
Mixed waste drain slit and street sweepings	133	19
Total	708	100

Source: Adapted from DPR (Revised) prepared by Regional Centre for Urban

Development, Government of India, University of Lucknow, Lucknow

MSW Management at Mathura:

Urban population of Mathura (as per 2011 census) is 349336. Assuming a per capita waste generation of 0.4 kg/day (average value estimated for Indian cities), the estimated quantity of MSW is 140 tpd. At present, at Mathura disposal of MSW is practised in Laxminagar area of Nimgaon in a non-scientific manner. The practice is not in compliance with the guidelines of MSW Rules. As reported, Mathura Nagar Waste Processing Co. (P) Ltd. has been entrusted with the task of establishing and operating treatment and disposal facility for MSW. Total area of land proposed is 27 acres. The capacity of proposed facility is 177 tons of MSW per day.

MSW Management at Firozabad

At Firozabad, as reported, about 130 tons of municipal solid waste is generated per day. MSW is dumped at specified low-lying areas. The disposal of waste is practiced in non-scientific manner. The practice is not in compliance with the guidelines of MSW Rules. The construction of sanitary landfill and compost facility has been

proposed under JNNURM and UIDSSMT programme in Kutubpur-Chanera area to be developed by U.P. Jal Nigam

MSW Management at Bharatpur

The population of Bharatpur as per 2011 census is 252109. Assuming a per capita MSW generation of 0.4 kg/day (average value estimated for Indian cities), the waste quantity estimated is 100 tpd. Disposal of MSW is practised in non-scientific manner. The practice is not in compliance with the guidelines of MSW Rules. It has been proposed to construct a sanitary landfill and compost facility in a plot of land of area 11.92 ha on the West of Nohagaon near Achnera road.

Min Observation:

- Most of the Municipal Solid Waste manage in a non-Scientific manner
- The practice is not in compliance with the guidelines of MSW Rules
- No one has any kind of Sanitary Landfill
- There is a lack of awareness among public

Industrial Waste Management Plan for TTZ

Industries in Agra are located in scattered areas. In some locations, clusters of industries are available. The industries are generating a considerable amount of solid waste. Uncontrolled disposal of waste poses problems like drain blockage, flies and mosquitoes breeding, bad vision and odour problem. Following measures are proposed for controlling the present situation.

- There should be a common site exclusively for Petha industries. All the dairies should also be located at one or two sites, exclusively selected for dairies. Tanneries, electroplating and shoe making industries should be accommodated at another common site
- Possibility of recycling of other industrial wastes, leather, shoe making and electroplating industries can be explored in consultation with regulatory bodies. This will reduce the load on disposal facility for the industrial wastes.
- Possibility of composting Petha and dairy waste can be explored. The product can be utilized by applying in local gardens or used for agriculture purpose.
- Hazardous waste management rules should be strictly followed during storage, transportation, treatment and disposal of hazardous waste generated from the industries. The authorized TSDF nearby should be availed by all the industries.
- All the glass industries of Firozabad should be located at one common site exclusively identified for glass industries. The waste generated from glass industries at Firozabad should be collected properly

- For the shifting of Petha industry, an area has already been identified in Kalindi Vihar Yojna. As regard shifting of tanneries, electroplating units etc., there is no such need keeping in view the facts that at present there is only 01 tannery unit in Mathura which is operational at proper site. The electroplating units in Agra are proposed to be shifted to newly developed Lakhanpur industrial area.
- Regarding the recycling of industrial waste, the hazardous waste from industrial is sent to TSDF (Treatment Storage Disposal Facility) at Kanpur Dehat as per the provisions of Hazardous Waste Rule, 2016.
- Regarding composting of waste from Petha industries, it is proposed to dispose the waste to composting process after complete shifting of petha industries to Kalindi Vihar Yojna.
- In Agra, Mathura and Firozabad there are 159 number of units identified as hazardous waste generating units under the provisions of Hazardous Waste Rule, 2016. The hazardous waste from these units is disposed of authorized TSDF facility at Kanpur Dehat.
- In Firozabad, all the glass industries are located in industrial land use. Therefore, cause of relocating these industries does not arise because shifting of industries to a different location in the same district would not bring any change. Moreover, relocation of the industries has to be voluntary as per the Relocation Policy. The relocation of industrial cluster is a long drawn process and has not proved successful in India on the basis of past experiences.

Biomedical Waste Management Plan for TTZ:

Biomedical waste management is an area which needs special attention in Agra and other towns under TTZ. The following measures are proposed for improvement of the situation.

Biomedical Waste Management for Agra

- Many hospitals, nursing homes have not developed proper biomedical management facilities. The tasks of collection, segregation and storing of waste, which are the duties and responsibilities of the hospitals, are not executed properly. It is necessary to develop appropriate facilities in all the hospitals and operate properly as per the guidelines of Biomedical Waste Management Rules.
- The common treatment and disposal facility is not availed by some hospitals. Biomedical waste is often thrown in community bins meant for MSW and in nearby area

- Incinerators, autoclaves, hydroclaves and other machineries/equipments of the common treatment and disposal facility should be operated following the guidelines of BMW rules.
- It is necessary to operate effluent treatment plant efficiently. ETP sludge generated should be finally disposed of at authorized common TSDF.
- Flue gas analysis and wastewater analysis should be carried out regularly.
- In Agra, total Bio-medical Waste generation is assessed at approximately 2142 kg/day. There is 01 Common Bio-medical Waste Treatment Facility operated by M/s. JRR Waste Management Pvt. Ltd. at Atmadpur, Agra. The facility is equipped with Incinerator, Hydro-clave and shredder. The common facility has proper effluent treatment plant and air pollution control systems. At present 916 Health Care Facilities (HCFs) are the members providing their waste for disposal. The CBWTF at Agra has been found to be compliant in the joint inspection of UPPCB and CPCB on 13.07.2018.
- HIn Mathura, total Bio-medical Waste generation is assessed at approximately 954 kg/day. There is 01 Common Bio-medical Waste Treatment Facility (CBWTF) operated by M/s. Common Bio-medical Waste Agency, Neemgaon, Maath, district Mathura. The facility is equipped with Incinerator, Hydro-clave and shredder. The common facility has proper effluent treatment plant and air pollution control systems. At present 475 HCFs are the members providing their waste for treatment and disposal.
- In Firozabad, total Bio-medical Waste generation is assessed at approximately 422 kg/day as per latest inventory. Bio-medical waste generated in Firozabad is being treated and disposed by CBWTF situated in Agra.

At Bharatpur, Mathura and Firozabad, quality of biomedical waste management services is yet to be improved. The common treatment facility of Agra is not availed by some hospitals. The management status of the some individual hospitals is also far from satisfactory. It is required to develop proper management systems in all the hospitals. Moreover, all hospitals should avail the common biomedical waste management facility. More authorized treatment and disposal facilities can be established to cater to the needs of all hospitals, if required.

2.11 DISASTER

Disasters faced by this region have been mainly floods and drought which have not been severe. However as per predictions related with the climate change induced disasters the intensity of these are to rise. Coupled with this the rising levels of pollution in water bodies, ground water and heat spells spread of diseases could take a disastrous scale.

Agra

The district faces a number of hazards, like Earthquake, Hailstorm, Flood, Fire, Accidents, LPG cylinder blast, Chemical and Industrial Accidents, Terrorism and Epidemics, which pose the threat of disaster.)

Earthquake

Earthquakes have occurred in mostly all parts of Uttar Pradesh. Most of the state of Uttar Pradesh lies in the Gangetic Plain. This is a fore-deep, a downwarp of the Himalayan foreland, of variable depth, converted into flat plains by longvigorous sedimentation. This is known as a geosyncline and the Gangetic Plain is the Indo-Gangetic Geosyncline. This has shown considerable amounts of flexure and dislocation at the northern end and is bounded on the north by the Himalayan Frontal Thrust. The floor of the Gangetic trough (if see without all the sediments) is not an even plain, but shows corrugated inequalities and buried ridges (shelf faults).

Agra

Agra falls in high risk seismic zone III and corresponds to MSK intensity VII, making it prone to Earthquakes. The existence of the Great Boundary Fault near Jalesar, dense urban population and weak structures in old Agra city make it highly vulnerable to seismic hazards. Although no major earthquake has occurred in Agra in recent years, yet tremors have been felt whenever there is an earthquake in the NCR. The NCR has fairly seismicity with general occurrence of earthquakes of 5-6 magnitude, a few of magnitude 6-7 and occasional incident of 7.5-8.0 magnitude shocks.

North part of Bharatpur belongs to High damage risk zone IV and southern part of the district belongs to Moderate damage risk zone III, with VII-VII (6.0 - 6.9) and VI-VII (5.0 - 5.9) Intensity.

Hailstorm

Hailstorm affects the UP state as most of its economy is based on agriculture. In the year 2015-16, 73 districts of the state faced severe crop loss due to hailstorm. All the five districts are effected by the hailstorm.

Drought

Entire Vindhya & Bundelkhand region in UP is traditionally prone to drought. The factors that are responsible are exogenous in character and dependency on agriculture and allied livelihood is so high that even a small and seasonal change in weather component

can create adverse impact on rural populace and force them to borrowing from moneylenders or banks.

In Uttar Pradesh usually from 1st June to 30 September normal monsoon rainfall occurs. Normal average rainfall of the whole state from 1st June to 30th Sep should be 829.8 M.M. but this year it is only 443.7 M.M which is only 53.5% of the expected average rainfall of this duration. In 16 districts rainfall has been recorded at less than 40% i.e. Scanty category, whereas in 33 districts it is in between 40% to 60% i.e. highly Deficient category. There are 20 Districts in the category of deficient rainfall. Only 6 districts of Uttar Pradesh have rainfall in category of excess or normal. The situation got worsen due to long dry spells.

District wise detail of rainfall in the State from 1st June to 30 September 2015

Status	District	Normal Rainfall (mm)	Total Rainfall (mm)	% to its Normal
60%-80% i.e. Deficient	Firozabad	584.3	435.1	74.5
	Mathura	518.7	371.3	71.6
40%-60% i.e. Highly Deficient	Hathras	579.5	275.3	47.5
	Etah	612.1	285.3	46.6
Below 40% i.e. Scanty	Agra	584.3	208	35.6

Source: State Disaster Plan UP 2017

Agra

Adverse topography, Insufficient and highly erratic rainfall, Rapid industrialization, urbanization and withdrawal of huge ground water are leading factors for the occurrence of Drought in Agra district. The monsoon months from July to September see about 67 cm (27 inches) of rainfall annually. Adjoining Rajasthan, the Tehsils of Kiravali and Kheragarh are the worst affected from drought. The water level in wells of these Tehsils receds down beyond 80-90 feets which results in scarsity of drinking water. Kiravali experiences warm and dry westerly winds from Rajasthan in the summers.Jagner is a hilly part of Kheragadh which experiences chronic droughts. Tehsils Bah and Fatehabad are affected by irregular terrain and ravines. Tehsil Sadar and Etmadpur are also badly affected by receding groundwater in summers.

Floods

UP

Floods are main natural disaster the State experiences every year. South west Monsoon rainfall during the months of June to September is the main cause for triggering floods when rainfall happens to be in excess than the normal.

There are 8 village in Mathura Tehsil, 15 in Matt tehsil and 5 village in Mahavan tehsil which are belongs to high flood zone effected area.

Agra

The Yamuna- The Yamuna flows perenially and drains all the tehsils except Kheragadh .There are 118 number of villages affected by floods of the Yamuna

Utangatan River- Floods are caused in the Utangatan - a) due to Torrential rains, or b) because there is heavy discharge of water or a breach of Bandhs – Ajaan, Khanua and Chiksana in Rajasthan that wreak havoc and aggravate the situation in U.P. 66 number of villages affected by floods in the Utangatan.

Kiwad River- This River affects 22 villages of Jagner area of Kheragadh.

Khari River – After originating from Terah Mori Dam in Fatehpur Sikari,this River ultimately joins the Utangatan River near borders of Kheragadh and Fatehabad. Because of a breach in Chiksana Bandh in Bharatpur, the years 1978 and 1996 witnessed heavy floods in Kiravali that inundated a number of villages. 266 number of villages affected by floods in the Khari.

Bharatpur: Major portions of Bharatpur districts falling under the basin of River Banganga, and the basins of River Ghaggar in Sriganganagar are prone to floods. The reasons for flooding in these regions include: Excess rain in the catchment, Sudden release of large quantities of water from Dams/ water reservoirs, Breach/ damage in major reservoirs/ dams and Limited holding capacity Normal annual rainfall in Bharatpur is 674 mm where in 2016 the annual rainfall was 685 which is 163% more the average rate and causes floods in different parts of the district.

2.12 EPIDEMICS

The storage, transportation and disposal of hazardous waste is to be done strictly in accordance of the provisions of the Hazardous and other Wastes (Management and Trans boundary Movement) Rules, 2016.

Agra

The following epidemic are monitored in Agra: cholera, Gastroenteritis, acute Diarrhea/dysentery, infective hepatitis, encephalitis, poliomyelitis, typhoid, In addition to these Food Poisoning, Viral Fever, Dengue Fever and Meningitis outbreaks are also monitored.

Fire

Uttar Pradesh is the most populous state and has very less per capita income. Majority of the population lives in rural areas and many of them still live in thatched houses. In summer season fire incidents are very common. Unplanned structures & haphazard wires lead to fire events in urban areas. Fire incidents are on rise due to industrialization in residential areas.

Agra

Most of the reported accidents are in the city of Agra, mainly due to the inadequate safety measures in the electrical installation and chemical and LPG blasts, as well as careless practices while handling and storage of inflammable materials.

- Storage area of flammable/explosive material in the vicinity of populated area.
- Hotels and restaurants in crowded area using improper practices of storage of cooking fuel such as LPG, Kerosene etc.
- Multi-storey buildings especially in the cities, with inadequate fire safety measures.
- Narrow lanes, congested and overcrowded buildings, and old building with poor internal wiring.

Industrial Hazards

The state has two major production centers of leather and leather products, with over 11,500 units; Agra and Kanpur are the key centers. About 200 tanneries are located in Kanpur. In the State of Uttar Pradesh there are 2,456 factories of hazardous nature, wherein hazardous substances are being handled, used and stored and there is a possibility of impairment to the health of workers employed therein as well as pollution of the general environment.

Agra

Industrial accidents are most likely during chemical processing, manufacturing, storage, transport and disposal of toxic waste. The types of industries prone to accidents are those involved in the manufacture of:

- Chemicals and chemical products
- Nonmetallic mineral petroleum
- Petha units using coal/ gas cylinders
- Leather/shoes manufacturing units

2.13 TERRORISM

Agra

Agra is also at risk from the view point of terrorism, as it is a major tourist destination and holiday spot of India.The Taj Mahal, Agra Fort and Fatehpur Sikri, all three of which are UNESCO world Heritage sites, make it prone to terrorist attacks.The presence of the Mathura refinery, its pipelines and Narora atomic plant within a 150 km circumference make Agra vulnerable to terrorist attacks.

2.14 INFRASTRUCTURE

2.14.1 Physical and Social Infrastructure

Block Wise Availability of Infrastructure

Agra District

Name of the Block	Total pop (2011 census)	Standard/ Population= 1for 5000 population (Primary School)		Standard/ Population= 1for 15000 population (Sec. Shool)		Standard/ Population= 1for 5000 population (Health Center School)		Standard/ Population= 1for 5000 population (Community Center, CC)			Standard/ Population= 1 5000 populati (Community Center)
		Reqd. no.	Avail. Prim. School	Reqd. number	Sec. Sch. (S)	Reqd. no.	Pri. health centre (PHC)	Reqd. n0.	CC with / without TV	Reqd. no.	Anganwadi Centre (Nutritional Centres)
Khandauli	176019	36	81	11	17	36	2	36	16	36	44
Etmadpur	160900	33	74	11	11	33	2	33	28	33	59
Bichpuri	107843	22	60	8	21	22	3	22	8	22	27
Akola	133509	27	74	9	14	27	3	27	19	27	40
Barauli Ahir	239659	48	115	16	34	48	5	48	22	48	58
Fatehpur Sikri	163448	33	109	11	14	33	3	33	25	33	66
Achhnera	179687	36	62	12	11	36	2	36	37	36	63
Jagner	112360	23	47	8	4	23	4	23	34	23	42
Kheragarh	157936	32	45	11	15	32	3	32	17	32	42
Saiyan	163468	33	52	11	16	33	3	33	22	33	53
Shamsabad	204121	41	64	14	10	41	2	41	37	41	61
Fatehabad	200049	41	72	14	9	41	2	41	20	41	87
Pinahat	126168	26	48	9	3	26	2	26	12	26	44
Bah	147452	30	75	10	17	30	2	30	7	30	58
Jaitpur Kalan	121983	25	75	9	9	25	3	25	7	25	72

Ranking of Blocks (Scalogram):

Block wise Availability of infrastructure are described (only Agra is mentioned here other district are described in annexure) below- where both physical and social infrastructure are included. According to the availability of the facilities, the blocks are ranked. Also the gap between the infrastructures has shown in another table which is described how far the blocks are backwards in term of availability of basic amenities.

Blocks in six districts in TTZ area are ranked below according to the availability of basic amenities.

District	Name of the CD Block	Total Population	Rank (according to the total no. facilities available out of 94)
Agra	Barauli Ahir	239659	92
	Fatehpur Sikri	163448	89
	Bichpuri	107843	88
Mathura	Chaumuha	133576	88
	Mathura	265006	88
Agra	Etmadpur	160900	85
Mathra	Govardhan	195658	84
Agra	Achhnera	179687	83
Eath	Awagarh	152899	83
Mathra	Baldeo	186138	83
	Mat	168220	83
	Farah	154411	82
Agra	Khandauli	176019	82
	Akola	133509	82
Etah	Jalesar	149545	82
Agra	Bah	147452	81
Firozabad	Kotla	154844	80
Agra	Kheragarh	157936	79
	Shamsabad	204121	79
Bharatpur	Rupbas	257952	79
Firozabad	Tundla	269690	79
Bharatpur	Deeg	181711	78
Agra	Jagner	112360	77
	Saiyan	163468	77
	Fatehabad	200049	77
Bharatpur	Kaman	285133	77
Mathura	Raya	188991	77
Firozabad	Kheragarh	160064	77
Agra	Jaitpur Kalan	121983	75
Bharatpur	Bayana	225144	75
Hatheas	Sadabad	207545	75
Firozabad	Firozabad	223917	74
Bharatpur	Nadbai	188725	73
Hathras	Hathras	174014	71
	Mursan	182514	70
	Sahpau	126928	70
Agra	Pinahat	121983	65

The above Scalogram has done with the help of 94 parameter of facilities available in Blocks of five districts in Uttar Pradesh and one district in Rajasthan. The facilities are including education (14 parameter), Health (14 parameter), Drinking water facilities (8 parameter), Community facilities (4 parameter), Transport and Communication facilities (25 parameter), Bank and Credit facilities (3 parameter), Miscellaneous and recreational facilities (18 parameter), and Power Supply (4 parameter). The highest facility are available in Barauli Ahir Block in Agra with 92 number facilities available and also lower facilities are Panihat block in Agra with 65 facilities among 94.From above table it can be said that most backward district is Hathras which is characterized by lower number of facilities where as Agra is more developed than others.

2.15 ENERGY

2.15.1 Non-Conventional

Increasing trend of adoption of Non-conventional energy is observed.

Solar plate collectors, photovoltaics and biogas are the major non renewable energy sources. However work is being done for installation of wind systems at Fatehpur Sikri in TTZ.

No power generation plant of UP Power Corporation Ltd. Is installed in TTZ Area.

One 5MW Solar Power Plant is commissioned in the month of March 2018 situated at Vill – Nagla Girdhar, Block- Gokul Disst – Mathura in TTZ Area by UP NEDA

Mini Solar Power Plant are installed/under installation by cold Storage owners/other Industries.

2.15.2 Conventional

LPG usage is increasing, however petrol, diesel are also used especially in private vehicles, GEN sets, mobile towers etc. As per the 1996 court order most of the industries are using gas for production.

Non-commercial forms of energy such as small wood/twigs, cow dung cakes, are used by low income groups. Wood is used in some restaurants.

2.16 HOUSING

2.16.1 Structures

Rural areas, have mostly semi-permanent to permanent structures made of brick masonary. Reliance of locally made bricks is prevalent. However, there is shift to concrete and brick construction in urban areas where multi storey construction has started.(percentage of permanent, semi-permanent and temporary pie-chart are mentioned in annexure)

2.17 AGRICULTURE

2.17.1 Crop Types

There are two types of crops are usually grown. Rabi (wheat crop) crops like wheat, gram, peas, mustard and lali etc. and kharif (rainy season crop) are grown in paddy, maize, jowar, bajra and sesame etc. Most agricultural land has irrigation facilities. Canals originating from the lower Ganges and their tributaries in this area are the main means of irrigation and also irrigation is done by tube-wells too.

2.18 ANIMAL HUSBANDRY

2.18.1 Livestock

Traditionally the practice of agriculture and animal husbandry went hand in hand. This gave way to some people only rearing animals for milk production or for heavy work. With reduction of agricultural land and pastures the livestock ownership has also gone down.

Animal Husbandry - In addition to agriculture, animal husbandry is also an important place. Due to very small size of land holding, cattle farming is an additional source of income for agriculture. (Details of Livestock of the District Agra has been given annexure)

2.19 INDUSTRIES

2.19.1 CATEGORY OF INDUSTRY

Employment in industry has reduced and new industries do not factor in the local skills.

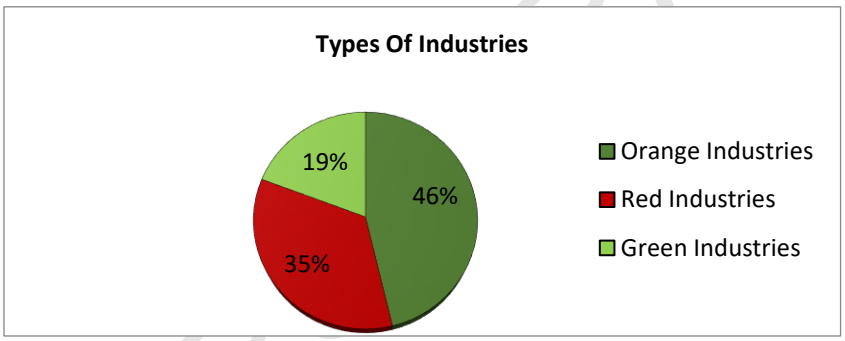
Only for Agra

Large Scale – 0.02%

Medium Scale – 0.23%

Small Scale – 0.29%

Household Industries – 93.96%



There are total 553 industries in Agra, out of which few are unidentified. From the list of industries that have been identified most of the industries are Orange Industries contributing 46% of the industries. There are only 98 industries (19%) under Green Category Industries.

3 Issues of Urban Development & Planning

3.1 INTRODUCTION

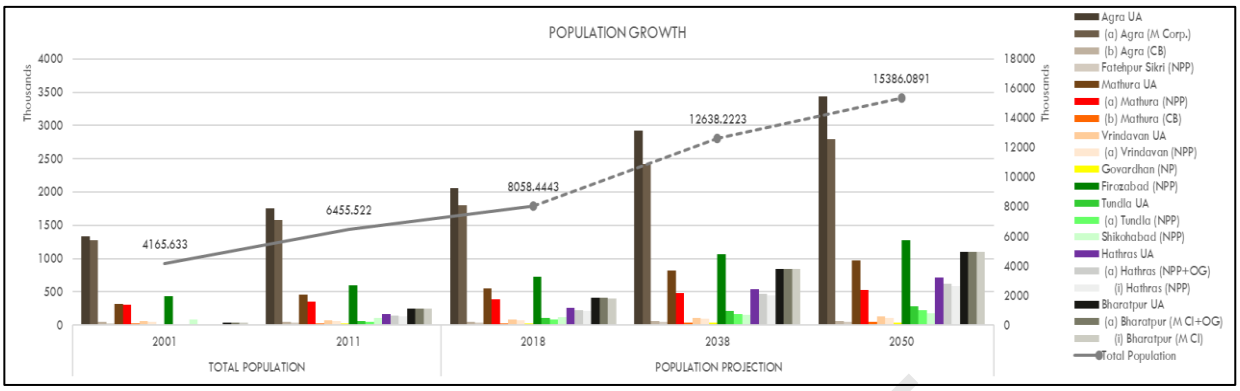
The Taj Trapezium Zone (TTZ) is a 10,400 sq. km area around the Taj Mahal, comprising of six districts of Uttar Pradesh and Bharatpur district of Rajasthan. The TTZ has been declared as an "Air Pollution Protected Area" (MoEF, GoI in 1983), due to the presence of world's beautiful monument, the Taj Mahal. The TTZ comprises about 40 protected monuments including three World Heritage Sites - the Taj Mahal, Agra Fort and Fatehpur Sikri. The zone also covers many unprotected and unidentified heritage sites which links India with its glorious history. It is a global tourism destination area and offers huge development potentials with respect to tourism, heritage and tourism-centric city economy. TTZ is so named since it is located around the Taj Mahal and is shaped like a trapezoid[1].

3.1.1 The Region

The TTZ area covers about 77 cities and towns apart from villages that fall within this zone and can be classified between the class I and class VI categories of census cities and towns. There are eight class I cities, three class II cities and about seventeen class III cities as per census 2011. The population growth pattern shows an increase in all the cities growth rate over the decades.

[1] Parliament of India Rajya Sabha, Department-Related Parliamentary Standing Committee On Science & Technology, Environment & Forests, Two Hundred Sixty Second Report On Effects of Pollution on Taj, July 2015

Figure 1: Population Growth and Projected Population based on Trend of few Selected Cities in TTZ



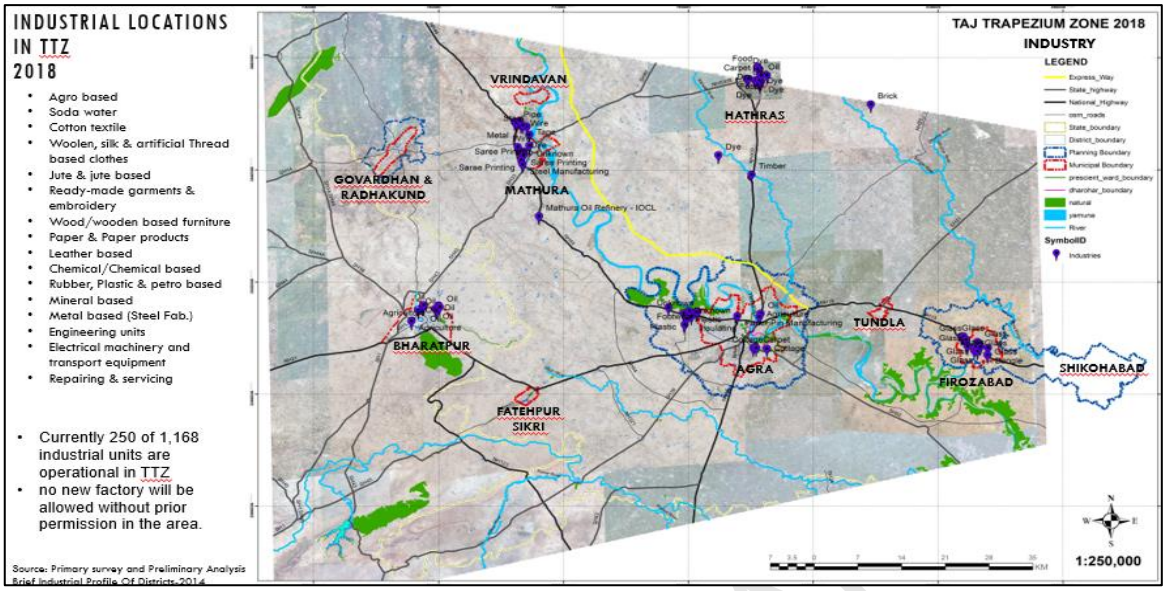
Source: Census 2011 and Trend based Projected Population till 2050

Demography: The socio-economic profile of the cities shows that about 70% of the population is literate while 30% being illiterate (census 2011). More than 65% of the population are in the non-working group while 30% are in the working group and about 5% are marginal laborers [2]. The number of non-workers are more because either the female workforce is not engaged in any kind of occupation and/or mostly the work force is engaged into agricultural activities and/or it is an aged population that is mainly residing in the region.

Economic Profile: An average growth rate of state gross domestic product (GDP) in Uttar Pradesh (UP) shows that the contributions from the tertiary sector to the GDP is followed by the secondary and primary sectors (NITI Ayog 2017). TTZ is centrally located and has close economic links with the northern and central part of India. As a global city, Agra is strategically located and well-connected by transportation linkages as a regional gateway for tourism, trade and services for India and rest of the world. Closure of a number of industries and restrictions on the industrial development in the region shows a stagnation in the growth trends in the secondary sector. The region is well connected with roads and railways and with the Agra expressway the connectivity linkages with the cities the region has further been strengthened. This will foster greater social and economic interactions and economies of scale of the TTZ region.

[2] Census 2011

Map 1: Industrial Locations in TTZ, 2018



Source: Brief Industrial Profile of Uttar Pradesh 2014, Primary Survey 2018 and Preliminary Analysis

Industrial Profile: Uttar Pradesh, a state with an access to a robust industrial infrastructure, has fifteen industrial areas, twelve specialized parks, four growth centers and Industrial Infrastructure Development Centers (IIDC). Under the central government scheme, various integrated industrial development centers have been developed so as to boost the development of micro small and medium industries at Etah, Banthar (Unnao), Kosi Kotwan (Mathura), Kursi Road (Barabanki) and various other places, most of which is in and around the TTZ Region.[3]

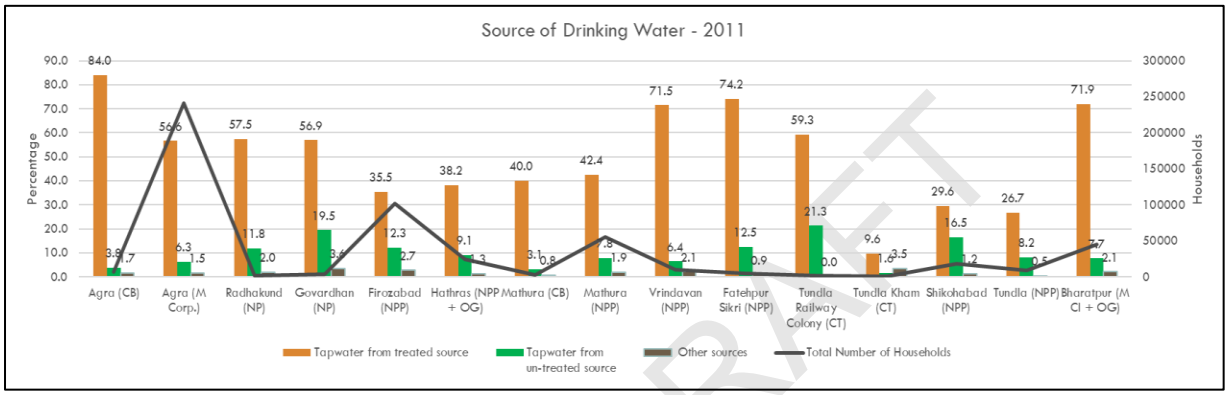
Irrigation Canals in TTZ: Uttar Pradesh has about 3,091 thousand hectares under canal irrigation which is 30.91 per cent of the total canal irrigated area of the country. Over one-fourth of the net irrigated area of the state is irrigated by canals. Agra Canal is the main source of irrigation in Taj Trapezium Zone Region. Following are the main canals in the state of Uttar Pradesh.

1. Upper Ganga Canal
2. Lower Ganga Canal
3. Sharda Canal
4. Eastern Yamuna Canal
5. Agra Canal

[3] Infrastructure Development in Uttar Pradesh – 2015, Prof. S.V. Pathak, Dr. Rajeev Prabhakar and Dr. Sandeep Kumar Gupta, XVII Annual International Seminar Proceedings; January, 2016

Physical Infrastructure Status – The TTZ is well connected with roads and railways with other regions in India. The region is well served with the supply of water and electricity. Under development programs like the Jawaharlal Nehru National Urban Renewal Program (JNNURM), AMRUT, RAY, Affordable Housing scheme, Swatch Barat Mission and now the Smart Cities projects, urban areas in Uttar Pradesh have been benefiting and the development is in progress in most of the cities. A brief on the infrastructure status is given below:

Figure 2: Source of Drinking Water



Water Supply: The infrastructural provisions in the region shows that 65% of the domestic households are not connected with tap-water from treated sources and are therefore depended on the ground water sources like bore-wells, hand-pumps, etc.[4]

Source of Electricity: On an average, about 92% of the households are provided with Electricity from legal connections while the percentage share of the other connections is very less. Though there are power connections, the region faces frequent power cuts and therefore the use of alternative fuel sources is very high in the region.[5]

Toilet Facilities: As per the toilet facilities available, it is observed that on an average 90% of the households in the TTZ region have toilets within premises. This was well observed in the field. About 10% of the households defecates in open area while Dhanauli, Dhaulpur, Bharatpur has highest open defecation rates[6]. But it is assumed that with the Swatch Bharat Mission, there can be changes in this situation

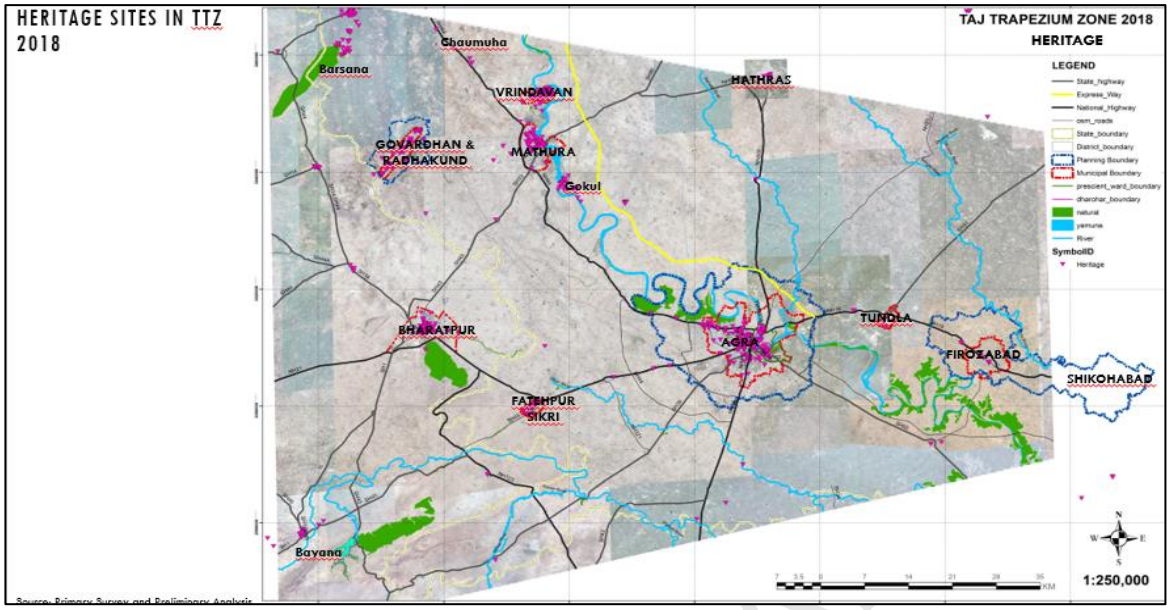
Tourism: The UP Government envisioned "Uttar Pradesh Pro Poor Tourism Development Project" with the financial support of World Bank is one of the stepping stone in restructuring its tourism sector in a pro-poor manner. This has been

[4] Institute of Social Sciences, India 2011
[5] Institute of Social Sciences, India 2011
[6] Institute of Social Sciences, India 2011

mandated with a view to increasing benefits to local communities and improving the management of its tourism destinations. The Pro- Poor Development Project focus on two main regions- Braj-Agra Corridor and the Buddhist Circuit; covering in all 12 destinations of high heritage and tourism significance. Among these, the subproject sites for 1st year has been identified along Braj – Agra corridor namely Agra and Vrindavan (Mathura); as these cities depend heavily on tourism .Apart from these, the Taj Trapezium Zone covers many such areas within the same region that flaunts its heritage sites and signifies to grow in the future based on the tourist economy. These heritage sites have been marked in the map below.

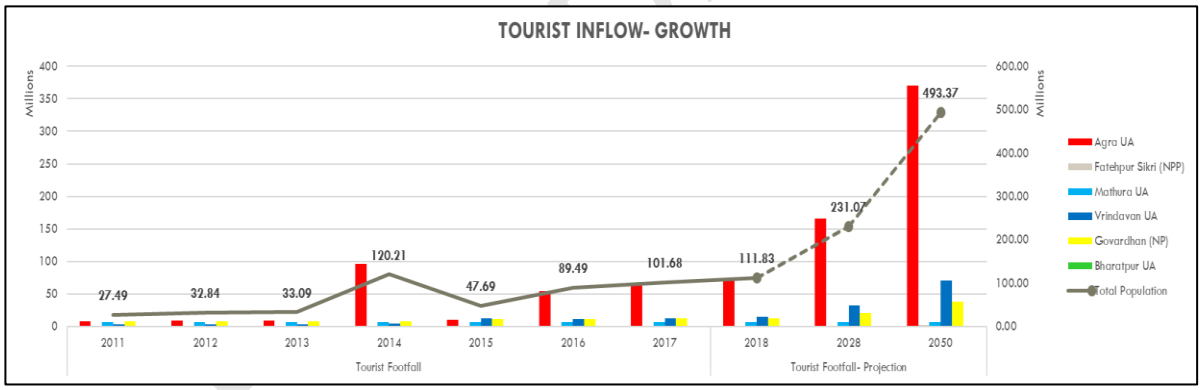
As per the census 2011, the tourist inflow in this region has been increasing considerably in few cities like Agra, Mathura-Vrindavan followed by Bharatpur, Fatepur Sikri and Govardhan. There are various other locations like Gokul, Deeg, Nandgaon, Chhata, etc. that are unexplored and untouched. However, a projection of the current tourist inflow in few selected cities shows that in another three decades Agra, Vrindavan and Govardhan will see a considerable increase in the tourist influx over the years.

Map 2: Heritage and Tourist Sites in TTZ Region



Source: UNESCO Documents; ASI Documents; Bhuwan 2018; Primary Survey and Preliminary Analysis

Figure 3: Tourist Inflow and Projections



Source: Uttar Pradesh Tourism, Department of Tourism Bharatpur and Preliminary Analysis

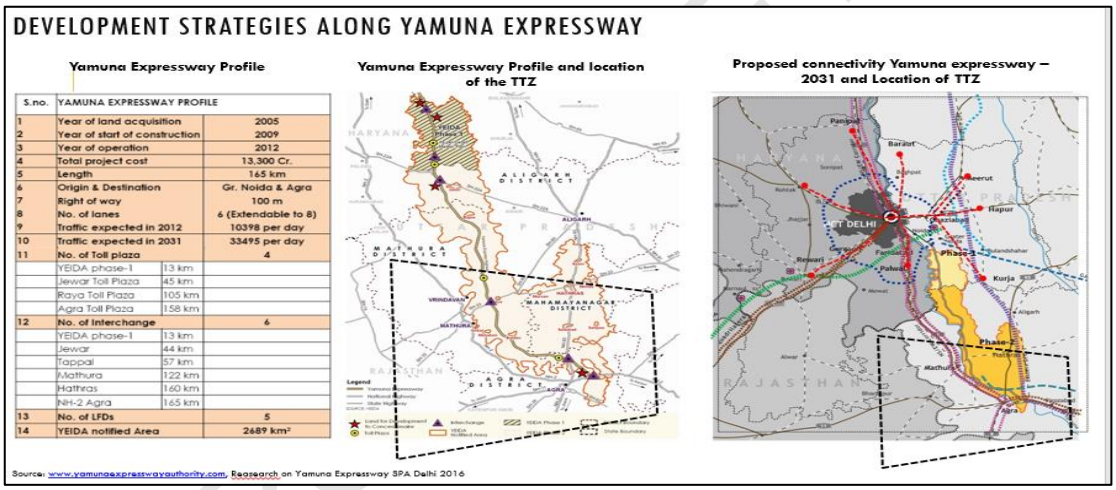
Settlement Pattern: Almost half of the population in most cities in the TTZ are estimated to be living in slums and low-income settlements, without access to adequate basic urban and social services or decent housing. Most of these slums/low income settlements are in the neighborhood of protected and unprotected monuments and heritage site. The presence of heritage assets in the neighborhood applies strict regulations for development and does not translate into any income gains or better

infrastructure or services. Poor households therefore stay unconcerned about the heritage and do not contribute to their conservation[7].

3.1.2 Development Strategies along Yamuna Expressway

Yamuna Expressway stretching 165 km connects international tourist destinations of Delhi and Agra. The Expressway is a 6-lane (extendable to 8 lane) access controlled superhighway and have 5 LFDs (Land of concessionaire) with facilities of 4 Toll Plazas, and 6 Interchanges along the entire length. Yamuna Expressway Industrial Development Authority (YEIDA) notified area covering approx. 2,689 sq. km falling in six districts to be developed in two phases[8]. The TTZ covers the southern part of the expressway.

Map 3: Development along TTZ Region along the Yamuna Expressway



Source: Yamuna Expressway Industrial Development Authority

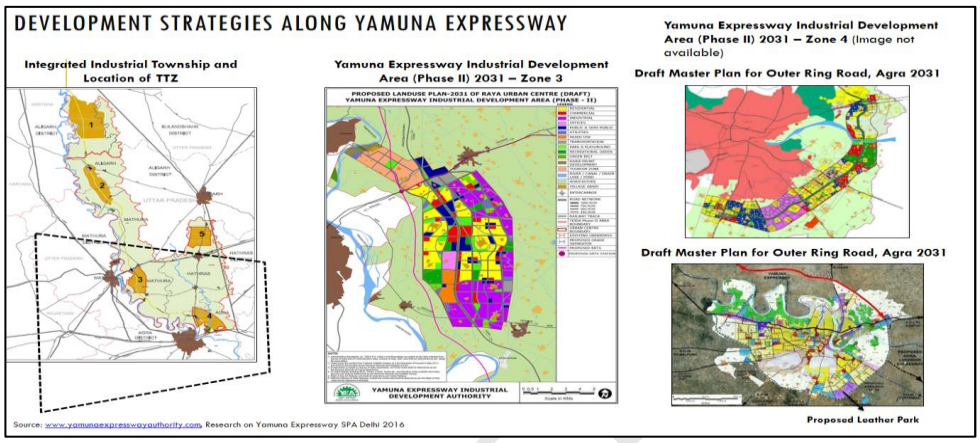
This proposed and on-going development along the Yamuna Expressway has given a rise in the land-value in the region. There is rapid spike in land value in all intersections along expressway specially during acquisition process. This has attracted big industrialists and bulk acquisition of land along the expressway[9]. The trend is growing with time.

The integrated Industrial Township Development Plans along the Yamuna Expressway proposes the development in two phases and in five zones. Zones 3 and Zone 4 that also falls in the TTZ Region shows proposed growth along the

[7] DPR Preparation and Safeguards Assessments of Proposed Y1 Subprojects Abbreviated Resettlement Action Plan (ARAP) Subproject1: Linkage of Kachhpura with Mehtab Bagh July 2016
[8] Yamuna Expressway Industrial Development Authority Website
[www. http://yamunaexpresswayauthority.com]
[9] Real Insights: Real Estate Overview Yamuna Expressway April-2015

expressways near Mathura –Vrindavan i.e. Raya Urban Centre (Zone 3) and near Agra i.e. Zone 4. The land use plan of Raya Urban Centre illustrates that an extensive industrial hub is coming up across Mathura – Vrindavan. The detailed land use plan for Zone 4 was not available. However, the land-use plan along expressway near Agra as given in the Master Plan 2031 and the draft Master Plan for Outer Ring Road in Agra for 2031, proposes industrial growth along it[10]. A proposed Leather Park has been planned to be developed in this region.

Map 4: Development Strategies along Yamuna Expressway and Land Use Plans of RAYA 2031 and Outer Ring Road Agra 2031



Source: Real Insights: Real Estate Overview Yamuna Expressway April-2015 and Yamuna Expressway Industrial Development Authority

About 190 ha of area has developed in a haphazard way near expressway in recent five years and activities like food storage and transport carrier are major land uses that has come up along it. The Industries that has been relocated from the cities due to the impact of TTZ has found its way all along the expressways specially near Kosi Kalan, Chhata and Nandgaon areas. About 413 ha of large agricultural land converted to vacant land due to speculation and appreciation in land dealing[11].

However, the Infrastructure development plans all along Yamuna Expressways shows a lot of growth potentials in the years to come.

[10] Yamuna Expressway Industrial Development Authority Website [www. http://yamunaexpresswayauthority.com]

[11] *Real Insights: Real Estate Overview Yamuna Expressway April-2015 and Yamuna Expressway Industrial Development Authority; Primary and Secondary Surveys 2018*

3.1.3 Cities in TTZ

Out of 120 cities in the TTZ region, about six class I cities shows constant growth in the future and there are about two class II cities that shows a tendency to transformation into the category of class I cities in the future. Apart from this there are two class III cities that has a very high tourist footfall and this increases with time. Therefore, based on the above conditions, the following cities has been selected for detailed planning intervention in the TTZ region. These cities are Agra, Mathura, Firozabad, Shikhohabad, Hathras, Bharatpur, Vrindavan, Tundla, Fatehpur Sikri and Govardhan. The details of all selected cities are given as Annexures in Vol II.

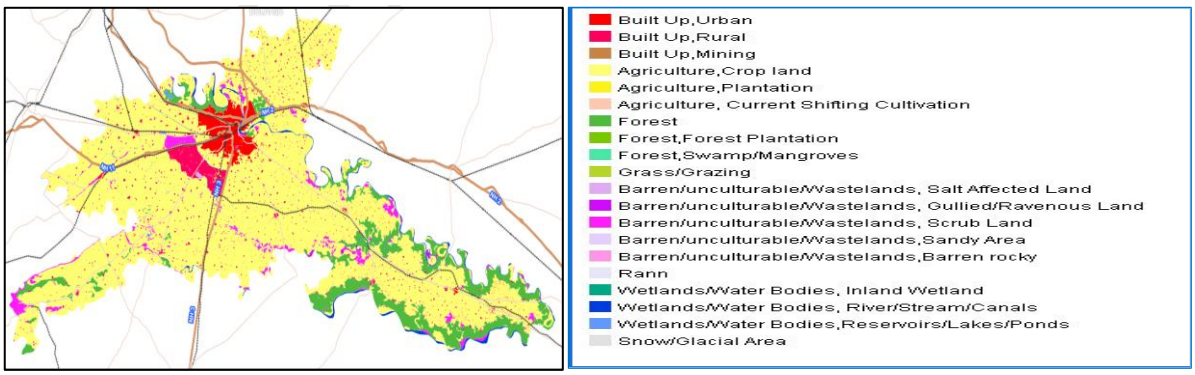
3.1.4 The City: Agra

Agra tehsil which comes under Agra district having a total area of 528.64 km. It has semi-arid climate continental type of climate with low monsoonal rains. It has a population of around 33,99,042 with literacy rate of around 70%. The area falls in the doab of Yamuna and Utangan rivers. Ravine land along the Yamuna & Utangan river is a common feature making the land unsuitable for agriculture.

Map 5: Land use Map Agra District and Tehsil LU/LC – 2002 - 2015

Table 1: AGRA TEHSIL – LU / LC IN 2002 AND 2015

Sr. No.	Land Use / Land Cover Classes	Area in Km² (2002)	Area in % (2002)	Area in Km² (2015)	Area in % (2015)	Variation from 2002 to 2015 (Km²)
1	Moderate Forest	8.28	1.56	4.35	0.82	3.93 ↓
2	Open Forest	8.71	1.64	2.24	0.42	6.47 ↓
3	Open scrub	105.4	19.93	8.95	1.69	96.45 ↓
4	Built-up Land	230.69	43.69	305.44	57.80	- 74.75 ↑
5	Agricultural Land	126.26	23.88	104.91	19.84	21.35 ↓
6	Water body	15.23	2.88	12.06	2.28	3.17 ↓
7	Barren Land	34.07	6.44	90.69	17.15	-56.62 ↑
TOTAL		528.64	100	528.64	100	-

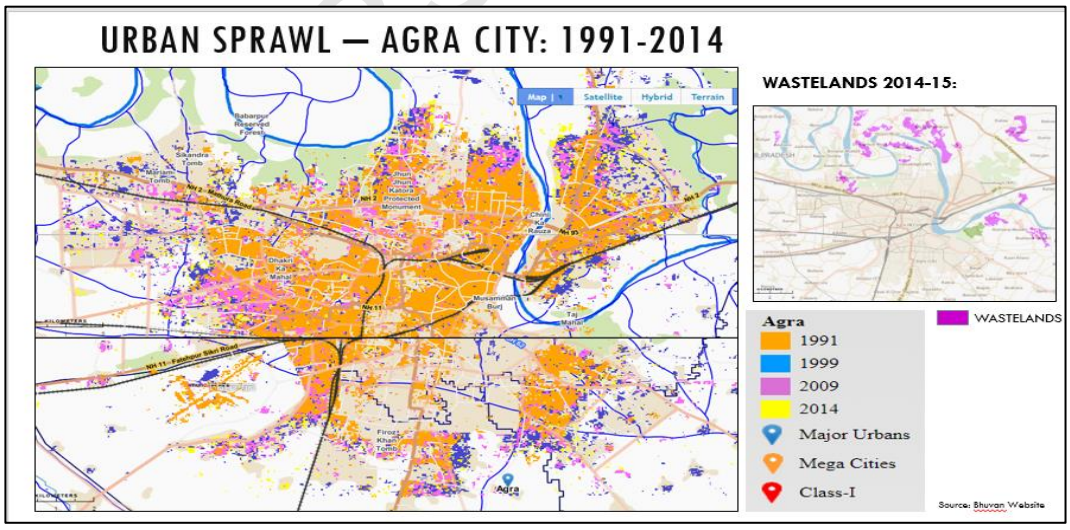


Source: Bhuvan Website and Land use land cover of Agra tehsil: A comparative study from 2002 to 2015; Bob Stanley Gardner, Brototi Biswas, Praveen Andrew Majeed Department of Geography, St Johns College, Agra, India*

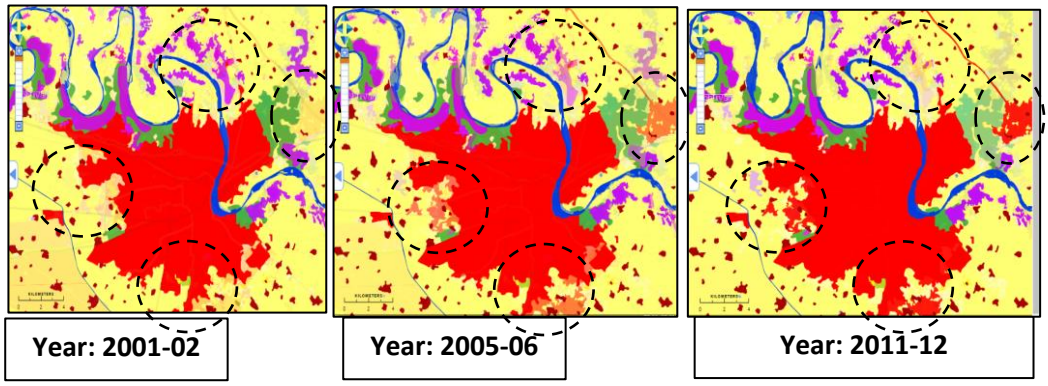
Locational Importance: Agra is a city found in Uttar Pradesh, India. Agra, the city of Taj Mahal is the 3rd most populous city in Uttar Pradesh and is administrative headquarters of the Agra district. The city of Agra is situated on the Western Bank of

river Yamuna on National Highway (N.H2) at about 200 kms from Delhi in the state of Uttar Pradesh. It has an extremely strategic location on the confluence of three distinct geo-physical regions namely the plain of Uttar Pradesh, the plateau of Madhya Pradesh and the desert of Rajasthan. The city also falls in the center of the four-culture areas- Braj, Bundelkhand, Rajputana and western Uttar Pradesh. Agra is ranked amongst the most outstanding historic cities in the world and certainly best known tourist destinations in India with three World Heritage Sites namely – the Taj Mahal, Fatehpur Sikri & Agra Fort present in the city.

Map 6: Urban Sprawl of Agra 1991 - 2014



Map 7: Change in Land Cover 2001 – 2012 and LU/LC Change (2002-2015)



Source: Bhuwan Website

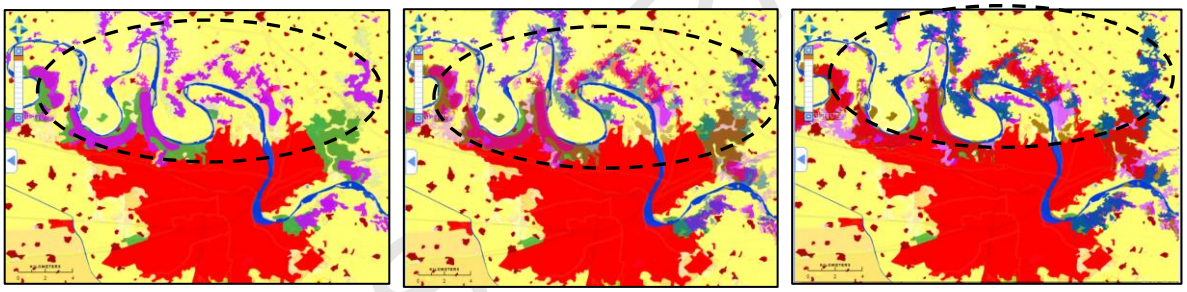
Growth in Agra: Growth in Agra has followed the central core to periphery pattern as can be observed from the populations maps from Bhuvan, ISRO (1991 – 2014). Agra's decadal growth rate has an average of 28%, most of which is concentrated in the core. Approximately 20% of the Municipal area of Agra grew from 68 sq.km to 141 sq.km between 1981 to 199112. Today, the municipal area stands at 1368 sq.km13. The area under industrial use is lesser (by 3.1%) than it had been proposed. The drop in number is probably due to the closure of 292 coal based industries after 'the initiation of the TTZ project. The land use / land cover change shows that maximum change of land has happened from agricultural and open scrub lands to built-up and barren land. Even water bodies are getting converted to barren land which is an area of concern. The decadal study shows that the rate of erosion taking place in and around the River Yamuna in the northern part of the city is extremely fast. The erosion rate is faster and is eating up areas around the industries and also the settlements residing along the river. The rate of erosion is also very high around the world heritage site of Taj Mahal which is the biggest concern. There is an urgent need to restore and redevelop the region along the river Yamuna around the city.

Role of River Yamuna: The river Yamuna enters the city from the north-east corner, flows towards south for some distance and then turns towards east. The general slope is from west to east on the right bank of the river Yamuna. The climate of Agra city is extreme and tropical. During summer season the maximum temperature of the city rises to 470 degrees Celsius and drops down to minimum of 3 degrees Celsius during winter season. The city receives moderate to high rainfall with an average yearly

[12] RAY Slum Free City Agra Study
[13] Existing landuse data and Municipal boundary coverage

rainfall of about 686mm. The ground levels at Agra vary from RL 150 m to 170m. The strata consist of mainly sandy soil. The sub-soil water level is generally 6 to 8m below ground level. The highest flood level of Agra City is 154.76m at Jawahar Bridge. The city stretches for about 9.0 kms along the Yamuna river. The major part of the city is on the Western side of Yamuna and has grown beyond the river on the eastern side and is called the Trans Yamuna area. The river has extremes of dry as well as flood conditions during a year. Due to high population density of the catchment, the river remains almost in dry state during January to June in many parts of its stretch and under flooded conditions during July-September. The Yamuna is now the source of irrigation for Uttar Pradesh and Punjab states. The East Yamuna, West Yamuna, and Agra are the major canals on the river. The drainage system of the area is controlled by the river Yamuna and its tributaries. Because of flooding and erosion in the meandering course of the river near the city there are areas where there is waterlogged during the seasons.

Map 8: Land Erosion 2001-2012



Year: 2001-02	Year: 2005-06	Year: 2011-12

Source: Bhuvan Website

Demography and Economic Profile: The population of the city as per Census 2011 is 15,85,704 inhabiting an area of 141.0 sq km. The city is divided into 90 wards. For a city with million plus population that has grown at more than 25% in last thirty years, the infrastructure development has failed to keep pace with population growth.[14.] The projected population for 2038 is 2424243 which is approximately 34% rise. The projected population for 2050 is 2796927. The work force participation rate (WFPR) of the city is 25.5 per cent. The occupational structure of the city shows that the majority of the population is engaged in tertiary sector (88.68 percent) and minimum in primary sector 3.50 percent. The percentage share of non-workers is also very high.

[14] Census 2011

Industries: The major part of Agra's industrial activity is in the form of small-scale and house-hold industries located in the old Mughal City particularly in Lohamandi, Rakabganj, Kotwali and Tajganj areas. The important industries are textile, leather, foundries, electrical goods, fans, pipes, casting, leather goods including shoes, etc. Agra has been a center of traditional handicraft industries from the Mughal times. The major handicrafts are marble, leather, carpet, brassware, artistic carpets and jewelry crafts. There are more than 50000 shops and commercial establishments registered at Nagar Nigam. The average growth rates of commercial establishments are high compared to hotels and restaurants. There are more than 50000 shops and commercial establishments registered at Nagar Nigam. The average growth rates of commercial establishments are high compared to hotels and restaurants.

Tourism Industries: Agra has a booming tourism industry as well as royal crafts like Pietra Dura, marble inlay and carpets. Agra city has its leather goods, the oldest and famous leather firm Taj Leather World is in Sadar bazar. The handicrafts, zari and zardozi (embroidery work) are other important activities. Agra is known for its sweets (Petha and Gajak) and snacks (Dalmoth), garment manufacturers and exporters and an automobile industry. Carpet making was introduced to the city by Moghul Emperor Babur and since then this art has flourished. The city center place at Agra has jewelry and garments shops. The silver and gold jewelry hub is at Choube Ji Ka Fatak are places of importance. The Shah Market area is an electronics market while Sanjay Place is the trade center of Agra.

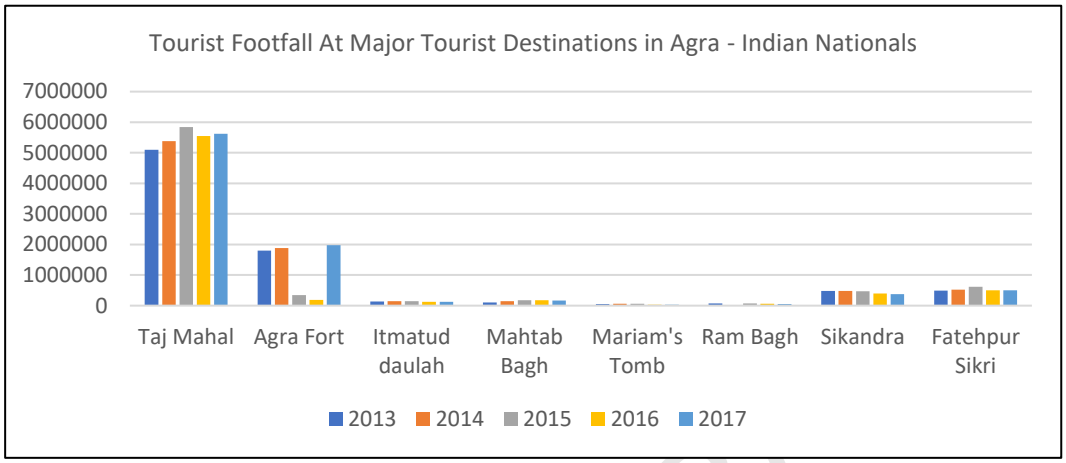
Housing: The Master Plan of 2021 envisages about 450,000 number of households in the city with family size of 5. The city has 199,497 residential units on which the deficit is about 16585 units. The Master Plan has also envisaged that the city will require 256,488 units by the year 2021. The new residential colonies are being developed by ADA and Avas Vikas Parishad[15].

Tourism: Agra city forms one of the three major cities of the prime tourist circuit in India, The Golden Triangle, the other two being Delhi and Jaipur. Statistics based on data from UP Tourism have shown Taj Mahal as the obvious main attraction in the city and has an average of 62,28,721 visitors per year (2013-2017). A per day footfall at Taj Mahal peaks to 60, 000 to 70,000 visitors in peak season. The other attractions being Agra fort, Itmad-ud-Daulah, Mahtab Bagh, Sikandram Mariam's Tomb and Ram Bagh. Fatehpur Sikri, though not in Agra, is a popular destination most visitors club with Agra. As per the Tourism Policy of Uttar Pradesh Government (2017) seven new circuits are being introduced. One being - Heritage Arc (Agra-Lucknow-Varanasi)

[15] Census of India, 2001 and 2011; Agra Master Plan 1971 and 2021

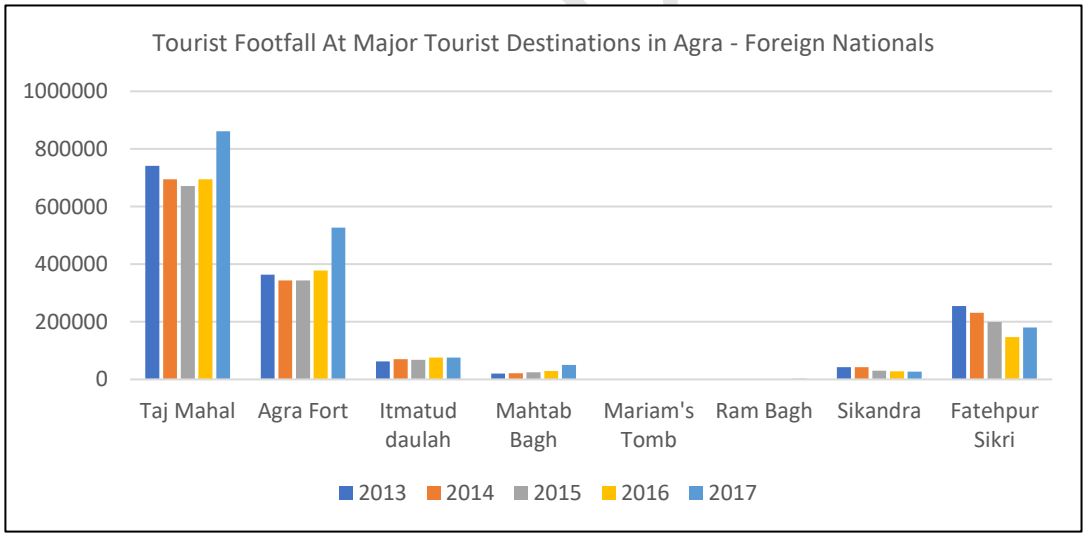
region. Significant infrastructure development projects/schemes such as Lucknow Agra Expressway, Yamuna Expressway, HRIDAY, AMRUT, Smart Cities, etc. are ongoing or proposed.

Figure 4: Tourist Footfall At Major Tourist Destinations in Agra - Indian Nationals



Source: UP Tourism, and calculations

Figure 5: Tourist Footfall at Major Tourist Destinations in Agra - Foreign Nationals



Source: UP Tourism, and calculations

Infrastructure Status: Entire city has 3 water supply zones with 26 sub zones. Parts of the precinct zone do not have water supply connections and they have to depend on tankers, tube wells and hand pumps. Even areas getting the city water supply connection receive poor quality water. There are two water treatment plants operational in Agra. One in Jeoni Mandi and the other at Sikandra.

The City is divided into 8 sewerage districts: North zone, West zone, Central zone, Tajganj zone, South zone-I, South zone-II, South zone-III and East zone. These 8 districts are further divided into 25 subzones. “The total capacity of seven STPs in Agra at present is 180.25 MLD. In total, the seven STPs are treating only 125 MLD of sewage, while the total capacity is 180 MLD. Some plants are old, and also not getting the required supply of water. Repair work is conducted on a regular basis. But there is requirement of more STPs. The requirement within the next decade will be 300 MLD while the total capacity at present is 180 MLD.”[16] Lack of sewerage network in the eastern zone imposes a serious threat to the river as the sewage generated in this area directly flows into the river. Currently work is on to upgrade the sewerage system of Tajganj.

The storm water system was laid 55 years ago in Agra. These drains are in bad condition, choked and encroached upon by slum dwellers. More than often areas without sewerage system, use these drains for discharging sewage waste which flood into the adjacent slum settlements due to its inadequate carrying capacity, causing unhygienic living conditions and pollution.

Proximity to social infrastructure in the precinct zone is adequate. Though future population growth suggests some deficits in schools and hospitals.

3.1.5 The Precinct: Taj Mahal and Surrounding

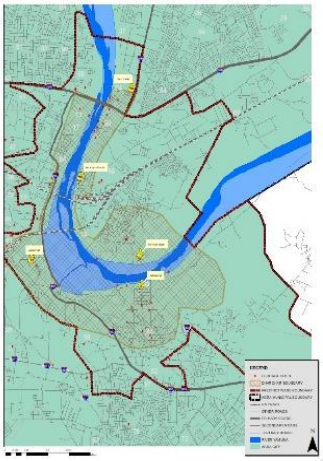
‘The Precinct’ is one of the three delineated study areas for developing the TTZ Vision document. As the word ‘precinct’ summarizes, the precinct zone comprises of the immediate regulated zone around the prominent heritage sites of Agra, The river Yamuna, The Taj Mahal, The Agra Fort, The Mehtab Bagh, Itmad-ud-daulah and Ram Bagh. ‘Regulated area’ means “an area near or adjoining a protected monument which the central Government has, by notification in the official gazette, declared to be a regulated area, for purposed of mining operation or construction of both.”[17] The Central Government has declared up to 100 meters from the protected limits to be prohibited area and further beyond it up to 200 meters to be regulated area for purposes of both mining operation and construction around heritage sites of significance.

[16] Agra’s STP Works Below Capacity; Deepak Lavania; 2016 [https://timesofindia.indiatimes.com/city/agra/Agras-sewage-treatment-plants-work-below-capacity/articleshow/50488762.cms]

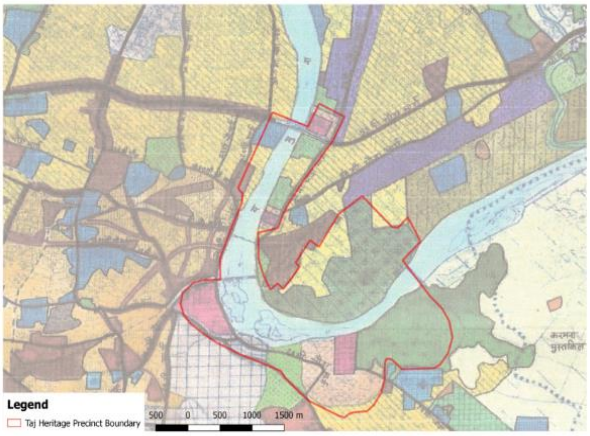
[17] Source: Archaeological Survey of India

Defining the Precinct Area: The Agra Precinct as adopted in this Vision Document, constitutes the core precinct and adjoining areas along the River Yamuna, encompassing the 'Taj Dharohar Kshetra' or the Heritage zone delineated in the Agra 2021 Master Plan as a strategy to protect the heritage sites of global and national importance. Further, from planning perspectives, the extended precinct boundary has been defined by the ward boundaries that include, whole or part of the Agra Precinct. The Other important precincts in the city are the Old City of Agra that forms the extended layer of the precinct because of its heritage value and historic character. The cantonment area reminiscent of the colonial period is the second extended layer of the precinct. Unlike the old city, this part has been well preserved and conserved. Most of the heritage buildings from the colonial period are used as administrative offices.

Map 9: Vision Plan Boundaries



Map 10: Agra Master Plan 2021 *"Dharohar Kshetra"*

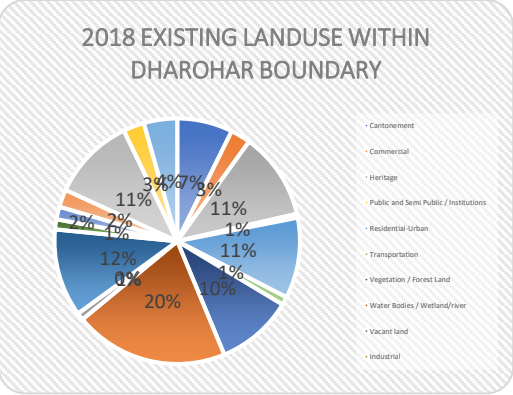


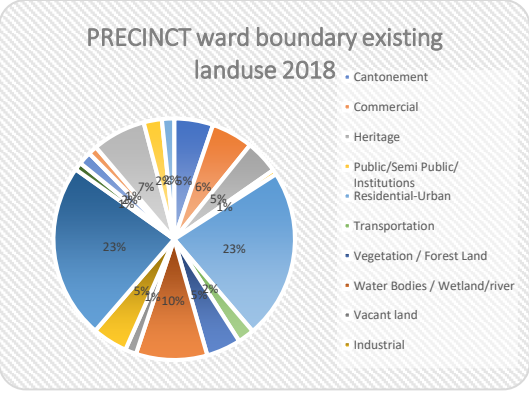
Land Use Character: About 10% of the Land within the 'dharohar kshetra' boundary is water body, wetland and river. Agriculture, forest cover and reserve forest comprise about 35% of the landuse. Heritage sites constitute of about 11% while residential covers around 25% landuse of which 10% use also generates income through home-based cottage industry (this number may be higher). 5% land use is industrial. Though the industrial number seems seemingly less in the precinct area, the major industrial belts of Agra like Foundry Nagar and the Nunhai Industrial estate shares boundary with the precinct. Most of the neighborhoods in the precinct and the old city are more than 20 years old. The colonies include Kachpura, Tajganj, Dhandupura, Telipada, Vibhavnagar, Belanganj, Motiganj and Rawat Pada. Majority of these settlements are tenured slums on government land. "As per 2001 census, 56% of Agra lives in slums or slum like settlements."[18]

[18] RAY Slum free city, Agra Study

Table 8: 2018 Existing anduse within precinct ward boundary	
LANDUSE	AREA IN HECTARE
Cantonment	124.59
Commercial	133.25
Heritage	107.81
Public/Semi Public/ Institutions	15.48
Residential-Urban	544.70
Transportation	52.75
Vegetation / Forest Land	110.28
Water Bodies / Wetland/river	228.00
Vacant land	35.78
Industrial	112.61
Agriculture	560.98
Mixed use	24.54
Public utilities	41.47
Recreational	28.70
Reserved forests	170.61
Residential with cottage industries	58.25
Waste land	39.15
TOTAL	2388.95

Table 9: 2018 Existing landuse within dharohar boundary (source: primary survey)	
LANDUSE	AREA IN HECTARE
Cantonment	65.30
Commercial	23.42
Heritage	102.40
Public and Semi Public / Institutions	4.51
Residential-Urban	94.77
Transportation	9.64
Vegetation / Forest Land	90.29
Water Bodies / Wetland/river	180.97
Vacant land	8.58
Industrial	0.00
Agriculture	103.13
Mixed use	11.76
Public utilities	14.97
Recreational	20.59
Reserved forests	98.15
Residential with cottage industries	24.67
Waste land	39.15
TOTAL	892.28





Demographic Profile: As observed from the census data of 2001 and 2011, 26% of the population are concentrated in the old city and 12 % in the precinct. However, the settlements in the core and the precinct are very dense and depend on inadequate infrastructures which are below the required standards. As observed from the census data of 2001 and 2011, about 20% of the total population were concentrated in the 14 precinct wards in 2001 and 12% in 2011. The available residential landuse statistics provide the density of 467 persons per hectare in the precinct and 147 persons/hectare in the city. Katra Wazirpura, a colony near itmad-ud-daulah is the city's largest slum with a population of more than 13000. The RAY survey conducted in 2011, noted that about 56% of the population in Agra lives in slum with an average household size of 6.4. Linear population projection and decadal population projections suggest that by 2050 there will be 30 to 35 lakh population. This increase will create a deficit of 7 lakhs housing units. The impact will affect the precinct residential zones as well.

Map 11: Existing Land-use of Precinct zone. Map 12: Existing Neighborhoods in the precinct zone

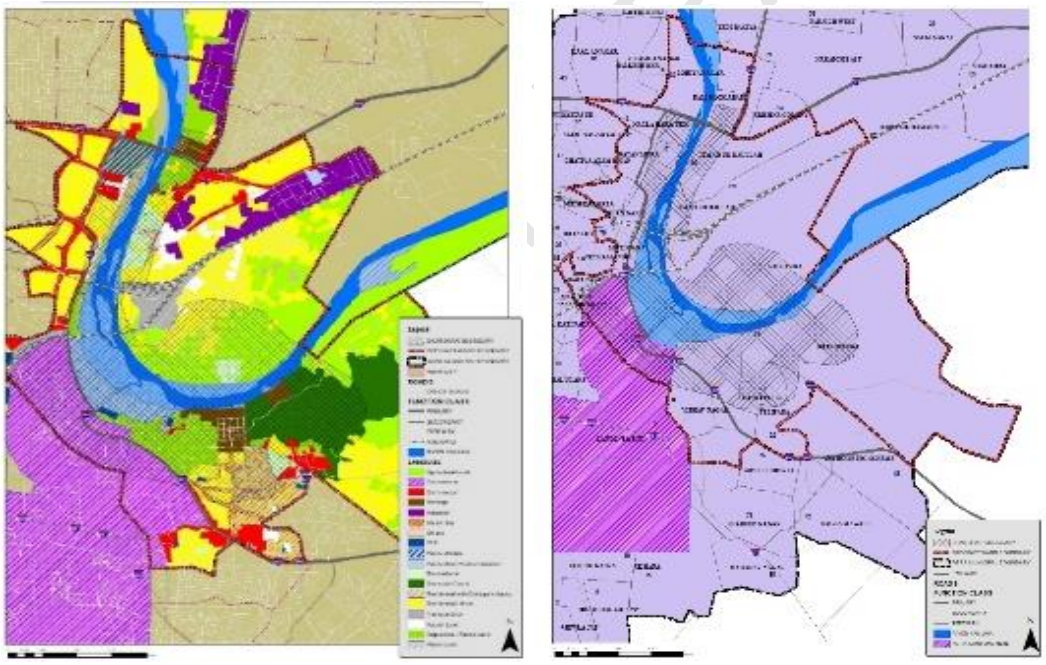


Table 10: Slum Settlement Type in Agra

Tenure			Land Tenability		
Status	**Secure**	**In secure**	**Tenable**	**Semi Tenable**	**Non - Tenable**
No. of Slums	345	72	405	4	8
Age of Slum					
Age	**0-15 years**		**More than 20 years**		
No. of Slums	8		409		
Land Ownership					
Ownership	**Local Body**	**State Government**	**Railways**	**Private**	
No. of Slums	4	406	1	6	

Source: RAY Primary Survey 2011

Economic Profile: Majority of the working population in the slums is engaged in tertiary sector which comprises of wholesale business, informal sector, tourist guides, rickshaw pullers, sweepers, street vendors, preparation of souvenirs such as replica of Taj Mahal and other home based small businesses. On the other hand, women in the families are majorly involved in tertiary activities such as domestic help and in the making of petha. In addition, a certain amount of the slum working population is involved in industrial activities such as shoe making, leather goods and ancillary industries supporting foot wear."[19]

3.1.6 Issues at Regional, City and Precinct Scale

The state of Uttar Pradesh, where Agra and the Taj Mahal are located, experiences electricity blackouts almost daily. This has had a negative effect on the functioning of the sensitive pollution monitoring system of the Taj set up by the Uttar Pradesh government. In April 2002, the Supreme Court ordered the Agra Heritage Fund to set up a solar power plant to meet the energy needs of the Taj Mahal and the surrounding area. The industries still located in the Taj Trapezium are taking the assistance of international organizations like USAID to minimize pollution under the Clean Air initiative since 1993. Taj Trapezium Zone Pollution Authority is monitoring this and other such schemes to control pollution in the Taj Trapezium[20]. However, brick kilns, oil refineries and factories, iron foundries, glass, leather and other chemical industries

[19] RAY SURVEY
[20] Comprehensive Environmental Management Plan (CEMP) For Taj Trapezium Zone (TTZ) AREA, NEERI report, 2013

are posing serious threat for the Taj Mahal, the River Yamuna and the settlements in the entire zone.

The issues that can be identified through the primary and secondary sources, at each level have been listed down below. The details of each along with analysis is enclosed as **Annexure 2** of the report in Vol II.

3.1.7 Issues at the Regional Level:

Issues of Urban Development & Planning

Land Use

3. Most of the cities in the region are a result of unplanned urban growth. The growth directions are determined either along the expressways or the river.
4. Areas adjacent to the market center and old settlements exhibit dense growth due to cluster housing, is under development pressure due to unregulated and unorganized development.
5. The core cities and the religious temples located along the river are also under development pressure from housing and infrastructure.
6. The land allocated for open spaces is also being consumed by residential development and there is substantial lack of recreational space in the city.
7. Public and semi-public areas are considerable less in terms of space allocation indicating lack of social infrastructure and the allotted area being used for different purpose.
8. There is new extensive planned development happening in the fringe areas.
9. Non-conforming activities: The industrial estate areas exhibit non-conforming residential development. The residential areas exhibit non-conforming commercial and mixed-use development along the major market areas, also leading to encroachments along the road. The open and green spaces are being encroached upon by residential or commercial activities.
10. Private realtors building luxury condominiums and gated residential communities are encroaching upon the farmland around the hills and green land.

Industries

11. The industries in the TTZ are basically of small and medium scale category with most of them operating in the Firozabad area.
12. Brick kilns, petha, tanneries, iron foundries, glass and other chemical industries which are generally polluting industries are found in the TTZ.
13. With growth and development, new Industries are coming up along the expressways that are polluting in nature, for eg. Kosi Kalan, Chatta and Nandgaon areas
14. There are two proposed industrial developments along the expressways in phase II (zone 3 and zone 4) that has large industrial hubs coming up within them. There is a need to understand the categorization and type of industries that are being approved in the zone as a leather park has been recommended in the proposals along the Agra Ring Road.
15. There are many household industries in the cites in the region which are of export quality. These industries have potential to contribute in economic growth and generate more employment in the region. The skills are only transferred from one

generation to another. There is no skill building opportunities or promotional facilities that are being offered to these industries.

Commercial

16. Major commercial areas in the city consists of mixed use lanes of commercial and residential characters. This is creating congestion and unlivable conditions for the people.
17. Stone and building construction materials shops are very common in the commercial areas that leads to air pollution.
18. Small household level creative industries are neglected and not supported.

Tourism:

19. Unidentified and unprotected tourist spots in Deeg, Nandgaon, Chhata, etc. needs to be identified with tourist infrastructure and connectivity.
20. Increasing number of tourists and pilgrims (five to seven million annually) has stressed the carrying capacity of the cities infrastructure in the region.
21. Unprotected and unmaintained Kunds and heritage areas.
22. Narrow entrances to enter the premises of Kunds.

Issues of Urban Settlements, Forms and Space

River Front Development

- River Yamuna carrying all pollutants from Delhi and downstream is clogging and drying the river.
- Also barrages formed at the end of the cities holds the water along the city but carries only sewerage water beyond the city jurisdiction converting it more into a nalla.
- The Ghats of the Yamuna River are not cleaned or maintained properly and haphazard new development is coming up all along the Ghats.

Issues of Urban Services and Infrastructure

Physical Infrastructure

23. Sources of water supply and quality of water are a huge concern for the region.
24. Sewerage treatment and management is absent in most cities in TTZ
25. Electricity supply and alternatives being used in industries and residential areas are reasons for pollution and fire hazards in the region
26. Solid waste and C&D waste are mostly dumped outside the cities along the highways. Open incineration is also practiced.

3.1.8 Issues at City Level – Agra

Agra Master Plan for 2021 anticipates an area of 20,000 hectares which have been assigned landuse as per future development projections. The existing scenario of development in the city indicates some variation to the proposed Master Plan though progress has been observed in the primary focus areas of the Master Plan which includes enhancement of tourism and restricting the industrial sector.

Issues of Urban Development & Planning

Landuse

- A major increase (about 15%) in area has been observed in residential category. Much of land which was meant to be used for recreational purpose has been encroached and put to residential use.
- The area under recreational and open spaces is 2.2% which is much lesser than required for a city of Agra's size. According to Urban Development Plans Formulation and Implementation (UDPFI) guidelines, the proportion of recreational areas which includes green and open spaces to the developed area should be 20-25%.
- Re-development and renewal has taken place all along the roads leading to Tajganj area in a span of 6 years but the alleys and bays leading to the inner part of the city have not been developed leaving an incomplete network.
- The city displays an unplanned and unregulated growth in all directions with almost 50% slums.
- There are many unregulated slums and squatter developments with no infrastructure provision and poor economic conditions.
- Unregulated and unplanned growth all along the river is also an issue as the geomorphology shows that there is severe erosion and occurrence of wastelands along the river.

Industry

- There are 128 active foundry units in the city which are functioning according to environment friendly standards. This needs to be monitored.
- The 66th round of National Sample Survey Office, shows that Agra was one of the top three cities that saw maximum increase in unemployment rate in the 2000s. The rate increased from 0.2 per cent in 2004-05 to 5.5 per cent in 2009-10. A critical concern when relocating industries would be to ensure alternative means of livelihood and a well-planned transition to environment friendly technology and manufacturing practices.
- The industrial estates particularly, the Nunhai Industrial Estate are not well planned and are located next to residential zones.
- Sikandra Industrial area has sick and closed tanneries which is either used as unauthorized warehouses or illegal squatters or simply abandoned, which is a waste of valuable land.
- There are many unregistered/ illegal industries that are still running within the city.
- There are many sick industries in the core as well, again a waste of valuable land which could be put to productive use particularly in a core that is overcrowded.
- The petha manufacturing industries are small, shabby and located in unhygienic conditions within the inner part of the city.

Trade and Commerce

- Mixed used activities have emerged in the inner city with shops on the ground floor and residence on upper floors.
- The inner city area has narrow and unhygienic streets, which are being encroached by various handicrafts and small –scale activities like leather work and petha production.

Tourism

- Lack of tourist infrastructure is an issue in city.
- Some of the heritage sites of lesser prominence are in dilapidated condition.
- Areas east and west of Taj Mahal along the river are totally neglected and needs intervention.
- Areas around Mehtab Bagh is growing in a haphazard manner with new slums thriving in the area.
- In order to attract tourists, pro tourist projects have been proposed and implemented like the international Golf course, stadiums, heritage walks but not much has been done towards the development of sustainable tourism in the core and the precinct area.
- As per the study by Ministry of Tourism, Agra's availability of 50-rooms/lakh tourist is substantially lower than the national average of 423 rooms/lakh tourist. However, this could be contributed to the fact that a larger number of visitors to Agra are day tourists and usually seek accommodation in Delhi or Jaipur.
- The tourism policies by the Government suggest a significant growth in tourist footfalls in the next 20 years which will require more accommodations and hence, more hotels, restaurants and tourist infrastructure and amenities by 2050.

Issues of Urban Settlements, Forms and Space

Housing

- The core of the city experiences intense development pressure due to its proximity to the prominent tourist attractions, services and jobs.
- The peripheral areas are gradually attracting attention due to better planned infrastructure and facilities.
- Many houses in the slums are pucca with brick wall, PCC flooring whereas some people live in jhopris.
- There are many unregulated slums with no infrastructure provision and poor economic conditions.
- 51% are notified slums while the remaining 49 are non-notified.
- The slums are distributed all across the city with the highest density occupying the area along the river in the Trans Yamuna zone.
- 50% houses in slums are pucca with brick wall, PCC flooring whereas the rest 40% people live in jhopris or shacks.
- Existence of squatters is also prevalent in many parts of the city. They are migrants from nearby villages and towns.

River Front Development

- Stagnation of river water and disposal of solid wastes into the river causing water pollution
- Sewerage and drainage openings into the river makes the scenario even worse.
- The river is a clogged river with a thin stream running at one end, more like a nalla
- Very slow river front development in progress
- The river Yamuna which reduces to a trickle in the lean season exposes vast stretches of sand on its beds and banks which forms a substantial source of Suspended particulate matter (SPM)
- The low humidity prevalent in this region, also promotes formation of SPM

Issues of Urban Services and Infrastructure

Water Supply

- The area covered by piped water network is only 85 per cent.
- Hand pumps and tankers meet the water requirement in Sikandra-II, Bodla-II, Shahganj-III, Tajganj-II & III, Trans Yamuna-II & Ghatwasan-II areas.
- The percentage of water loss due to leaks from pipes and pipes appurtenances ranges between 9-37 per cent while UFW ranges between 40-45 per cent of the total supply, which is very high.
- Poor raw water quality. Excessive water loss due to leaks in water pipes and pipe appurtenances.
- Damaged water mains and distribution mains. Very low pressure at tail end.
- Catchment area of the Zonal Pumping stations is not clearly segregated.
- Out of 15 blocks in Agra, 11 are in critical condition.
- Due to illegal boring for tube wells, installation of submersible pumps in households, deforestation, lack of rain water harvesting measures and concretization of parks and green zones of the city, the ground water table is fast depleting[21].

Sewerage

- Sewerage system is old, overloaded & choked
- There are huge waterlogged areas within the city.
- Poor sanitary conditions due to clogged drains, collection of household wastewater in open pits.
- Most of the sewage goes into the open drains, floods into the adjacent areas and finally gets dumped into the Yamuna.
- The system is badly silted, choked and damaged at number of places and overloaded due to the over exploitation of limited infrastructure.
- The STPs are made to perform beyond capacity, but still treat only 10% of the sewage they receive.
- Taj East Drain is one of the most polluted and malodorous drains in the city

Power Supply

- Underground electricity supplies available, but use of solar panels and other energy sources are not being used.

Solid Waste Management

- In Agra all the waste is added to the Nagar Nigam waste without segregation. Nagar Nigam does not have a proper disposal site for dumping of solid waste.
- The arrangement for separate collection of infectious biomedical waste is non-existent and there are no separate arrangements for transportation of infectious waste from hospitals and nursing homes.

[21] https://timesofindia.indiatimes.com/city/agra/Agra-division-ground-water-level-depleting-fast/articleshow/46148548.cms

- Several temporary storage points are not cleared on a day-to-day basis. This backlog of unserved bins continues to build up during rest of the week.
- Community involvement is absent.

3.1.9 Issues at Precinct Level – Taj Mahal and Surroundings

Issues of Urban Development & Planning

Zoning for Heritage Conservation, Congestion Mitigation and Environmental Protection

- Since the river is fast dying it is essential to be very careful about the choice of development on the river front.
- It should be ensured that flood protected zones should be free of any building construction.
- Many of the river fronts are encroached by squatters though these areas are assigned as green spaces and proposed as park and gardens in the 2021 Master Plan.

Industry

- Closure of polluting industries have had adverse effect on the income of the households that relied on those industries, resulting in lower quality of life and increase in poverty and slum growth.
- Almost 90% of the home based cottage units work without proper ventilation in the work areas and inadequate waste disposal system.
- Many of the tanneries and foundries have been closed down due to environmental concerns but it has resulted in abandoned mills, now used as illegal warehouses or encroached shelters which are not only eye sores next to heritage monuments but are also prone to inappropriate in fill development which have a tendency to turn into slum like settlements.

Tourism

- Festive season and holidays result in greater congestion and pollution in the core.
- The major tourist movement is within the precinct area.
- Most of the tourist footfalls limit to the Taj Mahal and the Agra fort.
- Most trips are day trips and most of the hotels and Restaurants are also located in the Precinct area.
- This adds to the traffic and congestion in the precinct zone since it also houses most of the residents of Agra.

Issues of Urban Settlements Forms and Space

Housing

- Most settlements within the precinct are unplanned, haphazard growths without any sense of regulation. They do not have adequate infrastructure and have a slum like structure.
- Most of the settlements within the immediate precinct are more than 20 years old. Some settlements are as old as Taj Mahal itself, since they developed during the Mughal period. Particularly settlements around the Agra fort still have the same streets, same built structure but in utterly dilapidated state.

- Slum development and squatter development has also resulted in obstruction in the Heritage and river connection.
- Open areas are encroached by squatters

River

- Major impact on the environment with respect to water and air quality particularly the primary river in the region, Yamuna is not a citywide impact but a region wide impact which extends beyond the Taj Trapezium Zone.
- Currently there are dhobi ghats, crematoriums, bathing ghats, defecation grounds along the river which play a vital role in its degeneration within the precinct area.
- Over the years, households, factories and farmlands has transformed the river into a sewage dump site and the backyard of the city. The river gradually became the confluence of untreated sewage canals instead of a connection between historical monuments and civic life.
- The reclaimed land that was originally proposed for Taj corridor in 2002-2003 is now a piece of useless land partially piled with garbage from an influent sewage canal further threatening the fragile hydrological environment of Yamuna River.[22]

Issues of Urban Services and Infrastructure

Infrastructure balance and prioritization

- Tourist potential invite poor migrants to the city, most of who settle down in the already dense slums in the hopes of better employment opportunities but eventually press the cities infrastructure particularly the core beyond its capacity.
- A significant percent of 43% of the households do not have access to drinking water and are dependent on public water taps, tube wells, open wells, hand pump and water tanker.
- Sewage connections are devoid of proper house connection.
- Most of the sewage goes into the open drains.
- 98% of the slums have street lighting facilities, not all of which are in working condition and found to be insufficient
- Animals on the road not only increase congestion but also cause dirt and filth on the roads.

[22] Source: Rethinking Taj Heritage Corridor: A River as Historic Connection

4 Linkages and Transportation

4.1 TTZ LEVEL

4.1.1 No designated mobility corridors

Based on the functionality of road, the urban roads are classified as arterial, sub-arterial, collector and local streets, which is an important step in designing and management of roads. In various settlements within TTZ even though road hierarchy exits, the standards are not maintained. Due to traffic congestion the vehicular speeds for all vehicles reduce and more so for the public transport vehicles. Since the travel times by public transport vehicles gets increased to a higher extent as compared to a private vehicle, commuters prefer to travel by private modes of transport.

Thus, it is imperative to have few strategic roads designated as mobility corridors to prioritize them to get priority for increasing the throughput and operating level of service.

4.1.2 Heterogeneity of vehicles sharing the same road space

All the settlements in the TTZ region, have heterogeneity of vehicles which share the same road space which is a serious concern in view of road safety and deterioration of existing infrastructure in terms of poor utilization and reduced capacities. The major target of this are cyclist and pedestrians which actually are the more efficient users of scarce road space than private motor vehicles. Thus, the safety of cyclists and pedestrians must be ensured in each of the settlements by providing dedicated infrastructure for cyclist and grade separated facilities (such as pedestrian foot-over-bridges or subways) or at-grade facilities (such as zebra crossings, striping, pedestrian flashing signals etc.) based on a detailed studies.

4.2 AGRA LEVEL

4.2.1 Unmitigated increase in personalized vehicles

The city has been witnessing an unprecedented increase in vehicle registration. Over the past five years i.e. during 2012-2017, vehicle registration has grown at a rate of 17%. During the same period, registration of four wheelers (4W) comprising of cars, vans, jeeps have increased at a rate of 31% and two-wheelers (2W) at a rate of 16%.

The total number of registered vehicles in the year 2017 was 89986 which is at a rate of over 245 vehicles per day. It is also significant to note that non-transport vehicles (2W-scooter, moped, motorcycles and 4W-cars, vans, jeeps) contribute to the

maximum share of registered vehicles i.e. 94.3% and the transport vehicles (heavy duty trucks, light commercial vehicles, buses-stage/contract carriages/ private, taxis, passenger autos) contribute a share of 5.7%.

Further, eighty-one per cent of these registered non-transport vehicles are two wheelers and twelve percent are four-wheelers. As a result of this unmitigated increase in the non-transport / personalized vehicles, the city roads has been witnessing growing vehicular traffic and the physical infrastructure hasn't been able to keep pace with this growth in demand.

This rapid motorization has led to severe congestion problems, longer journeys and higher per capita trips. The average vehicular speed in Agra is about 25.3 km/h (Source: Draft CMP Agra, 2017).

4.2.2 Pollution load due to vehicular emissions

Vehicular emissions is one of the major contributor to air pollution. Unlike other pollutions from industries, they are released at the ground level and hence the impact on the vulnerable road users is more from these sources. The vehicular growth in the city has been at an average rate of 17%. With this high growth, the impact of air pollution from vehicular growth would be tremendous.

With the limited data available, the vehicular pollution has been estimated at two levels i.e. pollution due to intra city trips and due to intercity trips. The detailed approach for estimating the emissions at these levels is discussed below:

Vehicular Emissions due to Intra City Trips: The existing population and the per capita trip rates have been used for estimating these emissions.

- **Step 1:** Estimated the total person trips by multiplying the population with per capita trip rates.
- **Step 2:** Converted the person trips to mode-wise vehicular trips considering the modal share and the occupancy of each mode.
- **Step 3:** Estimated the total vehicle-kms travelled by multiplying the vehicular trips with the average trip length.
- **Step 4:** Estimated the pollution load by multiplying the vehicle kms travelled by each mode with their respective emission factors.

Vehicular Emissions due to Inter City Trips: Being a tourist city, Agra attracts a large of intercity vehicular trips. Thus, the pollution loads due to these trips have been estimated separately. The traffic volume count at outer cordon points have been used for estimating these emissions.

- **Step 1:** Total vehicular trips have been considered from the traffic volume count surveys at outer cordon mentioned in studies carried out earlier.
- **Step 2:** Total vehicular trips have been considered to mode wise vehicular trips considering the modal composition of traffic at outer cordon.

- **Step 3:** Estimated the total vehicle-kms travelled by multiplying the mode wise vehicular trips with the average trip length.
- **Step 3:** Estimated the pollution load by multiplying the vehicle kms travelled by each mode with their respective emission factors.

The total pollution load due to vehicles has been calculated by adding up the both the pollution loads estimated. The total pollution load generated from the vehicles is estimated to be 2.18 tons/day of PM, 14.76 tons/day of NOx and 17.41 tons/day of CO. Table 1 below summarizes the total pollution load estimated from vehicles and Annexure 4.1 presents the detailed methodology adopted for estimating the pollution load from vehicles.

Table 1. Summary of estimated pollution load from vehicles

S.No	Pollutant		Emissions						Total
Mode		Car/Jeep/van	2Wheeler	Autos	Buses	E-rickshaws	Trucks	Tractors	
a	**CO_2 (Tons/day) ***	117.72	170.25	72.10	107.56	0.01	0.00	0.00	**467.64**
b	**PM (Tons/day)**	0.02	0.13	0.19	0.19	0.00	1.51	0.14	**2.18**
c	**NO_x (Tons/day)**	0.30	0.61	0.52	1.63	0.00	10.74	0.96	**14.76**
d	**HC (Tons/day) ***	1.40	4.72	1.80	0.97	0.00	0.00	0.00	**8.88**
e	**CO (Tons/day)**	0.84	5.09	4.12	0.15	0.00	6.60	0.61	**17.41**

**Does not cover emissions due to trucks and tractors*

4.2.3 Parking Issues

The on-street parking is another major concern in all the settlements of TTZ, which is making the roads chaotic and conflict ridden. Stretches like Sikandara Road, Agra Fort Road, Raja ki Mandi Railway Station, MG road(near Devi Ram Crossing), Jagnair Road (near Kheria Crossing), Near Bijli Ghar Chowk) and Yamuna Kinara Road in Agra have their effective road widths reduced due to on-street parking. At places, the parking is done on the walkways, and there is insufficient street space for pedestrians, cyclists and public transport.

At places, there does exist parking places still people prefer to park on-street because of lower convenience and high prices. Parking slots at major terminals and tourist spots in Agra like Taj Mahal, Agra Cantt and Raja ki Mandi station indicate high prevalence of private cars, taxis and autos which is poorly managed. This poorly managed on-street parking harms safety and liveability and leads to severe congestion and public transport delays.

Since, transport is one of the contributor towards environmental pollution, the issues of parking need to be addressed with the objective of enhancing road capacities and environment. For those having private owned vehicles, the parking charges, location of parking bay and strict penalty for unauthorized parking could play a major role in how an individual would prefer to travel.

4.2.4 Poor Public Transport Services

Agra has a bus fleet of about 170 buses existing i.e. about 7.5 buses per lakh population (Source: Draft CMP Agra, 2017). The service level benchmarks (Urban Transport Service Level Benchmarking for Indian Cities, MoUD, 2011) indicate that the supply of buses should be about 60 buses per lakh population, which clearly indicates that the existing supply of public transport services in Agra is very poor. Further, the condition of these buses poor as the fleet is very old and most of the buses are normal buses, very few low floor buses operate.

Thus, because of unreliable and poor coverage of public transport, intermediate public transport (autos, shared autos and e-rickshaws) act as the main spine of mobility in the city. These modes act as a competing mode for public transport rather than as complimenting modes. So, it is must to improve the quality and service of public transport to encourage more users to public transport.

4.2.5 Poor Road Infrastructure

The road infrastructure is most of the settlements in the TTZ region are focused on the motorists and pedestrians are at the mercy of the motorists. In Agra, most of the roads are devoid of any pedestrian/non-motorized transport (NMT) infrastructure

despite the fact that the city has about 33% NMT share (Source, Draft CMP, 2017). This forces the pedestrians to either walk on busy roads or cross roads amid heavy motorized traffic whereas they should have highest amount of regard in terms of design of roads.

In Agra, about 27% of the roads have footpath and most of the roads lack footpaths posing safety threats to the pedestrians. Further at places, where the footpath exists the design standards are not maintained. There is no continuity and at places the curb height exceeds up to 300-350 mm against the standard norms of 150mm. In case the increased curb height is for avoiding parking along the curbs than protective techniques such as bollards and planters could have been employed, which would have met the design standards. Also, another menace added to the pedestrian pathways is the encroachments by vendors and for parking leaving no space for pedestrians to walk. Further these street infrastructure does not address universal accessibility and also address the convenience and comfort of other users. Marked pedestrian crossings are very rare.

Another safety hazard for the road users is the poor condition of the medians. The medians are damaged at places encouraging disordered traffic movements by 2-wheelers and -wheelers/autos who prefer to take U-turns through the gaps.

4.2.6 Unorganized Intermediate Public Transport (IPT)

The IPT operating in the city primarily includes CNG autos, tata magic, e-rickshaws and 6-seater battery operated golf cart. These IPT modes act as a main spine of mobility. Despite this, very few designated parking spaces for IPTs exits, which compels the passengers to board/alight on the roads/carriageway itself, leading to congestion.

Further, the market of e-rickshaws is growing tremendously in Agra as well as in other settlements of TTZ. These e-rickshaws combat pollution as compared to autos or other fossil fuel operated vehicles, however majority of them use lead acid batteries which degrade the environment. Also most of the e-rickshaws plying are still unregistered which is a serious safety hazard for users as well as driver.

4.2.7 Poor Terminal Conditions

The major terminals in the city are very chaotic. For example, the Raja ki Mandi station has various issues like on-street parking, encroachments by temporary vendors on both sides of the road, congested road conditions and others.

Similar conditions were observed near ISBT where the boarding/ alighting of passengers was observed along the carriageway causing congestion. No designated spaces are earmarked for parking of autos and cars.

4.2.8 Multimodal Integration

There is no organized interface between regional and local public transport services. Thus, most of the people either prefer 3 wheelers or taxi for commuting particularly at the railway stations. Agra Cantt station was observed to have a high demand for parking for autos and cars. Therefore, proper multimodal integrated hubs are required to be designed and developed at major terminals with organized parking for other modes.

4.3 OTHER SETTLEMENTS IN TTZ

4.3.1 Vrindavan

Vrindavan is another tourist place located at a distance of about 11 km away from Mathura, It offers several attractions like Bankey Bihari temple, ISCKON, Prem Mandir, Samadhis, Ghats, kunds and institutions of religious and cultural education. In 2015, the city attracted 12.6 million domestic tourists and 47,890 international tourists (Source: UP Tourism Statistics).

The settlement has important historical linkages with surrounding places i.e. Mathura, Gokul, Govardhan, Nandgaon. However most of these above mentioned places have very poor infrastructure. Most of the approach roads are very narrow (3-8mts) with commercial activities on both sides, inadequate road signages and poor drainage system are the most prominent issues.

The settlement also has a 10.3 km long Parikrama Marg where a large number of devotees walk barefoot to perform the rituals. This pathway does not have an identifiable infrastructure to define a pilgrimage route. Lack of pedestrian-friendly environment and tourist infrastructure prevail. Sidewalks are available at places, however, they are encroached by vendors and parked vehicles. Traffic comprising of animal carts, cycle rickshaw, cycles, autos, cars, two wheelers compete on the same road space.

Over time, the vehicular traffic has been increasing in Vrindavan, and strategies of widening of roads like Mathura Vrindavan Road are proposed. However, the future vision to be to discourage private vehicles within the city. The existing traffic needs to be managed and actions to de-congest the city should be taken by encouraging energy efficient environment friendly technologies like electric vehicles, non-motorized vehicles and pedestrian environment.

There exists a multi-level car parking in the city which is underutilized. This is due to no proper enforcement of parking regulations in the city. On-street parking (by private vehicles, autos and other vehicles) is high along the pilgrimage routes like Bhakti Vedanta Marg, Parikrama Marg.

Further public transport connectivity to Vrindavan exist, however it is not very efficient, and majority of the people travel from Mathura by shared autos.

4.3.2 Mathura

Mathura another settlement in the TTZ region which attracts a large number of pilgrims/tourists is turning into a concrete jungle with new residential developments and growing commercial activities. Large number of autos, tempos and private vehicles ply on Mathura-Vrindavan road to provide connectivity to Vrindavan. Access roads to most of the tourist sites do not have pedestrian friendly environment. NH 19, the main spine of the city has issues of on-street parking, growing commercialization, no designated infrastructure of non-motorized transport. The pilgrimage routes and the mobility corridors in the settlement is not well established.

4.3.3 Tundla

Tundla situated along NH-2 is a linear settlement is connected to the railway station on the other end of the city. This road acts as the central spine of the city with a 4-lane divided carriageway (ROW of 30 meters) and paved shoulders of 5-7meters on both sides. This city has developed along this spine which faces similar issues of on-street parking and encroachments by vendors.

4.3.4 Firozabad

It is a small industrial town renowned for glass bangles and other glass products. NH-2 passes through the center of the city, and, the settlement to its left (i.e. towards Tundla) is much dense with narrow streets and huge commercial activities. The main markets like Suhaag Nagar and Sadar bazaar are the major attraction points. A lot of pushcarts seen plying in the city selling bangles. The narrow and dense road networks are highly congested with all types of motorized and non-motorized traffic, pedestrians and parking all sharing the same road space. Some of the internal roads have barricades to discourage the pushcarts to ply on the NH-2, despite which it is highly congested due to on street parking by autos, encroachment by vendors. Similarly, some of the market areas are restricted for four wheelers despite which it is not environment friendly. Since, the economy of Firozabad depends on its bangle industry and the industry needs to be uplifted for improving the socio-economic status of the workers.

4.3.5 Bharatpur

This settlement is located along the Agra Jaipur Highway. The city attracts substantial number of tourists primarily for the Bharatpur Bird Sanctuary. There are other tourist sites like Bharatpur Palace, Government Museum, several Temples, Lohagarh Fort, etc which are usually not explored much by tourists. The city has Lohagarh Fort in the

center with a 4-lane divided circular road surrounding it. Several narrow radials connect this circular road to the Fort.

Bharatpur as tourist destination has great potential but requires proper infrastructure planning. There are numerous rickshaw peddlers to take tourists through the bird sanctuary. Training these rickshaw peddlers to promote the city's history and other tourist destinations can enhance tourism further.

4.3.6 Hathras

Hathras is a small settlement that has developed linearly along the Hathras-Agra road. The city has an existing by-pass to decongest the inner city. The city does not have direct bus connectivity to other destinations; hence the commuters need to travel to either Aligarh or Mathura. On-street parking is observed along most of the roads. The city has several micro or small scale industrial units wooden furniture, dye, color manufacturing, electrical and machinery etc.

4.4 TAJ PRECINCT LEVEL

4.4.1 Poor pedestrian environment

The primary route to Taj Mahal constitutes of approximately 1 km drive along the busy Fatehabad Road, which then merge into the narrow, congested and winding streets of the Taj Ganj and finally reaches the Taj Mahal gate. Similarly, the distance between Agra Fort and Taj Mahal (via West Gate road) is about 1.3kms, which is a walkable distance. However, the road environment does not encourage users to walk. An unpleasant and congested situation with several autos, e-rickshaws, tongas, no shaded pathways deter the commuters from walking.

Another link between Agra Fort and Purani Mandi Chouraha (at the entrance of the Taj Ganj) is about 1.8kms via Agra Bah Road. This stretch also does not provide pedestrian friendly environment. The curb height of footpath is exceeding up to 300-350 mm, and also encroached by vendors.

4.4.2 South Entrance

The south gate was historically the royal axis route to Taj which is now closed for entrance. This road is very narrow (ROW of only 3-7meters). Neither does it have a good surrounding environment with cables hanging and several advertisements/ bill boards all around.

4.4.3 Unappealing road environment

There are no dedicated bays for PT and IPT stops and boarding/alighting occurs on the carriageway near Taj West Gate entry creating chaotic environment. Further, the movements of horse carts along carriageway creates disruption in movement of

motorized modes. Due to this intermixing of fast and slow-moving traffic, there is hindrance to smooth traffic flow.

At places, there are poor pavement conditions which causes hindrance to smooth traffic flow and higher vehicular emissions. Also, there is a lack of appropriate directional signages.

5 Issues of Heritage: Natural, Tangible and Intangible

The Taj Trapezium Zone (TTZ) is a region with a diverse and rich heritage having ecological, historical, cultural, associational, architectural, and aesthetic significance. This heritage is under threat due to absence of a holistic approach which should aim at an inclusive urban and economic development model focused on heritage assets located in the region. The following section identifies some of the key issues threatening this precious heritage, based on which strategies for its protection and conservation can be formulated.1The issues pertain to ecological linkages with heritage, community engagement with heritage, traffic, and access to heritage sites, urban development impact on heritage and administration of heritage assets.

5.1 REGIONAL SCALE: TTZ AREA

The entire region has a very rich history resulting in a diversity of heritage, spanning centuries of building activity from the Mauryan to the Colonial period, comprising of archaeological sites, havelis, temples, mosques, gardens, water bodies, groves. This layering of history goes largely unrecognised with a few settlements and layers of history getting precedence over others and in the process other settlements are neglected and the heritage lost. The table below very briefly outlines the key aspects of this history.

Table 1 History, typologies and significance of the settlements in TTZ region

District: Agra					
Settlement	**Agra**	**Period**	**Lodi, Mughal, Colonial**	**Significance**	**Architectural, Archaeological, Ecological, Socio-cultural, Economic**
History					**Major Typologies**
Sultan Sikandar Lodhi (1488–1517) moved his capital from Delhi to Agra in 1506 CE before it became the capital of the Mughal Empire from 1556 to 1658 CE. The colonial imprint of the city was established with the setting up of the cantonment in the early nineteenth century.					Fort, Memorials: Tombs, *Chattris*, Mosques, River Front Gardens, *Havelis,* Gateways, Churches, Institutions.
Settlement	**Sikandra**	**Period**	**Lodi, Mughal, Colonial**	**Significance**	**Architectural, Archaeological**
History					Major Typologies
Sikandra is named after Sikandar Lodi, who was in power from 1488 to 1517 CE. Sikandra Fort is located in the western periphery of the city at					Fort, Tombs, Tank, Archaeological remains.

[1]The list of heritage assets compiled for analysis and reflected in all the tables that follow is based on secondary sources and preliminary site surveys. It is not a comprehensive list of heritage resources in the region but is only indicative.

a distance of about 10 kms from the city center. Sikandra also has the mausoleum of the Mughal emperor Akbar.					
Settlement	**Etmadpur**	**Period**	**Mughal**	**Significance**	**Architectural, Ecological**
History					**Major Typologies**
The town is believed to be named after Mirza Ghiyas Beg or Itimad-ud-Daulah, a Mughal official, father of Nur Jahan and grandfather of Mumtaz Mahal.					Memorial, Water tank, Pavilion
Settlement	**Fatehpur Sikri**	**Period**	**Mughal, Colonial**	**Significance**	**Architectural, Archaeological, Ecological**
History					**Major Typologies**
The city was founded as the capital of Mughal Empire in 1571 CE by Emperor Akbar. After settling in Agra in 1803 CE, the British established an administrative center here and it remained so until 1850.					Walled city, Mosque, Havelis, Gateways, *Kos minars*
Settlement	**Fatehabad**	**Period**	**Mughal**	**Significance**	**Architectural, Ecological**
History					**Major Typologies**
Fatehabad was founded by the Mughal ruler Aurangzeb after his victory over his brother Dara Shikoh in 1658 CE. Fatehabad was later associated with Maratha king Daulat Rao Scindia (1794–1827) who ruled from Gwalior.					Sarai, Mosque, Bagh

District : Mathura					
Settlement	**Mathura**	**Period**	**Ancient, Medieval, Colonial**	**Significance**	**Architectural, Ecological, Religious, Socio – Cultural and Archaeological**
History					**Major Typologies**
Mathura is principally associated with the birthplace of Krishna. In times 5th century BCE, it was a major metropolis and the capital of the Surasena kingdom. Mathura saw its `golden age' during the rule of the Kushanas. It remained a center of power during the Mauryan period, through the rule of Emperor Ashoka to the Gupta era (4th century CE). During Akbar's reign the city again became the center of religious, artistic and literary activities. Jats ruled it till 1770 CE after which it came under the Marathas and then to the British when the Cantonment was established in 1804 CE. Mathura district was formed in 1832 CE.					*Ghats*, temples, *Kunds, dharamshala*, archaeological mounds and remains, mosques, Fort, *havelis, bazaars, Baoli, Matha,* Institutional and Residential buildings in Cantonment area.
Settlement	**Vrindavan**	**Period**	**Ancient, Mediaeval**	**Significance**	**Architectural, Ecological, Religious, Socio – Cultural and Archaeological**
History					**Major Typologies**
Vrindavan was not a very significant settlement until 1515, when Chaitanya Mahaprabhu interpreted Vrindavan and its surrounding landscape as the homeland of Lord Krishna. It received patronage during the Mughal and Jat period.					*Ghats*, Temples, *Kunds*, Baithak, *Havelis, Vans, Dharamshalas,*
Settlement	**Govardhan**	**Period**	**Ancient, Mediaeval**	**Significance**	**Architectural, Ecological, Socio-cultural, Archaeological and Religious**
History					**Major Typologies**
Govardhan hill has great religious significance in view of its association with Lord Krishna. It has architectural ensembles attributed to Bundela and Jat rulers, Veer Singh Deo, ruler of Orchha 1675 CE and Jat rulers Suraj Mal, and Jawahar Singh, the king of Bharatpur (1707–1763).					Hill, Archaeological Mound, Temple, cenotaph, *Chattri, Kunds*.
Settlement	**Gokul**	**Period**	**Ancient, Mediaeval**	**Significance**	**Architectural, Religious, Ecological, Social**
History					**Major Typologies**
Gokul is believed to be the settlement where Lord Krishna was brought up by his foster mother Yasodha.					Residential, Ghats, Temples.
Settlement	**Barsana**	**Period**	**Ancient, Mediaeval**	**Significance**	**Architectural, Religious, Ecological, Social**
History					**Major Typologies**
The settlement is associated with Radha, the favourite *gopi* of Krishna, who was born in Barsana and spent her childhood here. Barsana is surrounded by hills, which is why it has high ecological value because of the presence of numerous *kunds*. It also has *Jat* period *havelis* and monuments and a red sandstone temple of Hari Deva built by Raja Man Singh during the reign of Akbar.					Temples, Palaces, *Havelis*, *Bagh* and *Baghichis, Kunds* and *Vans.*

Settlement	Nandgaon	Period	Ancient, Mediaeval	Significance	Architectural, Religious, Ecological, Social
History					Major Typologies
Nandgaon is believed to be the home of Lord Krishna, where he spent his childhood along with his foster father Nanda Baba and mother Yashoda.					*Kunds*, Temples, *Havelis*
Settlement	Baldeo	Period	Ancient, Mediaeval	Significance	Architectural, Religious, Ecological, Social
History					Major Typologies
According to Hindu mythology, it is believed that Baldeo is the place where Lord Krishna's elder brother named 'Baldeo' use to reside.					Temples, *Havelis*, *Kund*s
Settlement	Mahavan	Period	Ancient, Mediaeval	Significance	Religious and Ecological
History					Major Typologies
Mahavan is also called Brihadvan, because it was the largest of all the forests. It is believed that Krishna and his friends used to come for *Ras* to the Mahavan forests.					*Vans*, *Kunds*
Settlement	RadhaKund	Period	Ancient, Mediaeval	Significance	Architectural, Religious, Ecological
History					Major Typologies
It is believed that Krishna and Radha spent time together at this site and has many myths about their pastimes.					*Kunds*, Temples
Settlement	Chaumuha	Period	Ancient, Mediaeval	Significance	Religious, Ecological
History					Major Typologies
Chaumuha is a settlement where Brahma Vimohan Leela took place during Krishna's time. Because of this the village has been named Chaumuha, indicating four heads of Brahma.					*Kunds,* Temples
Settlement	Chatta	Period	Ancient, Mughal	Significance	Architectural, Ecological
History					Major Typologies
The place has derived its name from Chhatra Dharana in Krishna's life. It has a fort like *serai*with high walls and bastions built in the reign of Sher Shah Suri and later embellished by emperor Akbar					*Kund, Serai, Kos minar*
Settlement	Kosi Kalan	Period	Mughal	Significance	Architectural and Ecological
History					Major Typologies
The settlement was an important trade centre on the Mughal imperial highway and has a large *serai* known as Shahi Serai, ascribed to Khwaja Itibar Khan, governor of Delhi during Akbar's reign. It was briefly occupied by Ranjit Singh, the Jat king, when retreating to Barsana in 1774 CE.					*Kunds* and *Serai*
District : Hathras					
Settlement	Hathras	Period	Ancient, Jat Period, Colonial	Significance	Archaeological, Architectural, Ecological, Religious, Socio-cultural, Economic
History					Major Typologies
Archaeological remains of Hindu, Buddhist, and Jain culture as well as items from the Shung and Kushan periods were found at many locations in Hathras. The fort dates from the Mauryan period. Many *bagichis* or the gardens of Jat period survive. A typical feature of almost every *bagichi* is the *akhara* or the wrestling ring where juveniles and adults practice various forms of wrestling. In 1716 CE, the Jat ruler Raja Nandram's son, Bhoj Singh, took over the rule of Hathras from the Rajput rulers, followed by the Scindia ruler Madhavrao I Scindia in 1784 CE. Hathras was an industrial hub during the British Raj with several cotton-presses and spinning mills.					Fort, Archaeological remains, *Bagichis, Havelis*, temples, Tanks
Settlement	Sadabad	Period	Late Mughal, Colonial	Significance	Architectural
History					Major Typologies
Sadabad was a zamindari of Lalkhani Muslim Rajput in the eighteenth and nineteenth century.					*Haveli* of Nawabs,Mosque
District : Firozabad					
Settlement	Firozabad	Period	Mughal, Jat, Marathas	Significance	Architectural, Economic
History					Major Typologies
Firozabad was founded by Firoz Shah Tughlaq and flourished during the time of Akbar and Jehangir. Bajirao Peshwa looted Firozabad and Etmadpur in 1737 CE. The Jats of Mahawan also ruled Firozabad for 30 years.					Mosques, Tombs, *Havelis*, Residences, *Bazaars*
Settlement	Tundla	Period	Colonial	Significance	Architectural

History					Major Typologies
Tundla developed as a major junction on the East Indian Railway in the colonial period and a main center of British administration resulting in a typical railway colony settlement with a railway station, bungalows, churches and barracks exemplifying industrial heritage.					Residential colony with Barracks, Church
District : Bharatpur					
Settlement	**Bharatpur**	**Period**	**Jat, Marathas, Colonial**	**Significance**	**Architectural, Economic**
History					**Major Typologies**
Bharatpur is also known as Lohagarh. In 1733 AD, Maharaja Suraj Mal built the city of Bharatpur as a well-fortified settlement. It changed hands between the Jats and Marathas in the eighteenth and early nineteenth century till Lord Combermere laid siege in 1825 CE and Bharatpur became a part of the British empire.					Fort, Moat, Temples, Palace, Gateways, Residences and *havelis.*
Settlement	**Deeg**	**Period**	**Jat**	**Significance**	**Architectural, Socio-Cultural, Ecological**
History					**Major Typologies**
Deeg was a palace garden retreat town in north of Bharatpur, laid by the Jats of Bharatpur.					Deeg Fort, Palaces, Gardens
Settlement	Kumher	**Period**	**Jat, Marathas**	**Significance**	**Architectural, Ecological**
History					**Major Typologies**
Kumher was founded by a Jat chieftain Kumbh. In 1754 CE, when Raja Surajmal of Bharatpur was the king, the fort at Kumher was under siege by the Marathas.					Fort, Palaces, *Kunds*, *Talaab*, Pavilions
Settlement	**Bayana**	**Period**	**Ancient, Mediaeval, Jat**	**Significance**	**Archaeological, Architectural.**
History					**Major Typologies**
Bayana is famous for Bijaigarh (Vijaygarh) fort which was built by Raja Bijai Pal in 1040 CE. It was an important settlement in the period of Sikandar Lodi, Humayun and Akbar and finds mention in Ain e Akbari by Abul Fazl as "this town is the burial place of many illustrious men".					Fort, Archaeological remains and inscriptions, Temples, Mosques, Tombs, Gateways, *Chattri*
Settlement	**Rupwas**	**Period**	**Mediaeval**	**Significance**	**Architectural, Ecological**
History					**Major Typologies**
The settlement was important in the period of Akbar, Shahjehan and Jat rulers.					*Chattri*, Tank, Residences

There is no comprehensive record of all the built, natural and intangible heritage assets of the region. The entire region is a cultural landscape, but heritage is understood and recognised only interms of a few buildings, due to which the linkages between culture and landscapethat existed historically are lost, leading to a loss in the quality of life. Because of lack of awareness and absence of identification of this rich heritage, there is very limited local administrative protection of built heritage, due to which the heritage is disappearing.

Table 2 Number of ASI, State protected and unprotected sites

Settlement	ASI Protected	State Protected	Unprotected Sites
AGRA			
Agra	55	0	111
Bah	0	1	0
Fatehpur Sikri	1*	0	20
Eitmadpur	3	0	0
Jagner	1	0	0
Jajau	1	0	0
Kgarol	1	0	0
Kakretha	1	0	0
Rasulpur	1	0	0
Rajwara	1		

Settlement	ASI Protected	State Protected	Unprotected Sites
ETAH			
Basundhra	1	0	0
Malawan	1	0	0
Noh Khas and Khera Noh	1	0	0
FEROZABAD			
Tundla	0	1	2
Shikhohabad	4	0	0
Ferozabad	0	0	6
HATHRAS			
Hathras	**2**	0	6
Sikandra	0	0	3

Mau	1	0	0
Sadabad	0	0	1
Sikandra	6	0	6
Fatehabad	0	0	3
BHARATPUR			
Bayana	**9**	0	5
Bharatpur	**14**	13	162
Brahmabad	**2**	0	0
Deeg	**6**	0	3
Kaman	**2**	0	0
Kumher	0	1	4
Malah	**1**	0	0
Noh	1	0	0
Rupwas	**2**	0	0
* group of 36 structures			

Rao			
Sadabad	0	0	1
MATHURA			
Bajna	1	0	0
Baldeo	0	0	14
Barsana	1	1	21
Chamah	1	0	0
Chatta	5	0	2
Chaumuha	0	0	2
Gohari	1		
Gokul	0	0	32
Govardhan	0	5	44
Kosi Kalan	2	0	1
Mahavan	0	3	15
Mathura	16	2	76
Nand Gaon	0	2	35
Radha Kund	0	0	16
Vrindavan	5	1	85

Several archaeological sites are not recognised as culturally significant areas, and in the absence of adequate protection are encroached upon or stay neglected.There are only 2 state protected and 23 ASI Protected archaeological sites identified in the region, there are several more archaeological mounds which are still unprotected such as Ganesh Tila in Mathura, Bardola Tila in Barsana, Girdharpur mound in Mathura, Kankor Tila in Mathura, Saptarishi Tila in Mathura,and Govindpura tila in Mathura.

Table 3 List of Protected Archaeological Sites

Site	Settlement	Protection Status
AGRA		
52 Bullock Well	Agra	ASI protected
Inscribed tablet in a piece of the old city wall of Agra	Agra	ASI protected
Old Tila and Tasu Tila	Khawaspur	ASI protected
BHARATPUR		
Ancient Mound	Noh	ASI protected
Rathakhana	Bharatpur	ASI protected
Ancient Mound	Malah	ASI protected
HATHRAS		
Remains of an old Hindu temple inside the Dayaram's fort	Hathras	ASI protected
ETAH		
Khera Basundara	Basundra	ASI protected
Two Mounds together with a statue	Noh Khas, Khera Noh	ASI protected
Remains of an old temple	Malawan	ASI protected

Site	Settlement	Protection Status
MATHURA		
Mound at Govindnagar	Govindnagar	State Protected
Ancient mound of Sonkh	Barsana	ASI protected
Small mound locally known as Chavar	Kosi Kalan	ASI protected
Palikhera Mound	Mahavan	ASI protected
Ahalyaganj Mound	Mathura	ASI protected
Chamunda Tila	Mathura	ASI protected
Ancient Site	Mathura	ASI protected
Gayatri mound	Mathura	ASI protected
Gopal Khera	Mathura	ASI protected
MATHURA		
Kankali tila, Jain and Chaubara Mound	Mathura	ASI protected
Mound marking the Old Fort	Mathura	ASI protected
Portions of Katra Mound	Mathura	ASI protected
Site of ancient Pokhar (Pushkarini)	Mathura	ASI protected
Pillar with Sanskrit inscription dated samvat 1666 in the flanking tower	Mathura	State Protected

at the Bhanakaur tank		
Ancient sculptures, carvings, images, bas-reliefs, inscriptions, stones and like objects	Mathura	ASI protected

Each of the settlements in the region has a rich history, which has expressed itself in very distinct morphological character and functional and economic base. This is reflected in the core historic areas as heritage zones, heritage precincts, and heritage streetscapes, each with a unique urban character. However only individual buildings are recognized and protected as heritage and large areas and precincts and core areas go unprotected and are prone to urban transformations resulting in loss of heritage character. In the absence of this recognition of their specific identity, the potential to highlight and enhance their unique urban character, which would additionally help them become major visitor destinations, is lost.

Table 4 Settlement wise Heritage precinct /heritage streets[2]

AGRA
Taj Precinct and Riverfront Gardens, Agra
Precinct 1: Taj Mahal and immediate surroundings, Agra
Precinct 2 : Extended Riverfront Gardens
Historic Core of Agra
Precinct 3 : Hing ki Mandi and Surrounding areas
Precinct 4: Marble industry of Gokulpura, Agra
Precinct 5 : Belanganj and its bazaars
Precinct 6 :Colonial Bungalow precinct, Agra
Precinct 7: Colonial Institutional Precinct, Agra
Precinct 8: Precinct of Sikandra

FATEHPUR SIKRI
Precinct 1: City of Victory: Settlement of Fatehpur and Sikri
Precinct 2: Mughal Imperial Highway Precinct

HATHRAS
Precinct 1: Baghs and Bagichis of Hathras

BARSANA
FOOT HILLS AND HISTORIC CORE
Precinct 1 : Core settlement at the foot hills
KUNDS AND VANS OF BARSANA
Precinct 2 : Vrishbhanu Kund Precinct
Precinct 3 : Kunds and Temple
Precinct 4 : Sakhi Giri Parvat Precinct

MATHURA
Historic Core of Mathura
Precinct 1: *Tilas* and Ghats of Mathura
Precinct 2: *Bazaar* Streets with *Havelis* and shops
Archaeological and Mythological Core of Mathura
Precinct 2: Mosque and Janmabhoomi Precinct with the bazaar, Mathura

[2]Source: Preliminary surveys, INTACH Listing of Agra, Built Heritage Resource Mapping of Bharatpur and Braj Corridor Report for UP Pro Poor Tourism Development Project prepared by INTACH.

Precinct 3: Shiv Taal Precinct
Precinct 3: Bhuteshwar Road Precinct
Colonial Core of Mathura
Precinct 3: Colonial Precinct of Mathura

VRINDAVAN
Parikrama Marg Zone
Precinct 1: Ghat Precinct of Vrindavan
Precinct 2: Temple precinct of Parikrama Route
Significant Temples and Environs
Precinct 3: Rangji Temple and Govind Dev Temple precinct, Vrindavan
Precinct 4: Banke Bihari Temple and Bazaar lanes of Vrindavan

GOVARDHAN
Parikrama Zone
Precinct 1: Hills enveloped by Parikrama Marg

NANDAGAON
Mythological and Ecological Settlement of Nandgaon
Precinct 1: Ecological envelope of Nandgaon
Precinct 2:Mythological core precinct of Nandgaon

GOKUL
Mythological Settlement of Gokul
Precinct 1: Ghat precinct of Gokul
Precinct 2: Mythological core of Gokul

BALDEO
Precinct 1: Temple and Kund Precinct of Baldeo

BAYANA
Precinct 1 : Group of Mughal Monuments of Bayana
Precinct 2 : Syncretic Precinct of Bayana

RUPWAS
Precinct 1 : Lal Mahal Precinct

TUNDLA
Precinct 1- Colonial Precinct of Tundla

BHARATPUR
Fortified City of Bharatpur
Precinct 1 : Fort including the moat
Precinct 2 : Colonial Precinct
Precinct 3 : Historic haveli and bazaar street of Bharatpur

DEEG
Precinct 1:Royal Garden and palaces precinct of Deeg

KUMHER
Precinct 1 : Historic and Ecological precinct of Kumher

FATEHABAD
Precinct 1 : Mughal Precinct of Fatehabad
Precinct 2 : Mughal Garden of Fatehabad

FEROZABAD
Precinct 1 : Historic Bazaar Street

SIKANDRARAO
Precinct 1 : Old fort/ Tehsil precinct

SADABAD
Precinct 1 : Nawabi Palace Complex

Figure 1 Hathras: Transformation of the historic edge of the water body

Figure 2 Agra: Historic elements being engulfed in urban development

Figure 3 Mathura: Insensitive infill development along *ghats*

Figure 4 Vrindavan: Development activities along the river front

The diversity of heritage which has given these settlements its distinct urban character is also getting erased due to anonymous urban form and absence of controls and special byelaws which would recognise and respond to the special and unique built form character of these areas. For example, in the absence of any urban design guidelines, there are several new structures coming up in the ghat area, changing the spectacular skyline of the ghats.


Figure 5 Chatta (left) and Rupwas (right): Rapid commercialization and infill developments compromising the edge character of historic properties and streets lined with vernacular houses in smaller settlements

There are many water bodies which, as an integral part of heritage structures or heritage precincts, offer an opportunity for water harvesting and improving the health of local ecosystems. These water structures work in tandem with the local streams in the regional landscape. They go unnoticed and unprotected as an important component of the natural heritage in their ability to catch the surface runoff and become part of a larger hydrological system. The presence of historic bridges give clues to the presence of streams now lost due to changes in landform caused by unplanned development and changes in landuse.

Table 5 List of Heritage sites with water bodies[3]

S.no	District	Settlement	Number of sites with Water bodies	Sites with water bodies				
				Moat	Tank	Kund	Well	Baoli
1.	Agra	Agra	**5**	1	2	1	2	1
2.	Agra	Eitmadpur	**1**		1			
3.	Agra	Fatehabad						
4.	Agra	Fatehpur Sikri	**2**			1		1
5.	Agra	Sikandra	**1**		1			
6.	Bharatpur	Bayana	**2**			1	1	
7.	Bharatpur	Bharatpur	**10**	2		3	5	
8.	Bharatpur	Kumher	**2**		2			
9.	Bharatpur	Rupwas	**1**		1			
10.	Bharatpur	Deeg	**1**		1			
11.	Ferozabad	Ferozabad						
12.	Hathras	Hathras	**1**		1			
13.	Hathras	Sikandra Rao	**1**		1			
14.	Mathura	Baldeo	**1**			1		
15.	Mathura	Barsana	**7**			7		
16.	Mathura	Chatta	**2**			2		
17.	Mathura	Chaumuha	**2**			2		
18.	Mathura	Gokul	**4**			4		
19.	Mathura	Govardhan	**28**			28		
20.	Mathura	Mahavan	**5**			5		
21.	Mathura	Mathura	**5**			5		
22.	Mathura	Nandgaon	**23**			23		
23.	Mathura	Radha Kund	**5**			5		
24.	Mathura	Vrindavan	**7**			5	1	1

[3] The information is based on preliminary site survey, INTACH listing of Agra, Bharatpur listing by Urvashi Srivastava and Braj Corridor Report for UP Pro Poor Tourism Development Project prepared by INTACH.

The kunds and vans (groves) were a manifestation of the weave of natural and cultural ecology.They have not been recognised as heritage of immense ecological value and consequently have not been identified, listed and protected as heritage. Kunds are not recognised as part of the larger ecosystem, essential from the perspective of maintaining a healthy hydrological balance. This is because of lack of awareness of the traditional water management systems and the possibility of reviving them to help sustain a better quality of life.

Vans or sacred groves which worked in tandem with the kunds in providing soft surfaces to help recharge the water table have been lost due to developmental pressures. Many of the sacred groves or vans have been encroached and built upon as a result of which most have disappeared and many survive in a fragmented state.

Table 6 Forty eight forests of Vraj Mandal[4] including Vans, Upavana (sub forests), Prativanas and Adivana

S.No.	**Vans (Padma Purana)**	**Upavanas (VarahaPurana)**	**Prativanas (BhavishyaPurana)**	**Adivana (VishnuPurana)**
1.	Mahavana	Brahmavan	Rankavan	Mathura
2.	Kamyavana	Apsaravan	Varttavan	RadhaKund
3.	Madhuvana	Vihvalvan	Karahavan	Nandgaon
4.	Talavana	Kadambavan	Kamavan	Gadha
5.	Kumudavana	Svarnavan	Anjanavan	Lalita Gram
6.	Bhandiravana	Surbhivan	Karnavan	Vrishabhanupura
7.	Vrindavana	Premvan	Krishnakshipan van	Gokul
8.	Khadirvana	Mayurvan	NandapreksanaKrishnavan	Balbhadravan
9.	Lohavana	Manengitavan	Indravan	Govardhan
10.	Bhadravana	Sesagaylvana	Shikshavan	Javat
11.	Bahulvana	Naradvan	Chandravalivan	Vrindavana
12.	Baelvana	Paramanandavan	Lohvan	Sanketvana

Table 7 Twelve forests of Vrindavan and their status[5]

S.No.	**Historic Vans/ Sacred groves**	**Status**	**Present Condition**
1	Sri Atalvana	Extinct	Residential development has come up in the area
2	Kevarivana	Partially exists	Residential Landuse
3	Viharavana	Extinct	Residential Landuse
4	Gocarnavana	Extinct	Residential Landuse
5	Sri KaliyaDamanavana	Extinct	Residential Landuse
6	Sri Gopalavana	Extinct	Residential Landuse
7	Nikunjvana(SevaKunj)	Partially exists	Residential Landuse
8	Nidhivana	Partially exists	Residential Landuse
9	Radhavana(RadhaBagh)	Partially exists	Green cover is partially present in the form of Rangjika Bagicha, and other open spaces within the temple or ashram compounds
10	Jhulanavana	Partially exists	
11	Sri Gaharvana	Partially exists	
12	Sri Padapavana	Extinct	Residential Landuse

Urban development around the edges of kunds is detrimental for their efficient functioning as water harvesting and ground water recharge facilitation. It is observed that embankments are being constructed around the kunds as part of the ongoing

[4]http://en.brajdiscovery.org/index.php?title=Vanas_of_Braj

[5]Sri Vraja-mandala Parikrama, Gaudiya Vedanata Publications.2007

projects of 'beautification' and 'repair' of kundswhich is detrimental to the ecology of the region as it is diminishing their role as water harvesting structures. As part of interpretation of these kunds many insensitive developments in the form of theme parks with excessive hard surfaces are being constructed around these sacred and ecologically sensitive sites.

Figure 6Chiksauli near Barsana: ongoing 'beautification' works of building embankments around*kund*

Figure 7Chaumuha: Ongoing inappropriate works and development of theme park around the *kund*

Many of the kunds have been abandoned and are used as areas for garbage dumping in the absence of a city level solid waste management strategy. Eutrophication is observed in several kunds due to stagnation of water and incompatible uses around.

Figure 8 Hathras: Eutrophication of the water body in historic water tank along the road being treated as garbage dumping site.

Figure 9 Settlement between Barsana and Govardhan: Eutrophication of the water body

Urban development and growth trajectories have ensured that the settlements turn their back to the river and the heritage along the river, reducing the riverfront to a backyard. Cities have turned their backs to the river and river edge heritage, in the process losing out on very valuable assets the local communities can experience. Even though the ghats are an important part of the cultural ecology of the region, most

of the heritage resources along the river (like ghats) are neglected and in need of restoration.

Table 8 No. of Heritage resource along the riverfront

Typology of resource	Nos.
Agra	
Garden	8
Gateway	3
Chattri	2
Ghat	2
Tomb	7
Mill	1
Institutes	3
Mosque	1
Residences	3
Temple	2
Well	1

Typology of resource	Nos.
Gokul	
Temple	4
Ghat	4
Fort	1
Baithak	2
Chattri	1
Vrindavan	
Ghat	2
Temple	3

Typology of resource	Nos.
Mathura	
Temple	10
Haveli	1
Dharamshala	5
Ghat	14
Burj	1
Fort	1
Mound/Tila	3

With the river receding or having shifted its course, the interface with the river is also lost. This is evident in settlements like Vrindavan, where the old riverfront with its ghats stands neglected, when it could become a very important public realm within the city.

Figure 10 Vrindavan: Road cutting across the river and original *ghat*interface

Figure 11 Vrindavan: Historic *ghats* below the existing road level

The kunds and vans are the blue and green open spaces of the settlements. But they are not integrated with the open space systems of the settlements. Kunds and groves, most of which are sitting in the heart of settlements, have not been recognised as an important part of the open space system of the settlements and continue to be encroached upon.

Figure 12Barsana: Vrishbhanu kund on the outskirts as a public amenity

Figure 13Barsana: Radha Bagh located in the heart of the settlement

Because of lack of awareness, there is very limited community engagement with both protected and unprotected heritage.

Many heritage structures are crumbling due to neglect, as there are no incentives built within the urban administrative legislating system for owners of these properties which will help protect and conserve these unprotected heritage structures.

Figure 14 Mathura: Dilapidated state of structures on the ghats

Figure 15 Agra: Parvez tomb on the riverfront in a ruinous state

In the absence of adequate recognition of the rich craft tradition as a valuable asset, the living and working conditions of craftsmen are very poor, lacking the basic standards of health and hygiene.Through primary research and secondary sources there are several crafts identified in the region. In case of Agra marble inlay, zardozi, petha making, carpet making are few crafts identified in the settlement which are still surviving. Few other crafts identified in the settlement from secondary sources have either changed their form of practice or have very few craftsmen. These include leather works and bamboo crafts.

Table 9 List of settlements with specific areas with crafts[6]

Craft	Area
Agra	
Marble inlay Pietra Dura	Gokulpura, Taj Ganj
Leather Craft (Selling and packaging)	Taj Gang, Fatehabad Road, Sadar Bazaar
Carpet Work	Villages around Agra - Rasoolabad, Tedhi Baghiya, Gutlashan, Lal Garhi etc.
Zari work	Hing Ki Mandi, Lohamandi
Petha Making	Noori Darwaza (Moti Katra)
Firozabad	
Bangle making	SN Road, Humayunpur, Kotla Road
Bangle coloring	Bohran Wali Gali
Glassware	SN Road,
Hathras	
Hing Making	Nayaganj
Brass works	Gola Gali, Tabela Gali
Color Industry	Nayee Nagla Area
Jute embroidery	Purani Tehseel Road
Vrindavan	
Tulsi Mala	Gaura Nagar, Banke Bihari Bazaar, Rajendra Kanthi Mala, Lohi Bazaar, In front of Shah ji
Zardosi	Gaura Nagar
Silver Anklets	Radha Niwas Tila, Govind Kund
Poshak Making	Kailash Nagar, Maruti Nagar, Gaura Nagar, Kishore Pura.
Mukut Making	Gautam Para, Chipi Gali
Kulhar	Kumar Pada
Misri and Chinori	Chipi Gali
Brass Polishing	CFS chauraha, Near Shahji Temple
Peda	Nidhivan

Craft	Area
Mathura	
Sanjhi Art	Spread out all over the settlement
Poshak making	Spread out all over the settlement
Mukut Making	Spread out all over the settlement
Kanthi Mala	Rajadheraj Bazaar
Marble and alabaster figures	Pagal Baba Mandir, Shahji Temple
Brass Murti	Vishram Bazaar
Peda Making	Manipada, Lohi Bazaar
Gokul	
Tulsi Mala	Spread out all over the settlement
Mukut Making	Spread out all over the settlement
Poshak making	Spread out all over the settlement
Govardhan	
Poshak making	Spread out all over the settlement
Mukut Making	Spread out all over the settlement
Tulsi Mala	Spread out all over the settlement
Flower Garland	Spread out all over the settlement
Misri and Chinori	Spread out all over the settlement
Nand Gaon	
Peda Making	Spread out all over the settlement
Barsana	
Peda Making	Spread out all over the settlement
Baldeo	
Peda Making	Spread out all over the settlement
Mahavan	
Flower Garland	Spread out all over the settlement

[6]The information is based on preliminary site survey and Braj Corridor Report for UP Pro Poor Tourism Development Project prepared by INTACH.

Many heritage structures serve as important landmarks in the urban landscape and could serve significantly in improving the imageability of the settlement, but stay unattended and abused.

Figure 16 Etmadpur: Budhia Ka Taal

Figure 17 Bayana: Structures of Mughal Period in Bayana

Figure 18 Sikandra Rao: Old abandoned tehsil

Figure 19 Hathras: Beni Ram ki Bagichi in the settlement

Figure 20 Rupwas: Historic tank with chhatris

Figure 21 Chatta: Protected serai gateway

Many large heritage structures sitting in the heart of settlements, are abandoned and vacant in otherwise burgeoning and bustling urban-scapes. They are prone to misuse with many becoming garbage dumping grounds. They have the potential to accommodate public amenities in a sensitive manner and become an integral part of the urban system.

Figure 22 Chatta: Abandoned colonial structure in the enclosure of the Akbari Sarai

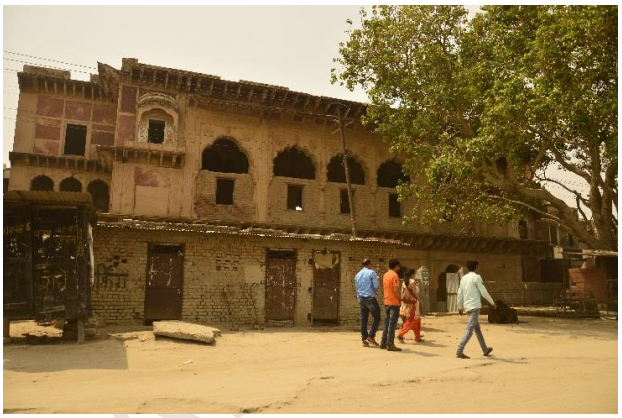


Figure 23 Vrindavan: Abandoned structure at Chir Ghat has potential to incorporate amenities and facilitate social infrastructure for both local community and pilgrims.

There are no risk preparedness plans for heritage protection in the event of any manmade and natural disasters.

The scale of streets in the historic core were for pedestrian use and were not designed for vehicular traffic, as a result of which there is traffic congestion around historic areas, adversely impacting the experience of the user and visitor. In the absence of traffic management plan, many streets with heritage structures are in danger of being widened leading to loss of heritage structures on either side of the road. Additionally, polluting vehicles impact both the natural and built heritage.

Figure 24 Fatehabad: Street lined with historic residences and shops

Figure 25 Mathura: Narrow streets of Chatta Bazaar lined with residential *havelis* cum

Figure 26 Bharatpur: Historic street with gateway being used for two way vehicular and pedestrian traffic

Figure 27 Hathras: Busy market street square with clock tower

Many of the heritage sites have no easy access as a result of which they are not visited and consequently fall in a state of disrepair. There is lack of universal access to most heritage sites.

The lack of awareness of heritage sites is also due to the lack of interpretation infrastructure for heritage sites.

There is a total absence of, or lack of adequate parking facilities around significant heritage sites. Public amenities such as drinking water and toilets around many protected sites are also absent

Figure 28 Agra: Dara Shikoh Library in Belanganj

Figure 29 Agra: Rauza Diwanji Begam, an ASI protected structure in Tajganj

The physical infrastructure such as transformers are ill located in heritage open spaces or in front of heritage structures undermining the use, aesthetic quality, and appreciation of these spaces and heritage structures. Electrical wires and fittings also deface the heritage facades.

Figure 30 Chatta: Electric wires and poles in front of the gateway of Akbari Serai

Figure 31 Bayana: ASI protected structures Lodi period Minar, Usha Mandir

5.2 CITY SCALE: AGRA CITY

Agra has a very rich heritage comprising primarily of Lodi, Mughal and Colonial layers of history. However tourists leave the city with a very limited and myopic view of the heritage that exists. The table below lists briefly significant historical events and the evolution of built heritage in Agra over various periods of history7.

[7]The historical narrative is based on Lucy Peck, Agra, The architectural heritage, INTACH listing, Roli books, 2008.

Table 10 History, significance and typologies of heritage in Agra

Period	Significance	Major Typologies
Early Mediaeval Period	**Architectural**	**Fort**
In 11th C the fort at Agra was attacked by the Ghaznavid rulers of Afghanistan. Mid 15th C Agra is mentioned as dependency of Bayana, In 1475 CE Badal Singh built Badalgarh fort		
Period	**Significance**	**Major Typologies**
Lodhi Period (1504 -1526)	**Architectural**	**Fort, Garden at Sikandra, Ruins in Sikandra, Palace, Mosque, Fort**
In 1504 CE Sikandar Lodi shifted Court to Agra to be close to Gwalior. In 1505 CE earthquake destroyed many buildings. 1517 CE Ibrahim Lodi constructed palace and mosque with in Badalgarh Fort		
Period	**Significance**	**Major Typologies**
Early Mughal Period (1526 -1555)	**Architectural, Ecological**	**Gardens. Mosque, Fort, River front gardens – char bagh gardens, Residential settlements.**
Babur invaded India, defeated Ibrahim Lodi set up base in Agra and the foundation of the Mughal empire was laid in Agra. Babur built gardens on bank of river in Agra.Babur's architectural contributions were mainly in form of gardens, mosque, and hammam. He was succeeded by Humayunwho built a mosque in Kachpura and Gyara sidhi on east bank of Yamuna, across the river from the fort. In 1540 CE Sher Shah Suri seized power and repaired Badalgarh Fort. He laid down the imperial road, evidence of which is in the form of kosminars and remains of sarais along Delhi Agra. Nai ki Mandi, parts of Belunganj and Kachpura were the settlements established during this period.		
Period	**Significance**	**Major Typologies**
Mughal Period (1556-1628)	**Architectural**	**Fort, Moat, Fortified walls, Residence, Mosque, Diwan-i-aam, Palaces, Memorial – Tomb, River front gardens**
Akbar ruled from Agra and made Agra his capital, naming it Akbarabad. The Red fort of Agra was constructed over the site of Badalgarh fort. In 1569 CE Akbar established the city of Fatehpur Sikri. Prominent areas developed during Akbar's reign were Shahpur, Shah mandi, Loha Mandi.In 1605 CE Jahangir shifted capital to Lahore but also laid many gardens in Agra. Nur Jehan was also a great patron of gardens the most famous being Itmad-ud-Daula's Tomb garden for her father on the banks of the river in Agra in 1622 CE. Nur Ki sarai was also built during this time. . In 1629 CE Palseart listed 33 gardens in Agra which were created or remodeled in Jahangir's time.		
Period	**Significance**	**Major Typologies**
High Mughal Period (1628-1658)	**Architectural, Ecological**	**Taj Mahal and River front Gardens.**
Shah Jahan came to power and shifted his capital back to Agra briefly before planning Shahjahanabad in Delhi. He built Taj Mahal during 1632-1643 CE		
Period	**Significance**	**Major Typologies**
Late Mughal Period (1658-1857)	**Architectural, Ecological**	**Memorial. Fort, Havelis, Residences, Palaces,**
It was in Aurangzeb's time when Haveli of Alamgir, Masjid Mubarak Manjil, Jatni Ka Bagh, Haveli and rauza of Shaista Khan, Rauza of Zafar Khan, Haveli of Hoshdar Khan, Haveli of Islam Khan were built in Agra. Maratha governor was appointed in Agra in 1758 CE. In 1764 CE Raja Suraj Mal of Bharatpur took over Agra. Jaswant Singh ki Chattri was built by Rajas of Bharatpur. In 1785 CE the fort was occupied by Scindias before the fort was taken over by General Perron in 1799 CE.		
Period	**Significance**	**Major Typologies**
Colonial Period (1857-1947)	**Architectural, Social**	Schools, Libraries, Colleges, Hospital, Churches, Administrative offices.
1836-68 CE when British soldiers were stationed in Agra the Cantonment and civil lines area started developing.Hessing tomb, St George'scathedral, St Mary's Church, St Peter's College, Medical college, Agra college are few institutional structures that were built during this period.		

Only a small fraction of the diversity of heritage of Agra is recognized and protected. A large part of the heritage goes unrecognized and unprotected.

Table 11 Typologies, Number and Protection status of Heritage resource

Agra City Level					
ASI Protected Structures	**55**	**State Protected Structures**	**1**	**Unprotected structures**	**111**

Typologies	Number of Structures
ASI Protected Structures	
Well	3
Tomb	9
Dargah	1
Mound	1

Typologies	Number of Structures
Unprotected Structures	
Cemetery	3
Chattri	2
Church	7
Tomb	10

Palace	1
Mosque	4
Takht	1
Pavilion	1
Residence	3
Statue	1
Inscriptions	1
Idgaah	1
Gardens	3
Gateway	9
Kos Minar	8
Chattri	5
Cemetery	1
State Protected Structures	
Shikargah	1

Temple	10
School	5
Samadhi	1
Residence	7
Hospital	3
Ghat	2
Gateway	3
Garden	9
Factory	2
Dargah	3
Court	2
College	7
Mill	2
Library	2
Idgah	1
Administrative structures	3
Railway Station	2
Offices	3
Police Thana	2
Pavilion	1
Palace	1
Jail	1
Mosque	8

Only individual monuments or complexes like Taj Mahal, Agra fort are perceived as heritage, even though there are several heritage zones and precincts within Agra, each with their own character. In the absence of this recognition and the appreciation of the value of each zone, new buildings not in conformity with the heritage character are being constructed. There are no special guidelines for the conservation and enhancement of character of these heritage zones. Some of the key zones and precincts identified are:

Table 12 Heritage Zones, Precincts, and significantcharacteristics of each.

AGRA
TAJ PRECINCT AND RIVERFRONT GARDENS, AGRA
Precinct 1: Taj and immediate surroundings, Agra
Precinct 2 : Extended Riverfront Gardens
HISTORIC CORE OF AGRA
Precinct 3 : Hing ki Mandi and Surrounding areas
Precinct 4: Marble industry of Gokulpura, Agra
Precinct 5 : Belunganj and its bazaars
Precinct 6 :Colonial Bungalow precinct, Agra
Precinct 7: Colonial Institutional Precinct, Agra
Precinct 8: Precinct of Sikandra

Agra riverfront which could be a major asset of the city is completely neglected and only a few monuments are recognized and protected. The city has in fact turned its back to the river and the heritage assets like the gardens along the river. Historic gardens are also not recognized as part of open space systems of the city and the local population is deprived of an asset.

Table 13 Historic riverfront gardens, status of existence, current use and protection status

Garden no.	River front Gardens/sites	Period	Status of Existence	Current Use	Built Heritage Protection Status
East Bank Garden					
Garden 1	Bagh-i-Shah Nawaz Khan	1637	Partially Exists	Residences	Partially Protected (Remains Protected)
Garden 2	Buland Bagh	1600	Partially Exists	Nursery /Residences	Partially Protected
Garden 3	Bagh-i-Nur Afsan(Ram Bagh)	Before 1620	Exists	Monument (Sarai)	ASI Protected
Garden 4	Bagh-i-Zahanara	Before 1631	Partially Exists	Nursery /Residences	Partially Protected
Garden 5	Unamed Garden	Not Known	Lost	Residences	
Garden 6	Chini Ka Rauza	Before 1639	Partially Exists	Nursery	ASI Protected (Tombs Protected)
Garden 7	Bagh-i-Wazir Khan	1640s	Partially Exists	Nursery /Residences	Unprotected
Garden 8	Bagh-i-Sultan Parvez	Before 1621	Partially Exists	Nursery /Residences	Unprotected
Garden 9.	Maqbara Itmad-ud-Duala	1622	Exists	Garden /Monument	Protected
Garden 10.	Bagh-i-Mausawi Khan Sadar	1636	Partially Exists (a dome roof structure exists)	Residences	Unprotected
Garden 11	Bagh-i-Padshahi	Not Known	Lost	Railway station	
Garden 12	Moti Bagh	Before 1626	Lost	Residences	
Garden 13	Bagh Padshahi	Not Known	Lost	Residences/Agricultural	
Garden 14	Lal Bagh Padshahi	Not Known	Lost	Residences/Agricultural	Partially Protected (Gyarah Sidhi Protected)
Garden 15	Char Bagh Padshahi	Not Known	Lost	Agricultural	
Garden 16	Bagh-i-Bisht	1526	Lost	Agricultural	
Garden 17	Bagh-i-Mehtab Padshahi	Before 1640	Exists	Garden /Monument	Protected
West Bank Gardens					
Garden 18	Haveli of Khan-i-Duran	1633	Partially Exists	Haveli, Gateway	Unprotected
Garden 19	Haveli of Agha Khan	1652	Structure Exists	Temple trust	Unprotected
Garden 20	Rauza of Shah Jahan	1648	Exists	Garden/ Monument	ASI Protected
Garden 21	Bagh-i-Khan-i-Alam	1609	Exists	Garden/ Monument	ASI Protected
Garden 22	Haveli of Aslat Khan	1644	Lost	Residence	
Garden 23	Haveli of Mahabat Khan	1605	Partially Exists	Cemetery	Unprotected
Garden 24.	Haveli of Hoshdar Khan	1664	Lost	Forest Land	Unprotected (Protected by Forest Department)
Garden 25.	Haveli of Azam Khan	1630	Lost	Forest Land	
Garden 26.	Haveli of Mughal Khan	1650	Lost	Forest Land	
Garden 27.	Haveli of Islam Khan	1669	Lost	Forest Land	
Garden 28	Agra Fort	1564, 1637, 1662	Exists	Monument	ASI Protected

Garden 29	Haveli of Dara Shikhoh	1620s	Structure Exists	Monument	ASI Protected (Structure protected)
Garden 30	Haveli of Khan-i-Jahan Lodhi	1620s	Lost	Residences	
Garden 31	Haveli of Hafiz Khitmadgar	Not Known	Lost	Residences	
Garden 32	Haveli of Asaf Khan	Before 1634	Structure Exists	Residence	Unprotected
Garden 33	Haveli of Alamgir	1600	Lost	Residence	
Garden 34					
Garden 35					
Garden 36	Haveli of Sasat	1657	Lost	Residence	
Garden 37	Haveli of Jafar Khan	1637	Lost	Residence	Partially Protected
Garden 38	Rauza of Sasat, tomb of Shaista Khan,		Lost	Residence	
Garden 39	Haveli of Wazir Khan,		Lost	Multiple Use : Residences offices, industrial	
Garden 40	Haveli of Mukim Khan,	Before 1620	Lost	Multiple Use : Residences offices, industrial	
Garden 41	Haveli of Khalil Khan,		Lost	Multiple Use : Residences offices, industrial	
Garden 42	Bagh-i-Rai Shiv das,	Before 1722	Lost	Multiple Use : Residences offices, industrial	
Garden 43	Bagh-i-Hakim Kazim Ali		Lost	Water works area	
Garden 44	Rauza of Zafar Khan	1650	Partially Exists	Tomb and Mosque , Gaushala along the river	ASI Partially Protected
Garden 45	Chattri of Jaswant Singh	1640	Exists	Monument	ASI Protected

Agra has three World Heritage Sites of Taj Mahal, Agra Fort and Fatehpur Sikri under the protection and management of ASI. However there are no comprehensive Site Management Plans as per UNESCO guidelines which address present day site specific issues, and measures for their conservation for any of these sites and their buffer areas.

Agra lacks tourist circuits as a result of which some heritage sites are over visited at the expense of the lesser known even as Agra has a rich heritage spanning several centuries, diversity of periods and typologies of heritage.

Heritage sites are getting fragmented due to urban pressures and new road networks. This is most visible in the gardens along the riverfront.

Table 14 Fragmented Mughal gardens and the roads bisecting them

Garden No.	Name of the Garden	Roads fragmenting the garden
Garden 4	**Bagh-i-Jahanara (Lost)**	Chennai Delhi Highway (National Highway 2)
Garden 10	**Bagh-i-Mausawi Khan Sadar (Lost)**	State Highway 39 (leading to Ambedkar Bridge)
Garden 11	**Bagh-i-Padshahi (Lost)**	State Highway 39 (leading to Ambedkar Bridge)
Garden 24	**Haveli of Hoshdar Khan (Lost)**	Agra Bah Road
Garden 25	**Haveli of Azam Khan (Lost)**	Agra Bah Road

Garden 26	**Haveli of Mughal Khan (Lost)**	Agra Bah Road
Garden 27	**Haveli of Islam Khan (Lost)**	Agra Bah Road
Garden 29	**Dara Shikhoh Haveli**	State Highway 39
Garden 30	**Haveli of Khan-i-Jahan Lodhi (Lost)**	State Highway 39 (Road along western edge of Yamuna River)
Garden 31	**Haveli of Hafiz Khitmadgar (Lost)**	State Highway 39 (Road along western edge of Yamuna River)
Garden 32	**Haveli of Asaf Khan**	State Highway 39 (Road along western edge of Yamuna River)
Garden 33	**Haveli of Alamgir (Lost)**	State Highway 39 (Road along western edge of Yamuna River)
Garden 34		State Highway 39 (Road along western edge of Yamuna River)
Garden 35		State Highway 39 (Road along western edge of Yamuna River)
Garden 36	**Haveli of Sasat (Lost)**	State Highway 39 (Road along western edge of Yamuna River)
Garden 37	**Haveli of Jafar Khan (Lost)**	State Highway 39 (Road along western edge of Yamuna River)
Garden 43	**Bagh-i-Hakim Kazi Ali**	Chennai Delhi Highway (National Highway 2)

There are very limited livelihood opportunities connected with heritage as a result of which there is a much diminished engagement of the communities with the unprotected heritage. Many protected heritage sites sitting within dense habitation are fenced off as a result of which the local community has minimal engagement with them. Local community is disconnected with open spaces around both protected and unprotected monuments.

Figure 32 Agra: Jaswant Singh ki Chattri, ASI protected monument located in dense residential neighbourhood

Figure 33Agra: Unprotected pavilion at Gandhi Smarak in neighbourhood near Itimad ud daulahs garden

Many crafts still survive in historic areas like petha making in Moti Pada, Noori Darwaza; stone carving in Gokulpura and *zardozi* in Nai basti. Traditional craftsmen engaged in stone carving, zardozi are existing on the margins of society, and in the absence of adequate recognition of the rich craft traditions they nurture, the living conditions of craftsmen are very poor, lacking the basic standards of health and hygiene.

Figure 34 Agra: Petha making unit in Noori Darwaza

Figure 35 Agra: Stone carving in Gokulpura

Figure 36 Agra: Stone carving in Gokulpura

Figure 37 Agra: Marble inlay work in Tajganj

Figure 38 Agra: Zari work in Nai ki Mandi

Figure 39 Agra: Zari work in Lohamandi

Table 15 Location of Crafts centers

S.No.	Craft	Location
1	Marble inlay /Pietra Dura	Gokulpura, Taj Ganj
2	Leather Craft[8] (Selling and packaging)	Taj Gang, Fatehabad Road, Sadar Bazaar
3	Carpet Work	Villages around Agra - Rasoolabad, Tedhi Baghiya, Gutlashan, Lal Garhi
4	Zari work	Hing Ki Mandi, Lohamandi
5	Petha Making	Noori Darwaza (Moti Katra)

The historic water channels running through the city, are an important part of the heritage, as they captured the storm water surface runoff and fed the river. They have been reduced to sewers taking the untreated sullage and sewage from the residential areas around and polluting the river. Encroachments around these historic water channels have reduced their carrying capacities, besides increasing the surface runoff in the absence of soft areas along their banks. Introduction of new road networks have disturbed the flow of these water channels.

Table 16 Major Historic Nullahs and existing condition

S.No.	Historic Nullah	Historic Settlement / Site	Character of current setting
1.	**Drain passing close to Sat Kuiya**	Garden 1 : Bagh-i-Shah Nawaz Khan	Drain passing close to the site of Sat Kuyia, partially through residential settlement along the Aligarh Road and partially through the nursery.
2.	**Drain passing through Nur Ki sarai**	Between Garden 2 : Buland Bagh and Garden 3: Ram Bagh	One of the major drains passes through a sarai, currently known as Nur ki Sarai.
3.	**Drain between Itmad-ud Daula and Chini Ka Rauza**	Garden 7 : Bagh-i-Wazir Khan	The drain passes through a nursery.
4.	**Drain between Katra Wazir Khan and Moti Bagh**	Gardens are lost most likely part of Garden 12 to 14	Currently the area is an uncontrolled development area. Drain running through the area has issues such as open defecation, and solid waste dump.
5.	**Drain on east side of the Taj Mahal, flowing through the forested area (called nature trail)**	Garden 19 : Agha Khan Haveli and Tajganj	Forested area between east access to Taj and river has a nullah which flows through Paktola of Taj Ganj Area. This is one of the major historic drains. The drain is probably built over by a road in section of Fatehabad road to Taj Ganj. In the protected forested area the drain is modified with new masonry.
6.	**Drain flowing through paradise park**	Garden 29: Haveli of Dara Shikoh And Garden 27 : Haveli of Islam Khan Gokulpura/ Rakaabganj Belunganj	Currently the area is called paradise park which is part of the buffer area of the Taj Mahal. It is a green belt along the river. This drain runs in western part of the city through Gokulpura, Rakaabganj, and Belanganj. Drain was part of the Darah Shikoh Garden as a water channel and has historic bridges over it. Solid waste and sewage dumped into this drain through out the city and it is clogged in front of Dara Shikhoh Library
7.	**Three drains flowing through John's Mill Area**	Garden 40 to 42 : Haveli of Mukim Khan, Haveli of Khalil Khan, Bagh-i-Rai Shiv das	These gardens have been built upon by industrial development of colonial period. Currently the settlement has abandoned

[8]In the primary surveys, only leather items were found being packaged or sold. No more leather tanneries continue to exist in the settlement.

			mills with few workshops and new development.
8.	**Drain flowing next to Zafar Khan Tomb**	Garden 44 :Rauza of Zaffar Khan	Residential Settlement. Nalla passes along a Gaushala.

Figure 40 Agra: Drain in Belanganj

Figure 41 Agra: Condition of drain in Gokulpura

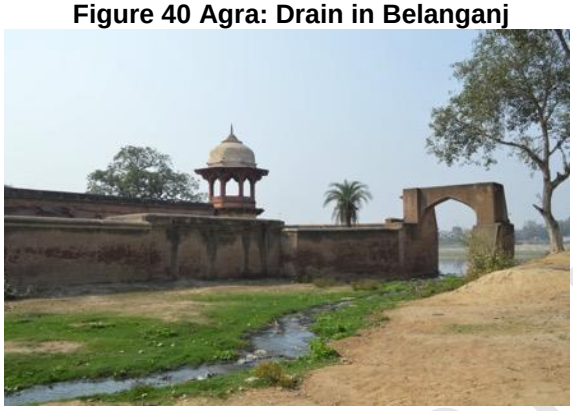


Figure 42 Agra: Drain through Nur Serai

Figure 43 Agra: Drain near Johns Mill area

The present flood plains, with the mud and sand banks have created open spaces for the city. But due to lack of infrastructure and amenities for the population residing along the river, these open spaces are used for open defecation, polluting the river.

The historic city was not planned for vehicles and was meant to be a pedestrian friendly city. In the absence of a traffic management plan, and with multiple modes of transport there are nodes with perennial traffic jams. Narrow streets in the historic core of Agra, in areas such as Belanganj and Hing ki Mandi, initially meant for only pedestrian movement, have two way vehicular movement which leads to chaos. Polluting vehicles adversely impact both the natural and built heritage. Resurfacing of historic streets in materials not in consonance with their historicity is adversely impacting the character of these historic streets.

Figure 44 Agra: River bank

Figure 45 Agra: River bank

Several protected and unprotected heritage sites are inaccessible or have limited accessibility, leading to their neglect and loss of visitor potential. There is lack of universal access to most heritage sites.

Many heritage sites of immense significance have been encroached upon due to absence of administrative control. Protected and unprotected sites within the settlements are used as dumping grounds for solid waste.

Figure 46 Agra: Tajganj

Figure 47 Agra: Gateway in the neighbourhood of Tajganj

Figure 45 Agra: Garbage dumped in a heritage site in Paktola area.

Figure 46 Agra: Existing open ground in front of ASI protected sites used as defecation ground and garbage dump yard

There is a complete absence of parking facilities around many heritage sites such as Itmad-ud-daula, Chini ka Rauza, Mehtab Bagh.

There is no comprehensive landscape and related plantation policy in Agra, specifically addressing needs and demands of heritage zones and precincts, such as a complete absence of a tree plantation policy along wide roads in the heritage precinct of cantonment area or the river front heritage gardens.

Figure 47 Agra: Paradise park with lawns

Figure 48 Agra: Opposite riverfront without plantation as seen from Itmad-ud-daula complex

Street furniture in areas with a distinct heritage character is not in consonance with the aesthetics of the area.

Figure 49 Agra: Street furniture in Shahjahan Park

Figure 50 Agra: Solid waste disposal system

Figure 51 Agra: Alien lighting fixtures in Taj ganj

Figure 52 Agra: Electrical infrastructure along the riverfront

Heritage and its protection do not figure on the agenda of various administrative civic bodies functioning within the historic core of Agra. Additionally there are no incentives within the administrative framework and policies for the maintenance and conservation of the large volume of unprotected heritage in the custodianship of private individuals.

Most roadside drains within historic precincts are open and are blocked with solid waste and plastic. There are very few public amenities like public toilets within the heritage areas leading to misuse of heritage properties.

Figure 53 Agra: Clogged drain

Figure 54Agra: Clogged drain

Figure 55 Agra: Accumulation of plastic waste in the river

Figure 56 Agra: Untreated sewer outflow in river

Historic elements of significance belonging to heritage structures are left neglected and abandoned in the streets.

Figure 57 Agra: Valuable pieces of historic building elements

5.3 PRECINCT SCALE: TAJ PRECINCT

Only six of the original forty-five historic gardens along the riverfront are protected in their entirety. The rest have been lost completely or are encroached upon. New infrastructure like bridges, roads and flyovers, built over the last several decades, have fragmented the riverfront gardens. Multistory apartment blocks have been constructed in the north part along the west bank of the river, many over the footprint of the river facing gardens. Jafar Khan's tomb garden has been lost and converted into a *gaushala* in the last few years.

Refer Annexure 5.1 for the works undertaken by ASI at Taj Mahal for past 6 months as received by ASI on 19th July 2018.

Table 17 Riverfront gardens, status of existence, current use, accessibility and protection status

Garden no.	River front Gardens/ sites	Period	Status of Existence	Current Use	Access to the garden	Access to the river	Formal organized Parking Availability (yes/no)	Built Heritage Protection Status
East Bank Garden								
Garden 1	Bagh-i-Shah Nawaz Khan	1637	Partially Exists	Residences	No	No	No	Partially Protected by ASI (Remains Protected)
Garden 2	Buland Bagh	1600	Partially Exists	Nursery /Residences	Limited access	No	No	Partially Protected by ASI
Garden 3	Bagh-i-Nur Afsan(Ram Bagh)	Before 1620	Exists	Monument (Sarai)	Yes	No	Yes (parking space not allocated, informal parking)	ASI Protected
Garden 4	Bagh-i-Zahanara	Before 1631	Partially Exists	Nursery /Residences	Limited access	No	No	Partially Protected by ASI
Garden 5	Unamed Garden	Not Known	Lost	Residences	-	No	No	
Garden 6	Chini Ka Rauza	Before 1639	Partially Exists	Nursery	Limited access	Yes	No	ASI Protected (Tombs Protected)
Garden 7	Bagh-i-Wazir Khan	1640s	Partially Exists	Nursery /Residences	Limited access	No	No	Unprotected
Garden 8	Bagh-i-Sultan Parvez	Before 1621	Partially Exists	Nursery /Residences	Limited access	No	No	Unprotected
Garden 9.	Maqbara Itmad-ud-Duala	1622	Exists	Garden /Monument	Yes	No	No	ASI Protected
Garden 10.	Bagh-i-Mausawi Khan Sadar	1636	Partially Exists (a domed structure exists)	Residences	Limited access	-	No	Unprotected
Garden 11	Bagh-i-Padshahi	Not Known	Lost	Railway station	-	-	No	
Garden 12	Moti Bagh	Before 1626	Lost	Residences	-	-	No	

Garden 13	Bagh Padshahi	Not Known	Lost	Residences /Agricultural	-	-	No	
Garden 14	Lal Bagh Padshahi	Not Known	Lost	Residences /Agricultural	-	-	No	Partially Protected by ASI (Gyarah Sidhi Protected)
Garden 15	Char Bagh Padshahi	Not Known	Lost	Agricultural	-	-	No	
Garden 16	Bagh-i-Bisht	1526	Lost	Agricultural	-	-	No	
Garden 17	Bagh-i-Mehtab Padshahi	Before 1640	Exists	Garden /Monument	Yes	No	No	ASI Protected
West Bank Gardens								
Garden 18	Haveli of Khan-i-Duran	1633	Partially Exists	Haveli, Gateway	Limited accessibility	-	No	Unprotected
Garden 19	Haveli of Agha Khan	1652	Structure Exists	Temple trust	Limited accessibility	Yes	No	Unprotected
Garden 20	Rauza of Shah Jahan	1648	Exists	Garden/ Monument	Yes	No	Yes	ASI Protected
Garden 21	Bagh-i-Khan-i-Alam	1609	Exists	Garden/ Monument	Limited accessibility	No	No	ASI Protected
Garden 22	Haveli of Aslat Khan	1644	Lost	Residence	-	-	No	
Garden 23	Haveli of Mahabat Khan	1605	Partially Exists	Cemetery	Yes	Yes	No	Unprotected
Garden 24.	Haveli of Hoshdar Khan	1664	Lost	Forest Land	-	-	Yes	Unprotected (Protected by Forest Department)
Garden 25.	Haveli of Azam Khan	1630	Lost	Forest Land	-	-	Yes	
Garden 26.	Haveli of Mughal Khan	1650	Lost	Forest Land	-	-	Yes	
Garden 27.	Haveli of Islam Khan	1669	Lost	Forest Land	-	-	Yes	
Garden 28	Agra Fort	1564, 1637, 1662	Exists	Monument	Yes	No	Yes	ASI Protected
Garden 29	Haveli of Dara Shikhoh	1620s	Structure Exists	Monument	Limited access	No	No	ASI Protected (Structure protected)
Garden 30	Haveli of Khan-i-Jahan Lodhi	1620s	Lost	Residences	-	No	No	
Garden 31	Haveli of Hafiz Khitmadgar	Not Known	Lost	Residences	-	No	No	
Garden 32	Haveli of Asaf Khan	Before 1634	Structure Exists	Residence	-	No	No	Unprotected

Garden 33 Garden 34 Garden 35	Haveli of Alamgir	1600	Lost	Residence	-	No	No	
Garden 36	Haveli of Sasat	1657	Lost	Residence	-	No	No	
Garden 37	Haveli of Jafar Khan	1637	Lost	Residence	-	No	No	Partially Protected by ASI
Garden 38	Rauza of Sasat, tomb of Shaista Khan,		Lost	Residence	-	No	No	
Garden 39	Haveli of Wazir Khan,		Lost	Multiple Use : Residences offices, industrial	-	No	No	
Garden 40	Haveli of Mukim Khan	Before 1620	Lost	Multiple Use : Residences offices, industrial	-	No	No	
Garden 41	Haveli of Khalil Khan,		Lost	Multiple Use : Residences offices, industrial	-	No	No	
Garden 42	Bagh-i-Rai Shiv das,	Beofre 1722	Lost	Multiple Use : Residences offices, industrial	-	No	No	
Garden 43	Bagh-i-Hakim Kazim Ali		Lost	Water works area	-	No	No	
Garden 44	Rauza of Zafar Khan	1650	Partially Exists	Tomb and Mosque , Gaushala along the river	Yes	No	No	Partially Protected by ASI
Garden 45	Chattri of Jaswant Singh	1640	Exists	Monument	Limited access	No	Yes	ASI Protected

In the absence of threshold capacity analysis of each of the heritage sites all heritage sites are adversely impacted. The heritage site of Taj Mahal is overvisited at the expense of the scores of other sites having immense potential as tourist destinations.

Table 18 List of Heritage sites other than Taj and their significance

Site	Historic Garden	Significance	Arc	Ecol	Hist	Arc	Reli	Soci
Protected Chattri and nursery	Garden 2: Buland Bagh	Buland Bagh is a historic garden with remains of Chattris and has archaeological and architectural value. Currently its being used partially as a nursery giving it an ecological value	Y	Y	Y	Y	N	Y

Ram Bagh Garden	Garden 3: Bagh-i-Zar-Afshan (Ram Bagh)	Ram Bagh garden has high architectural value because of its terraced gardens and water system. It is the first garden built along the river front by Babur. It has high ecological value.	Y	Y	Y	Y	N	Y
Chini Ka Rauza and Maqbara called Kala Gumbaz between Chini-ka-Rauza and Bagh Wazir Khan through a nursery	Garden 6: Chini Ka Rauza	The garden is a community space and has access to river. Part of the garden is a nursery and has economic significance as well. It is one of the garden which has limited access to the river.	Y	Y	Y	Y	N	Y
			Y	N	Y	Y	N	Y
Ruins of Prince Parwez Tomb	Garden 8 : Bagh-i-Sultan Parvez	Site has high archaeological value and architectural value. Has huge open space around it	Y	Y	Y	Y	N	Y
Itmad - ud - Daula Tomb	Garden 9: Maqbara Itmad-ud-Duala	The garden has high architectural value, with the tomb having marble inlay works on walls and paintings on the ceiling. The garden of Itmad-ud-Daula has high landscape and ecological value.	Y	Y	Y	Y	N	Y
Gyarah Sidhi	Sites close to Mehtab Bagh	Area has high archaeological. Also has view of Taj Mahal from across the bank of river.	Y	Y	Y	Y	N	Y
Humayun Masjid		Associational value and architectural value as it has been built by Humayun.	Y	N	Y	Y	Y	Y
Mehtab Bagh on the riverfront facing Taj Mahal	Garden 17 : Bagh-i-Mehtab Padshahi	The garden stands across the river and has view of Taj. It has high ecological value.	Y	Y	Y	Y	N	Y
Khan-i-Alam Bagh	Garden 21: Bagh-i-Khan-i-Alam	Now the garden is part of the protected forested area along the east gate of Taj. It has high archaeological value.	Y	Y	Y	Y	N	Y
Agra Fort, group of monuments	Garden 28 : Agra Fort	Agra fort is area of high architectural and associational value.	Y	Y	Y	Y	N	Y
Dara Shikoh Haveli/ Municipal School	Garden 29 : Haveli of Dara Shikhoh	Dara Shikoh Haveli has high architectural value. It now functions as a school.	N	N	Y	Y	N	N
John's Mill	Garden 40 to 42 : Haveli of Mukim Khan, Haveli of Khalil Khan, Bagh-i-Rai Shiv das	John's Mill area has two layers of history, one of *baghs*, which can be seen in the walls in *lakhori* brick and *Chattris* and the other layer as industrial heritage of Agra from colonial period, remains of which still exist. Site has high archaeological and architectural value.	Y	N	Y	Y	N	N
Jaswant Singh-ki-Chattri	Garden 45 : Chattri of Jaswant Singh	Ornate *baradari* which sits with in a walled enclosure gives the site its architectural value. There are remains of water channels, *chaddar* giving the structure high landscape and archaeological value.	Y	Y	Y	Y	N	Y

Mughal gardens are known to have had groves of trees, along with other plants and plantation patterns, supporting the idea of paradise as a garden. The landscape vocabularies adopted in the protected and unprotected garden sites not only

undermine their historicity and authenticity but lead to a loss of interpretation of the sites and a diminished visitor experience.

Figure 58 Agra: Chini ka Rauza

Figure 59 Agra: Ram Bagh Garden

The east gate entry stretch from the parking to the east gate of Taj Mahal is designed with excessive use of bollards and lighting fixtures. There is a complete absence of shade along this route meant for pedestrian movement.

Figure 60 Agra: Taj Mahal East gate

Figure 61 Agra: Taj Mahal East gate

The road along the west river bank has not only fragmented the gardens but also disconnected the city with the river. Designed access to the river is very limited. Because of high walls along the road running along the river, the river is not visible and stays unconnected with the many visitors who frequent this road.

There are several unprotected heritage structures in Belanganj in the form of *havelis*. This wealth of unprotected heritage in Belanganj area is being destroyed and built over.

Figure 67 Agra: Belanganj

Figure 68 Agra: Belanganj

Figure 69 Agra: Belanganj

Figure 70 Agra: Belanganj

Table 19 Key Structures in Belanganj within the overall mediaeval urban fabric

S.No.	Name of structures identified	Typology
1.	Dara Shikoh Library/ Municipal School	Library/ School/ Haveli
2.	Shahi Madrasa Masjid	Mosque/ Madrasa
3.	Kala Mahal	Residential
4.	Motamid Khan Mosque	Mosque
5.	Mahesh Chand Bansal House	Residential
6.	Mankameshwar Temple	Temple
7.	Hazoori Bhawan	Residential
8.	Motamid Khan Mosque	Mosque

John mill area is a surviving example of colonial industrial heritage. It is abandoned and neglected and prone to encroachments. With the removal of industries functioning from within, the area is prone to real estate development, which will result in the loss of the colonial industrial heritage.

Figure 71 Agra: John's Mill compound

Figure 72 Agra: Johns mill compound

Large heritage properties are laying vacant and in disuse, depriving the community of use of large spaces along the river edge. Inaccessibility is one of the major reasons for the neglect and subsequent deterioration of the heritage. Many river facing garden sites with remains of structures within are inaccessible. Total absence of well worked out and visitor friendly heritage trails is why many tourists miss out on heritage sites. Khan -e- Alam heritage site next to Taj Mahal, which also houses the aqueduct which fed the gardens of Taj Mahal, is not on the visitor itinerary. Haveli of Khan -e- Duran near the east gate of Taj Mahal is neglected and not visited even though it has the potential to become a major destination. Jaswant Singh *chhatri* is a protected site and has remains of tank and a *chaddar*. However it has a difficult access due to which very few visitors visit it. It is however used by the community residing around. While Ram Bagh is a protected site by ASI and visited by a few visitors, the adjacent Nur Serai and remains of Buland Bagh go unnoticed and are in a state of neglect.

Figure 73 Agra: Khan-i-Alam aqueduct

Figure 74 Agra: Nur ki Sarai

There is lack of universal access to most heritage sites.

Lighting fixtures and other infrastructure are ill sited in front of heritage structures.

There is an absence of community toilets in the precinct due to which many heritage sites and the river front is used for defecation.

Heritage structures which are remains of historic gardens in Shahjahan Park are not recognizedby ASI.

Figure 75 Agra: Unprotected structure, part of historic garden in Shahjahan park

Figure 76 Agra: Ruins of historic garden in Shahjahan Park

There is lack of parking and other amenities for the heritage sites along the river.

The involvement of the local community is negligible towards the care and protection of heritage because of lack of engagement with the heritage. Historic gardens along the riverfront are inaccessible depriving the local community of a very vital open space. Gandhi Smarak has been fenced off depriving the community of a vital open space.

Figure 77 Agra: Gandhi Smarak

Figure 78 Agra: Gandhi Smarak

The large volume of unprotected heritage is subject to vandalism and the few surviving structures are also in danger of being lost in the absence of their recognition as important heritage sites. There are several remains of historic built material like arches, columns lying unattended in open areas and alongside drains in the Belanganj and other areas.

There is absence of signage in all heritage properties along the river front.

Near absence of solid waste management practices along the riverfront are impacting the heritage of the area.

The small patch of protected forest adjacent to the Taj complex on its east side is not in a very healthy state of existence and needs to be restored.

Figure 79 Agra: Forest area

Figure 80 Agra: Open drain in forest area

Many nurseries exist along the west bank over the footprint of historic gardens. They present an opportunity to connect the historic gardens with the livelihoods of the community residing in the vicinity. The nurseries also present an opportunity to promote the Mughal plant industry, which will also add another dimension to the natural heritage of Agra.

6 Urban Settlement Form, Space and Image

6.1 EMERGING ISSUES AT REGIONAL (TTZ) LEVEL

6.1.1 Pressure of urbanization and changing form of cities

All the large settlements of the region, especially, Agra, Mathura and Firozabad, have seen exponential growth in terms of population in past twenty years. Annual growth rate of these three settlements has been substantially higher than the national average of urban areas when compared since 1991. During 1991-2001, Agra, Mathura and Firozabad showed the annual growth rate of 3.2%, 3.45% and 4.81% respectively as against the national average of 3.0%. For the period, 2001-2011, three settlements showed the annual average rate of 3.51%, 2.83% and 3.39% respectively as against the national average of 2.4%. For a state dependent on agriculture as a primary economic activity, these growth rates are normal as rural to urban migration is observed in such economies due to shift of labor from primary to secondary and tertiary sector with improvement in agricultural practices. Thus, in general, all the settlements of TTZ region are facing the pressure of urbanization.

The pressure has been observed in many forms, be it the ribbon development along highways or conversion of agricultural land into residential real estate along the periphery of the settlements or emergence of slums both within the city, along the ecological precincts or at city periphery. The image of such a pressure is quite stark across the cities of TTZ. On one hand, periphery is showing emergence of plotted colonies along with mid-rise to high-rise residential and commercial real estate development and on other hand, about 40-50% of the city lives in slums. (Mathura-49%, Agra-56%, Firozabad-33%, Hathras-44%). Study of the available satellite data also supports this observation towards rapid urbanization, wherein it can be easily deciphered that settlements have seen rapid urban sprawl. Apart from natural migration of people from rural to urban areas, another major reason for rapid urbanization and resultant urban sprawl is mega-infrastructure projects. Three projects that have impacted the region are, widening of National Highway-2 in 2000s, laying of Greater Noida-Agra Expressway and laying of Agra-Lucknow Expressway. Analysis of available satellite data between 1999 and 2014, shows the impact across cities such as expansion of Mathura beyond NH-2 towards Govardhan, real estate development between River and Yamuna Expressway at Mathura-Vrindavan, expansion of Vrindavan towards NH-2, expansion of Firozabad towards the bye-pass and growth of areas between Aligarh road and Yamuna Expressway at Agra. At Vrindavan, other phenomena have been observed wherein city showed increase of

only 7000 people between 2001-2011 but the area of developed land has more than doubled due to emergence of numerous real estate-based colonies between old core and NH-2.

Outer Ring Road of Agra is almost complete barring the bridges at key locations and Lucknow expressway is now operational. It can be easily envisaged that eastern and southern periphery of Agra along with smaller towns such as Fatehabad and Shikohabad would undergo major change. Another mega-project in the form of Jewar International Airport is going to further fuel urbanization in this region. As these infrastructure projects came independent of the Master Plans of the cities of the region, or, came after the publication of Master Plans, the resultant urban form at the periphery is quite distinct (single use, plotted, large parcel-based development with setback and higher FAR) from the regular fabric of the city and discontinuity in the form and systems between new and old is quite evident.

6.1.2 Poor living conditions and loss of character of old settlements

Largest settlement such as Agra or very small settlement such as Barsana, Hathras or Nandgaon shows traces of history. These traces belong not only to Mughal period or Colonial period but go as far as painted grey period, Kushan period and Buddhist period. Every town of TTZ has a contiguous historic core, a living settlement, having distinct urban morphology layered with traces of historic evolution. Many of these historic cores have specific activities, cultural practices, work communities and resultant economy. Through visual surveys and study of Master Plans, it is observed that these historic cores suffer from lack of infrastructure, congestion and thus poor living conditions. Interventions in these historic cores have been point-based (sector specific) without looking at the historic core as a comprehensive entity. There is a lack of any specific attention given to the historicity, associated unique morphology and urbanism of these cores in the development plans of these settlements and thus they have degenerated to a large extent in terms of their unique character and shows signs of neglect.

6.1.3 Destruction of the regional landscape and associated elements of Braj Region

River is one of the most important images of this region but urbanization pressure and nature of urbanization has reduced river to a mere drain with little or no water and thus it represents a very gloomy picture. At the same time, lack of any attention to unique riverfronts of Mathura, Vrindavan and Agra as expression of history and with possibility of future public spaces for these cities is evident. Absence of a quality river edge also leads to dilution of cultural, religious and social activities associated with river.

Figure 1 Vrindavan: Degrading water system

Figure 2 Mathura: Inaccessible and underutilized Kund

Braj Region is characterized by not only architectural and urban elements, but in fact regional landscape of the region and its constituting elements-Orchards and Forest (Van, Upvan, Bagichi and Baghs), kunds, mounds etc. have shaped the cities in past and given them specific and distinct character. These elements are under serious threat as their inter-relationships are either broken or diluted in newer development patterns. As a matter of fact, this unique regional landscape of Braj or numerous archeological sites find no suitable recommendation or policy directions in the Master Plans (Refer Annexure 6.1). Even the restoration work undertaken at few selected kunds near Mathura is very piece-meal, project oriented and mere aesthetic treatment without giving much consideration to the historical and ecological relationship and local context of the kunds. Another important aspect of this region are 'Yatras', the sacred routes of Braj. These are again not respected in the development plans and with destruction of regional landscape features- kunds, vans etc, the significance and experience of yatra is getting diluted.

6.1.4 Informalization and changes in building use and form across old cores

Trade related commerce and religious activities has been the lifeline of the old cores of TTZ. With the rise of religious tourism, old cores of larger settlements such as Mathura, Vrindavan, Govardhan, have seen manifold increase in visitors and thus excessive commercialization and production of products including problems associated with vehicular parking. This has been detrimental to the historic fabric both from character and experience perspective. In the absence of any specific provision in the Master Plans (Refer Annexure 6.1) of these settlement, the changes have been haphazard thus leading to loss of built heritage and unique image districts.

Figure 3 Mathura: Degeneration of Historic core

Figure 4 Fatehpur Sikri: Unorganised movement and informal activity

Towns of Uttar Pradesh are known for small and household-based industries linked to cultural and metal products. As TTZ restricts the growth of industries, informalisation of work is visible in the cities and towns of the region and old cores, having unique morphology, have seen further proliferation of household-based production. This has aggravated changes in the built form of the traditional parts of the settlements.

6.1.5 Poor Image of Major Regional Corridors

All the roads connecting important towns of the region are marked by ribbon development constituted by highway related uses, malls, residential township. No specific attention is thus given to manage the character of these important movement corridors and nodes along the highways. Another aspect connected with highways/roads is poor management of right-of-way of these roads. At many places, the land is left without any surface treatment leading to dust on the road.

Figure 5 Agra: Lack of character at Fatehabad road

Figure 6 Vrindavan: Degrading image of regional and urban corridor

Figure 7 Vrindavan: Poor image of city entrance and regional corridor

All the key junctions along highways are cluttered with excessive inter-modal and associated small-scale commercial activities leading to unsafe pedestrian spaces and haphazard movement of people and vehicles.

Major corridors connecting regional towns such as Govardhan, Mathura, Vrindavan, Gokul etc. have many important villages with archeological and religious sites but visitors are not aware of these sites and they have the potential of adding image and experience to the travel of visitors.

6.2 AGRA SPECIFIC ASESSMENT

6.2.1 Degradation of Character of Old City

The city of Agra boasts a rich cultural history, the traces of which are deeply embedded and layered in its urban fabric. The historic core of the city has many layers of built heritage ranging from Mughal period, Post-Mughal, Art Deco, to Post-independence and along with its diverse socio-cultural practices, creates a rich character.The historic core of Agra comprises of many neighborhoods such as Belaganj, Ghatiya Azam Khan, Pathwari, Fubbara, Daresi, Noori Gate, Rajamandi, Lohamandi, Golkura Park, Naai Mantola, Sadar Bhatti, Baluganj, Naamner, Cheepitola, Roshan Mohalla, Kuchehri Ghat, Jeewani Mandi, Kala Mahal, Gugdi Mansoor Khan etc. Due to the absence of any serious conservation policy, the old city core in Agra has witnessed a tremendous degradation. The population density as well

as built density has increased over the past decade affecting not just the form and space but also the character and overall image of the place and is not able to provide any unique and coherent experience.

The connected intermediate spaces within the traditional neighbourhood are getting filled with more built spaces and courtyards are slowly diminishing from the morphological character of the neighbourhood. The area around Jama Masjid and Agra fort have transformed tremendously and grown vertically over the period of time without respecting or incorporating the surrounding heritage. The spatial clusters forming intricate and intimate public spaces are also diminishing with time. The condition of the heritage structures is deteriorating with crumbling facades and no provisions are made at the policy or planning level to save the heritage of the historic core. A rather modern, low quality and generic form of construction is slowly engulfing the heritage character resulting into a mish-mash of a messy uncontrolled urbanism. Unfortunately, the present condition of the city core is like an old decrepit neighbourhood.

A number of heritage precincts in the old city such as in Jama Masjid area historically hosting mixed-use are now used only for commercial purposes and a series of such structures can be noticed in many primary streets which has resulted in systematic deterioration of the street character. The excessive commercialization and changing built use pattern had a significant role in the changing urban character of the historic city core and its neighbourhoods such as Favara Chauraha. This has also changed the overall experience of the place for not just the visitors but most importantly for the residents.

The pressure of commercialization as well as urbanization has also threatened the quality of living. The increase in built density and population density had a significant impact on the available infrastructure and lack of comprehensive planning to address the historic core has left it to decay even further. Inharmonious buildings in the traditional urban fabric in terms of height, material, physical condition, poor maintenance, lack of proper infrastructure, overcrowding, incompetent land and built use, noise and pollution has resulted in degrading residential quality and experience of the place.

Figure 8 Agra: A street treated as an urban backyard in Belanganj

Figure 9 Agra: Underutilised spaces around Agra Fort

The intense commercialization of the settlements attracts high intensity traffic and the narrow streets are choking with vehicular traffic, noise and pollution. The high influx of traffic and vehicular movement is a deterrent to any kind of visual experience. There is an uncontrolled flow of four wheelers, private vehicles, E-rickshaws and a number of small trucks can be seen moving around the tertiary lanes of the settlements. Large number of pedestrians can be noticed on the streets throughout the historic core, yet no proper provisions facilitating pedestrian movement is evident.

The master plan or the development regulations fail to recognize the changing character of these historic neighbourhoods and the loss of associated cultural heritage. There is no recognition of the historic core in the master plan and all the existing built areas in the city are treated in the same fashion and blanket provisions are made to propose them as high density residential zones. The primary roads in these settlements have experienced high commercial activity and are proposed as Market Street. These proposal are not contextual and negates the diversity of character zones and the unique morphological features which are present in different character districts. There is no recognition of the present or an imagination of the future form, space and character of these neighbourhoods and the proposals are based on a template based approach which seems to be followed in rest of the cities in TTZ (Refer Annexure 6.1).

Figure 10 Agra: Dilapidated heritage buildings in historic city core

Figure 11 Agra: Settlements along the drain in old city

Figure 12 Agra: Wholesale commerce near Jama Masjid

Figure 13 Agra: Specialised commercial activity in old city

6.2.2 River Yamuna and its relationship with city

Historically the Yamuna in Agra has held a significant place and the city had a strong relationship with the river and its edges. The city of Agra used to boast continuous riverfront gardens that were an integral part of it. Unfortunately, the river in Agra has lost its significance and has become a mere dumping site for untreated sewage and solid waste throughout the city. Ecological linkages to river in the form of natural drains carry city waste or are blocked, thus not just disturbing the whole hydrological system in the city but also destroying the relationship of the river with the city and its people. The river in Agra is no better than a drain and carries piles of garbage and untreated sewage, causing unhygienic and unhealthy living condition for the people.

Figure 14 Agra: Urban profile along Yamuna

Figure 15 Agra: Lack of character and image of riverfronts

A number of important monuments were located along the edge of the river including Taj Mahal, Itmad-ud-daula and a series of Mughal gardens forming a strong relationship with the river and providing an access to riverfronts in the past. The water edges are currently inaccessible except only at certain places. The rest of the Yamuna river front has become an urban backyard for the city. The cultural significance of the river in Agra is lost in time and the socio-cultural practices associated with the river are also destroyed with the ecology of the river. A few ghats, monuments and settlements located at the edge of the river provide access to the river. There are many low-key and smaller monuments such as Raja Jaswant Singh Chhatri, Chini ka Rauza etc located along the river that lack proper access and maintenance but have the potential to be developed as sites for community use or domestic tourism. Piles of garbage can be seen along the river around these locations with no proper infrastructure and access. This historical relationship (physical and visual) between the river and the city is disrupted, losing an important cultural resource and a potential public space in the city.

The many old settlements along the river a facing a number of challenges in the city. In spite of being the historic neighborhoods, the settlements dating as old as 1950's adjoining the heritage sites along the river are facing a slum like condition without basic infrastructure provisions. The riverfront needs immediate attention and ecological restoration. There are several important visual corridors along the river providing views to the monuments that need immediate attention and conservation. There is no discussion about this integral relationship of the river with the city and its monuments in the Master plan and building regulations. The issue of water pollution in Agra is addressed in the Master Plan 2021 primarily from the tourism perspective.

Figure 16 Agra: Riverfronts treated as urban backyards and dumping ground

6.2.3 Negligible attention to other character districts and heritage precincts

The Agra Master Plan 2021 recognizes Taj Dharaohar as one heritage precinct in the city when there are many other heritage precincts and character districts in the city facing negligence and a cohesive understanding or strategies of conservation and development is missing. All the important character districts such as Cantonment, Tajganj, Tajganj Extension, Old city and green cover around Taj are lying in isolation without any physical or activity-oriented integration. Rapid urbanization, economic development requiring modern buildings and the fast-growing number of private cars, all represent very real threats for these character districts which are constantly deteriorating with time. A number of heritage sites and monuments are located in these multiple character districts and heritage precincts.

Cantonment is an important urban precinct representing colonial heritage of the city and dense green cover. The character of this precinct is under threat due to planned activities. This precinct is important for Taj Mahal and the city of Agra due to large tree cover and it is necessary to address this issue through recommendations or policy level interventions in order to save the lungs of the city. Fatehabad Road is the most important road providing access to all the three gates of Taj Mahal. In recent years, lot of new hotels have come up on this road. Yet, this road provides no such experience and image to the visitors and neither has it served as a public space for the city. Provisions to develop more up-scale hotels are made in the master plan. An over-all vision and form of this hospitality corridor has been failed to address in the

city's master plan and building regulations. The building regulations rather provide a generic approach to the hospitality industry and presents a spatial and contextual mode of development in the city merely based on pre-defined standards and statistics.

6.2.4 Transit nodes-inter modal integration and activities

All the transportation nodes- Agra Cant, Agra Fort and Bus Stand provide no such sense of arrival to this important city with three world-heritage monuments and other innumerable heritage structures. The transit nodes in the city fail to create a culturally relevant visual experience for the visitors and the domestic users. There is a lack of a cohesive planning strategy for the movement in the city and the city lacks pedestrian friendly spaces. The main arterial roads as well as inner city roads lack any proper pedestrian infrastructure or activity. The paths are not shaded in many places which makes it equally inefficient and unfriendly.

Figure 17 Agra: Mismanaged and ill designed transit nodes

Figure 18 Agra: Lack of pedestrian infrastructure and mix of traffic

Lack of inter-modal nodes at major transportation nodes- haphazard movement and parking of para-transit, lack of footpaths and intense small-scale commercial activity makes it difficult for visitors to negotiate the space visually and physically. No properly designed or demarcated transit nodes are available in the city. Irregular and unorganized para transit vehicles cause nuisance to the internal neighborhood streets. There are no para transit stands with proper infrastructure in the city when E-rickshaws, Autos and cycle rickshaws are the major modes of public transport in the city.

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6.2.5 Image of Regional corridors

Important corridor enter the city. Barring the link from Expressway, all the other provide no special experience of the city. Stripped commercial activities can be

noticed along these major corridors with sparse real estate or/and freehold plotted development. The areas along these corridors host a number of residential projects until it hits the Ring Road. A number of rural and peri-urban settlements fall along these regional corridors. Different movement corridors in Agra lead to a different character district in the inner city but visual and physical character of these corridors is not representative or contextual to the character district it merges with.

The influx of new townships and large scale development probes a threat of creating segregated enclaves of development. The development along the Yamuna expressway would have a magnetic effect in terms of attracting development forces and changing the regional landscape around Agra. All the corridors are dotted with local commerce and parking- restricting the flow of regular vehicles and lack of pedestrian infrastructure is also evident.

6.2.6 Public spaces

The global imagination of heritage tourism has caused a huge disconnect between heritage tourism and community, creating enclaves and exclusionary tourist spaces. Over the past few decades, the focus in Agra has been towards developing tourism sites and facilitating tourist infrastructure, largely ignoring the historic old city and other parts of the town where population has far outstripped infrastructure. The rest of city and its residents have faced a huge set back in the quality everyday urban spaces and an inclusive public realm. The public spaces lack universal accessibility and are fairly gendered in nature. There are no public amenities for female users and lack of proper lighting and infrastructure also restricts the movement of female users and other genders at night. There are not many spaces meant for the leisure of the locals and there's very little invested in the well-being of the residents in the city.

There is no major public space available for visitors (foreign or domestic) and local population except the the triangular green (Ambedkar Park) near Jama Masjid and space around Fort Station. This implies that despite the presence of World-heritage sites, city has not benefitted from any public space or associated economic activity around the monuments. This is quite opposite of any world-heritage site, wherein such important sites also result in preservation and enhancement of public realm around the monuments. The city fails to provide an enriching and culturally relevant everyday experience to its residents as well as the visitors. The local spots for leisure and triangulation of people is missing and it lacks an integrated public realm for its local actors. Except a few organic activity nodes here and there, there is no comprehensive understanding to create a system and hierarchy of public spaces in the city.

Figure 19 Agra: Lack of provisions and design for everyday spaces

Agra has a rich cultural past, monuments, crafts, literature, and cuisine. Yet the experience is only limited to the monuments and not reflected in day-to-day city life and spaces. It is observed that most of the visitors come in cars/buses from their hotels and after visiting Fort and Taj go back straight to their hotels, restaurants or Jaipur.

6.2.7 Need for Implementation of sustainable and comprehensive tourism policy

After a detailed review of tourism policy, it is evident that an aggressive brand marketing of the Taj by the state and tourism agencies, lack of recreational opportunities and degrading nature of the city may account for the fact that out of the total daily tourist arrivals in the city, most of them leave after visiting only the Taj Mahal (Refer Annexure 6.2). It has also been noticed that most of the tourist depart from the city the same evening of the arrival after visiting three major monuments in the city (Taj Mahal, Agra Fort, Itmad-ud-daula Tomb) as its close to Delhi and Jaipur. The annual footfall of visitors in Itmad-ud-daula tomb and Agra fort is 3.7% and 49% respectively, of the footfall of Taj Mahal (Refer Annexure 6.2). The heritage tourism in the city has failed to provide any economic or community revival to the city. The city is unable to convert World Heritage designation into proportionate advances in local community development in a context where it is most needed. The planning agendas in the city are unable to find a balance between the tourism and everydayness of the city and there is a lack of a pro-poor, community-based heritage tourism and comprehensive vision for the city (Refer Annexure 6.2).

The low tourist footfall for other historic sites nearby has resulted from a lack of knowledge of their presence and whereabouts, compounded by accessibility and infrastructure issues. Not only the development of infrastructure around other monuments is poor but also, connectivity is low and amenities are inadequate which result in lower number of visitors.

Figure 20 Agra: Point based design interventions at East Gate towards Tajganj

The master plan recognizes this issue with a myopic understanding and considers transport related issues in the city to have caused such short-term tourist trips. The Master Plan of Agra (2001–2021) emphasizes growth in the tourism sector, development of high-tech enclaves, corporate and private sector involvement in urban development, better intra- and intercity transport connectivity, and quality infrastructure, all seen as necessary for global tourism and global city aspirations. Leisure and recreational activities get preference and are planned to be concentrated in the southern zones of the city. It is evident that the Master Plan is influenced by the 'Global Tourist Agra' image with both the state and planners trying to accommodate global agendas (Refer 6.2.4)

6.3 ASSESSMENT OF OTHER SETTLEMENTS IN TTZ

6.3.1 Degeneration of Historic/Inner Cores and loss of character districts

The cities and towns in TTZ are pertaining to rich historic significance which is concentrated mostly either in inner city/city core and/or along their river banks which forms a unique character district. In Mathura and Vrindavan, the inner city has more or less retained its visual and spatial character as evident not only visually but also through activity and movement patterns. The predominant function, which is religious, is maintained and supported by various ancillary activities. Due to the needs and aspirations of inhabitants, this part of the city may face major spatial transformations for which the trajectories can be established from existing indicators of transformation such as expansion of built form in contemporary built style and heightened tourism oriented commercial activities. There is a lack of any visual attention to unique riverfronts of Mathura(Vishram Ghat) and Vrindavan(KC Ghat). On a much smaller scale, in Hathras and Sadabad, the pace of transformation is milder. However, gradually impacting its intimate narrow lanes with low height structures.

Figure 21 Firozabad: Degrading City core and its character

Figure 22 Fatehpur Sikri: Degrading character due to lack of basic infrastructure

Figure 23 Mathura: Changing building typologies

Figure 14 Bharatpur: Disconnected relationship with water system

The situation is similar in Govardhan where the urban core is significant around the kunds but the built and spatial transformations are dominating the fabric. The new development along the parikrama route is inculcating the “worldly” experience through non spiritual or religious spaces/functions/forms throughout the parikrama. Even while approaching the town, the built form around does not suggest any significance and one enters the town abruptly. Also, no noteworthy image is established while going towards Deeg, though the settlements are very different and significantly unique.

The definition of inner core is different in Deeg, Bhartpur and Fatehpur sikri than the above-mentioned towns with respect to the presence of forts or palace and hence the mode of degeneration is different. The degeneration is not limited to the urban cores in the vicinity of fort/palace but also, the organic edge conditions adds to distorted urban image and hence the experience. In Deeg, The urban edge to the palace is organic and diluting the visual experience predominantly around the stepwell and entry/exit. In Bharatpur, being on Jaipur-Agra route (part of Delhi-Jaipur-Agra golden tourism triangle) and due to Bharatpur bird century and new tourist attractions within the fort, the fort may see a higher footfall, which the vehicular accessible streets around the fort may not take the load and may require specific local movement oriented schemes. The situation is disappointing in case of Fatehpur sikri where the settlement edge along the steps of Buland Darwaza is chaotic and inversely contributes to the overall experience of the monument.

Tundla flaunts a unique character of the region which is Colonial architecture. The built forms are underutilized (high walled British constructions and huge barracks used as godowns) due to adjoining major railway junction which facilitates the region. However, some are now been converted into railway quarters.

Figure 25 Tundla: Degrading character of station road, one of the primary movement corridors

The TTZ expresses a wide pallet of rich heritage cores which are going through a transition and in-turn accelerating the pace of losing unique character districts. There is still a lot of potential to carryforward these significant urban precincts while developing with the global parameters of transformations and the needs and demands of citizens.

6.3.2 Smaller Tourism Resources, Planning and Crowd Management

Cities and towns in TTZ are known for their architectural, cultural and natural assets which are significant to catch attention of not only local population but also, pilgrims and visitors from across the globe. Based on the visitor footfall, the settlements can be categorized in the categories of over-crowded sites, unutilized potentials and unidentified possibilities. While the region is known for the Taj, there are various significant unexplored tourism assets which if planned, will help in tourism decentralization and larger regional benefits.

With the inception of Yamuna expressway, the weekend trips to the religious sites of Mathura and Vrindavan are frequent. The effects of overcrowding are not limited to parking space shortage but also, overall conceptualization of segregating vehicular and pedestrian movements in the cities, whose cores were designated to limited pedestrian footfall. Crowd management during weekends and festivals, and more strongly for emergency situations, will be crucial for better pilgrim's and visitor's access and the overall experience of the cities. The existing measures does not

ensure qualitative aspects such as spiritual experiences, ease of access and versatile activity patterns.

The sacred yatra routes are not well established and lesser known which are not recognized in the master plan. However, pilgrims do follow them as a spiritual deed. Along the specific movement paths, the sacred sites are not well established (which earlier use to) and have a high potential to be incorporated within the larger planning schemes supported both by activities and urban form to strengthen larger cosmogony. This will encourage longer tourist stays as short-stay tourism spots are common at present.

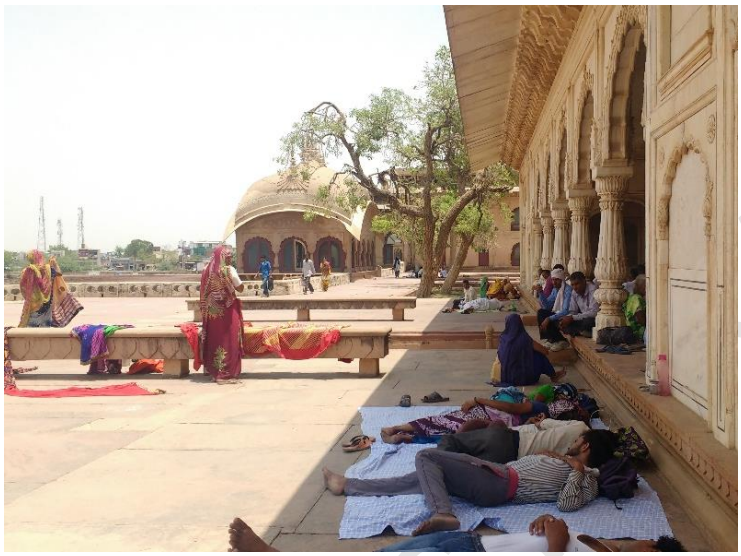

Figure 26 Deeg: Pilgrims at Deeg Palace

Figure 27 Vrindavan: Pilgrims around Banke Bihari Temple

In Deeg, where the tourist potential is underutilized, not only due to its palace glamorous form and spatial arrangement within the complex, it attracts local tourists and invites pilgrims from Chorasi Koshi Yatra for resting, which heightens the activities around the palace and along the yatra route within Deeg, yet it's not using this potential. There are almost no services around the Palace supporting the pilgrimage almost as if nothing exists beyond the walls of the palace whereas there is so much life and activity inside the palace. There's a lack of comprehensive pilgrim/tourism planning not only in Deeg but in all of the TTZ. A regional tourism network needs to be developed around Bharatpur as there are many potential heritage sites available in and around the city including the Deeg Palace which can be incorporated in developing a comprehensive, sustainable tourism plan for the region. These sites and its surrounding area are currently either facing neglect or not used upto their potential. No comprehensive tourism planning is done for the city and its counterparts. The city attracts its tourism primarily due to the Bharatpur Bird

Sanctuary. Other sites need to be developed to their full potential to sustain the tourism in the city.

Figure 28 Fatehpur Sikri: City level bus terminal near Buland Darwaza

From the established single day trips to Agra and Fatehpur Sikri, the overall experience is not appealing and hence, does not encourage longer stays. This in turn results in underutilized tourism potential which is impacting livelihood of the locals. Lack of overall conceptualization of tourist's movement from entering from the parking till reaching back to the parking via Buland Darwaza and palace complex (undersigned and unplanned circuit). No tourist infrastructure such as tourist center, museum or designated souvenir shops can be identified. The authenticity and experience is solely governed by the local guides.

The settlements such as Firozabad and Tundla are considered under unidentified tourism possibilities as the socio-economic assets such as bangle and glassware-making are not explored much as a tourist attraction. At Tundla, the unrecognized Colonial architecture has a similar potential.

The TTZ region is experiencing a wide disparity in terms of tourist footfall while having the tourist magnate in Agra. The incomparable distribution of tourists is majorly due to no comprehensive tourism planning and provision of infrastructure. Activating above mentioned attractions will lead to longer tourist stays and help strengthening regional socio-economic equity.

6.3.3 Degeneration of Ecological Precincts

In the towns and cities of TTZ, as mentioned previously in the sub chapter, the growth has engulfed many ecological precincts or they are in deteriorated conditions due to the lack of ecological sensitivity, lack of policies, policy implementations and awareness. Under ecologically sensitive precincts, the towns/cities can be categorized based on the ecological asset they are bestowed with, such as river, kunds and forests, natural drainage flows with lakes or motes and nallahs.

Figure 29 Govardhan: Mansi ganga kund

Figure 30 Mathura: Polluted water system

Figure 31 Deeg: Polluted water system at Deeg Fort

Figure 32 Mathura: Ghats as garbage dumps

Cities and towns along Yamuna, namely Vrindavan, Mathura and Gokul, are inversely contributing to the ecology of the river by adding solid and untreated sewer waste into the river. Due to the religious significance, the sacred potential is underutilized to maintain the ecology and a cleaner precinct which can be recognized as a social space for recreation. Amid the ecological degeneration, the unique image is diluted. In addition to the above mentioned towns, Govardhan is losing its ecological heritage

in terms of Kunds . Also, the edge of urban sprawl with the hillock is under threat and require immediate actions for its preservation.

In Bharatpur, ecologically deteriorating precincts with discontinuous water network (both manmade and natural) around the fort and its precincts create unhygienic living conditions specifically during monsoons and also hampering the overall experience of the town center. The natural hydrological system is under threat due to sporadic city expansion which is also losing the potential for attracting unique flora and fauna and, development of urban water edges of various scales is not identified. On a smaller scale, the ecology and associated attributes are negotiated in Deeg.

The nallahs in Firozabad, Tundla, Sadabad and Hathras are in extremely unhygienic condition with respect to solid waste management and edge condition. Under negligence, they are neither contributing towards the larger ecology of the town nor creating a healthy environment with their surroundings.

6.3.4 Lack of Public/Everyday Spaces

Trajectories from existing spatial conditions indicates that the cities and towns are losing their public spaces either towards to growth or in the hands of tourism. The resort to this issue can be handled by preserving the open spaces for everyday use and, not limited to, promoting ecologically sensitive sites as strategic public spaces.

Figure 33 Mathura: Isolated fenced Kunds are potential community spaces

Figure 34 Bharatpur: Highly underutilized Bharatpur fort and its surroundings

Mathura and Vrindavan and, to some extend in Govardhan, a diverse set of everyday spaces are lacking. There has been almost no consideration towards the local actors but more for tourism and pilgrimage which remains a central focus and supersedes every other aspect of the cities. The cities are unable to convert its tourism/pilgrimage into proportionate advances in local community development.

Figure 35 Fatehpur Sikri: Potential Public space

Figure 36 Firozabad: Markets as everyday spaces

In Vrindavan, discontinued and convexly dotted historic built forms losses the potential to be seen as a spatial asset for localities, pilgrims and visitors. The degree of enclosure by narrow alleys finds the ghats area as a spatial relief and has a potential to attract small to medium scale activates. At Govardhan, kunds are having the potential of being an element of surprise due to their hidden location and scale. The network of kunds can be utilized as a public space (not only limited to festive seasons) for locals. The access to these kunds and the built edge have seen unorganized rapid growth which is effecting the overall experience of the place.

There seems to be no recreational spaces for the residents in Bharatpur. The many lakes and water channels hold a strong potential to be developed as recreational spaces for tourists as well as the locals that are currently nothing but dumping sites for garbage and overflowing with sewage. Deeg is facing a similar crisis of open spaces while neglecting ecological precincts as an asset for its provision.

At large, public spaces are lacking in Tundla and Firozabad due to the sporadic growth and encroachments. The dilapidated condition of leftover public spaces is an evidence of attitude towards healthy conditions of living, recreation and leisure, and poor living conditions.

6.3.5 Urban Sprawl and resultant Urban Form

As mentioned earlier, the overall increase in population and its density, the urban nodes are subjected to unorganized increment or the urban sprawl which is resulting into distorted and non-contextual urban forms. It is easy to identify three modes of urban growth and corresponding urban morphologies namely, infill development between two urban nodes or web form of growth, concentric pattern of growth and, along a movement corridor or ribbon growth.

The web for of growth is evident in Firozabad and Tundla where the distance between the two settlements is not large and also the dependencies will be shared as manufacturing units are located in Firozabad and Tundla facilitates rail connectivity

for raw and processed goods. The growth is predominantly web-like, however, the presence of highway and development along it cannot be neglected. Tundla has been historically an important railway junction and it seems, the city held on to this function a bit too strongly. The only imageable spatial entity in the city is the Railway precinct. The rest of the city is primarily fine grained with any major catalytic development in the city restricting not just the economic opportunities but also a diverse experience of form and space. The peripheral parts of the city are having an image of slums with unplastered walls. Like many other industrial town, most of the workers live in dilapidated housing conditions.

Figure 37 Vrindavan: Plotted and enclaivic peripheral development in Vrindavan is a representative of greenfield development in TTZ

The prominence of NH 2 in the discourse of Mthura and Vrindavan is crucial along with Mathura-Vrindavan Marg which are also facilitating day to day live-work linkages. Urban Form as per the present Master Plans on the periphery of the towns is plotted, large parcels with setback and higher FAR. There are new townships, religious and real estate development on the periphery. Discontinuity in form and systems between older settlements and (religious core) its surroundings is becoming a generic trend. In Mathura, the urban form is experiencing a dramatic shift in its outermost layer of generic image, which is real estate oriented framed structured housing towers. They defeat the specific and unique image of this religious town however, it acts as a cover to the surprise which inner city's form and space has to offer. The case is similar to Vrindavan where previously, a settlement in the midst of garden of Tulsi, the town is now encountering a strong and unique image of modern symbols of spirituality in

terms of Maths and eye catchy temple forms with larger than imagined statues of god and goddesses at one of the major entrances of the town (from NH 2). Also, world's one of the highest temples is an upcoming credential to its spiritual fabric.

With the presence of central node as Fort in Bharatpur the pattern of growth is along the bypass with radial roads towards the fort. The peripheral growth is plotted in nature with evidences of clusters of group housings. As compared to other settlements, this urban node is having significant possibilities for decentralization due to its urban form with distinct character zones at various peripheries.

In case of Fatehpur Sikri, the settlement next to Buland Darwaza is sporadically growing on the hillock with unhygienic living conditions. The settlement is largely in a slum like condition, where the built fabric is in deteriorating condition, open drains, narrow lanes and piles of garbage all along can be noticed. The settlement around Fatehpur Sikri is degrading due to lack of proper basic infrastructure provision. The houses are crumbling and not much of upgradation/alteration could be seen in the area thus a loss and degradation of traditional urban settlement is evident.

6.3.6 Point-based projects vs Integrated approach

Due to the involvement of various agencies along with distinctly unique settlements, the zone is encountering various point-based projects and not integrated approaches for the holistic development.

Figure 38 Mathura: Pedestrianised road along Shri Krishna Janmbhumi temple is a case of point based interventions without understanding the systems in place

Piece-meal site-based project-oriented approach under Hriday and other programs instead of a comprehensive strategy to preserve and maintain the main core areas of Mathura, Vrindavan and Govardhan is followed. It is evident that the key religious nodes had gone through redevelopment projects such as Shri Krishna janm bhoomi

and at various location, sporadic pedestalization has led to decentralization of chaos and not the ease of usability. This also distorts the overall experience of the place and generation of unpleasant thresholds through movement control leading to spontaneous activities such as pick-up and drop-off points. Kunds, as discussed earlier, does not consider various ecological and social aspects and degenerating the larger nuances of kunds. The integration with larger context is the need for comprehensive approach.

Another instance of point-based projects over integrated approach is evident in Fatehpur Sikri where the first monumental view of the Buland Darwaza is diluted in drop-off and surrounding ordinary activities. However, the experience is designed from parking Drop-off up to the foothills. The impact is not only experiential but also utilitarian in terms of infrastructure.

6.3.7 Creative and Cultural Industries

Creative and cultural industries, however associated with management and preservation, have a strong relationship with activity patterns and livelihoods. With distinct nature of settlements, there is a change in associated creative and cultural industries. This is having a high potential to attract visitors while preserving the livelihood and the traditions.

Figure 39 Fatehpur Sikri: Potential to develop a cultural industry

Figure 40 Firozbad: The glassware and bangle industry

The inner city of Mathura and Vrindavan are captured under the threat of outsourcing the unique cultural products and also victimized with duplicity. This is having direct impact on livelihood and work culture of a settlement which is also impacting the form and associated space.

The markets in Firozabad have a great potential and attraction with beautiful glass wares and bangles. The markets area, even after being restricted for four wheelers, is not pedestrian friendly and not used upto its potential. It gives a quintessential

experience which can be developed as one of the major tourist as well as local attraction.

Figure 41 Vrindavan: Tulsi mala among various other handicrafts

6.4 ASSESSMENT AT TAJ PRECINCT LEVEL

6.4.1 Definition of Taj Precinct

The Master plan 2021 for Agra defines a ‘Taj Dharohar Kshetra’ as a heritage precinct around Taj by identifying important heritage site along the Yamuna starting from Taj Mahal to Mahtab Bagh on either side of the river. The region has been defined at a 500 m buffer distance from the Taj Mahal Complex, including the Taj nature walk area, Proposed National Park area on the other side of the river and extends till Rambagh along with Itmad-ud-daulah marg. Towards east crossing, the Yamuna Bridge area is delineated from Water Works Chauraha, along with Yamuna Bank Road till Railway Bridge. Later it also includes the area enveloping Agra Fort road along with the monument. This entire strip is defined as 'Taj Heritage Precinct' where Taj Mahal complex, Fort complex, Mehtab Bagh/Charbagh, Humayun Mosque, Itmad-ud-daula, Chini ka Rauza, Rambagh etc. are the protected monuments falling under the defined area. Many historically and archaeologically important monument/complex are located within the precinct. The main intent of defining Taj Dharohar Kshetra in the master plan is for easy access of historic sites for a pleasant experience of the tourists by creating tourist circuits and protecting the historic sites along the Yamuna bank.

There are certain areas within the precinct that are residential in nature and many Bastis are located north of Mehtab Bagh and Charbagh. A large chunk of the land parcel is used for Water Works on Mathura-Kanpur road by the Water Works department around which industrial activities are also evident.

There is no discussion about the alteration of the existing buildings in the Master Plan 2021 in Taj Dharohar Kshetra. The Master Plan only prohibits any new construction

or rebuilding. It is also proposed to relocate the industrial units to industrial zones in a phase wise manner. It is also deemed inappropriate to remove the exiting residential areas from the precinct. Therefore, these areas are reserved as residential land use in the Master Plan. Similarly, there are a number of commercial establishments and complexes located on the road extending from water works Chauraha to Jiwani Mandi Chauraha that are proposed to be retained as they are currently catering to the needs of the surrounding areas. Even though it is proposed to retain these in the Master Plan, the development of such areas is also taken into account and to be controlled and regulated as per the Master Plan (Refer Annexure 6.1)

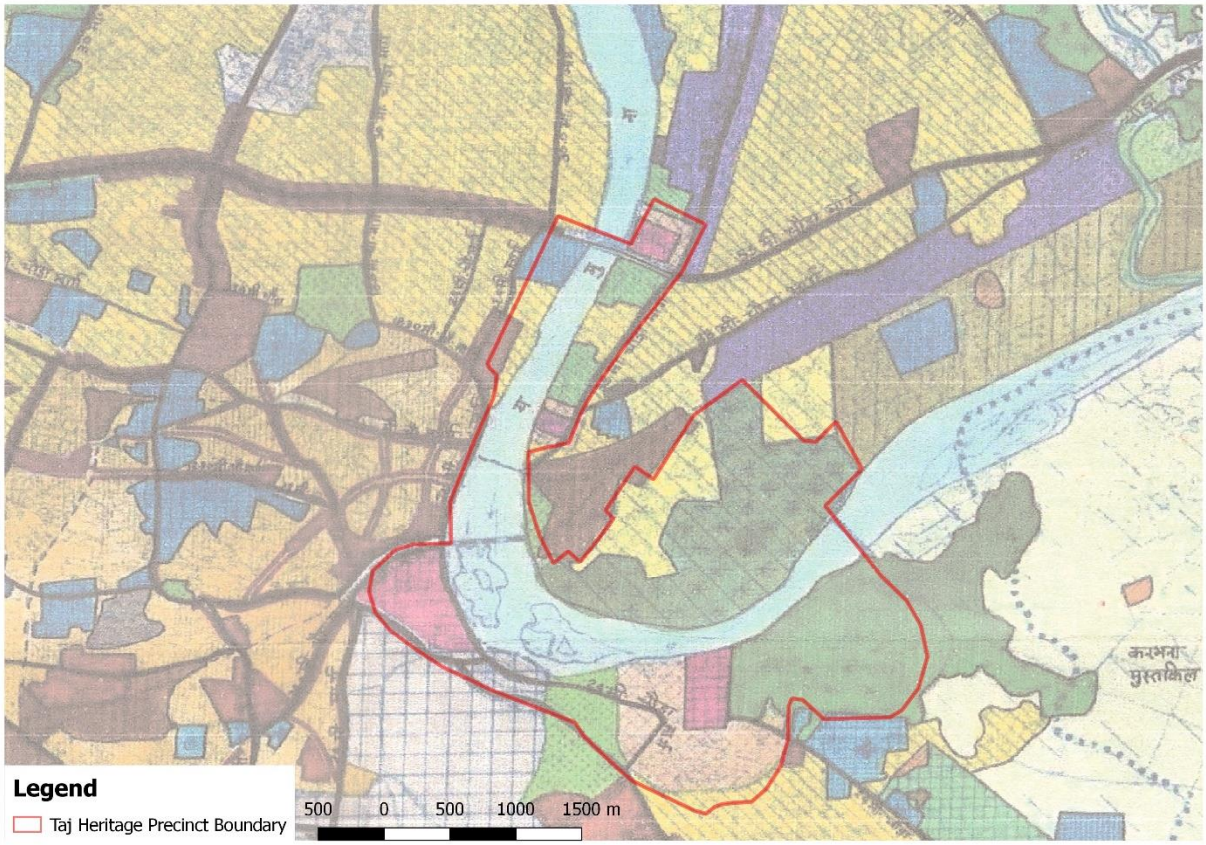

Figure 42 Agra:Taj Dharohar Kshetra delineation and other character districts in the city of Agra

The Master Plan 2021 takes a clear stance in retaining and improving the existing residential settlements (including the slums) within the demarcated heritage precinct and are reserved for residential use which is sustainable, inclusive and cost effective. It also specifically mentions proposals for the beautification, improvement and infrastructure provision for slums located in the demarcated area.

Figure 43 Agra: Taj Improvement District (TID) demarcated in the Smart City Proposal

Smart City proposal of Agra defines another heritage precinct called Taj Improvement District (TID). It envisions retrofitting of 2250 acres of selected local area-Taj Mahal and area comprising Tajganj, Agra Fort, Jama Masjid and Fatehabad road till inner Ring Road. With an envisaged outlay of INR 1699 Crore spread over the next five years, the TID aims to revive the historic relationship of the micro commerce with the monument. The retrofitted areas are imagined to become a new socio-economic engine for the Taj experience. The proposal revolves around mainly street improvement, beautification, decorative flyovers, murals and some façade improvements in the old city and lacks a comprehensive approach towards making provisions in conserving the heritage precinct defined in the Smart city proposal and at the same time does not acknowledge the Taj Precinct defined in the Master plan 2021 (Refer Annexure 6.1).

Both the delineated heritage precinct/district do not fall in tandem with each other and TID although tries to capture the form and space of the proposed district and makes provision for creating urban design guidelines for the region. The Master Plan proposals for the Dharohar Kshetra fails to discuss the local conditions, socio-economic or physical aspect of the areas falling under the precinct and a template regulation of Mughal style elevation and 3.75 height restriction is proposed. Any attempt of delineating a heritage precinct by the State is not contextual and does not represent varied nature, history and socio-economic profile of the settlements and sites falling under the delineated area.

The imagination of an important heritage precinct such as Taj Dharohar Kshetra is devoid of any consideration around form and space apart from the 300 and 100m buffer zone and height restriction of upto 3.75m in the Dharohar Kshetra and 7.5m in the adjacent areas. The tourism policy around the Taj precinct is based on point-to-point approach and lacks a comprehensive understanding in the development agenda of the city authorities (Refer Annexure 6.1).

There are no special provisions, development controls, regulation or guidelines in the Agra building bye laws for the Taj Heritage Precinct. The document provides generic guidelines for the city and does not take any special demarcated area into consideration. The building bye laws for the city are general building bye laws by the UP town and country planning department and do not collate with the Master Plan proposals. (Refer Annexure 6.2).

6.4.2 Relationship of Taj Mahal with Tajganj

The bazaar and the Caravan Sarai complex which originally formed an integral part of the Taj Mahal has now almost been obliterated by the city quarter known as Tajganj. The narrow streets lined with small shops trading in marble inlay work and other souvenirs was once the main bazaar street of the utilitarian complex.

Taj Mahal being declared a World Heritage monument, Taj Ganj became merely a buffer zone and the integral relationship between the monument complex and the settlement got lost.

Figure 44 Agra: Congested inner lanes leading towards historic gates

Figure 45 Agra: Deserted streets in the evenings

The mausoleum was designed to be accessed as a transition from the realm of worldly and material to the realm of the funerary and spiritual. This transition was marked by a series of entrances in Tajganj. At the southern end of the complex is the Dakhini Darwaza, which marks the entrance into the complex into its worldly zone. It is a transition between the city and the Taj complex. There are a total of four Katras (Katra Omar Khan, Katra Phulel, Katra Reshum and Katra Jogidas) leading to the South gate that also marks the distinction between the present boundary of the Taj Mahal complex and the Katra, which were once part of it.

Tajganj currently represents an ironical condition when compared with Taj Mahal. Economic and visual relationship of Tajganj with the monument is an important issue to be addressed. Both East and West entries provide a sense of welcome along with visitor facilities but Tajganj is quite opposite of this experience and the historical relationship between the monument and the settlement is lost.

Protection and enhancement of the morphology of Tajganj along with livelihood options and public space improvement are important areas of concern as Taj and Tajganj share historic link. The sequential vision provided by the streets of Tajganj towards the monument is a unique experience (planned in the original layout of Taj) and thus needs enhancement. Areas around Tajganj are dead after evening, whereas with the present streetscape work, especially around east gate, an unused opportunity exists to activate spaces in and around Tajganj for tourist and most importantly local everyday experience.

6.4.3 Development Zones and Urban Form

A rapid transition in the character and urban form of the settlements around Taj precinct can be noticed due to pressure of messy and hidden uncontrolled and

unregulated urbanization with lack of basic infrastructure provision. In addition, ASI Act stipulates 100m prohibited and 200 m regulated zone around the nationally protected monument. In this regard, city has not framed any special regulations to protect the urban form around these monuments.

The multiple character districts around Taj and other ASI heritage sites are not recognised in the master plan and building bye laws for the future proposals. The character of these heritage districts is degrading with time due to lack of infrastructure provision and development regulation. Specific provisions for building level improvements (façade, height, reconstruction etc.) are not in place and this may lead to complete destruction of visual character and urban form of areas around the monuments.

The bastis located along the Nallah (which forms the moat for Agra fort) are in a poor condition and face a sheer lack of basic infrastructure and living condition is unhealthy. The state of housing is deterioration in other residential areas around the various heritage districts. Uncontrolled expansion of floors and built density is resulting in losing the unique form and space of the character zones.

Figure 46 Agra: Settlement around Raja Jasant ki Chatri facing lack of basic infrastructure, subsequently losing its character

Figure 47 Agra: Street chacater in Tajganj

The proliferation of commercial establishments in the primary streets is bringing unchecked commerce and haphazard development pattern in the settlements. There is no provision for pedestrian movement and vehicular transport remains unchecked. Lack of provision for arrival space/drop-off space, haphazard on street parking of two wheelers and four wheelers and hawkers selling essential commodities to visitors is also creating chaos and degrading the quality of living.

Space between the Road and Fort Wall is not properly maintained. The unregulated vertical development in the settlements around the monuments is resulting into losing the historical visual axis and vantage points at various locations. There were many vantage points located where a strong visual axis was formed with the fort, Jama

masjid as well the Taj Mahal. These vantage points are in threat due to pressure of urbanization as well as the open drains remain an important issue in this regard.

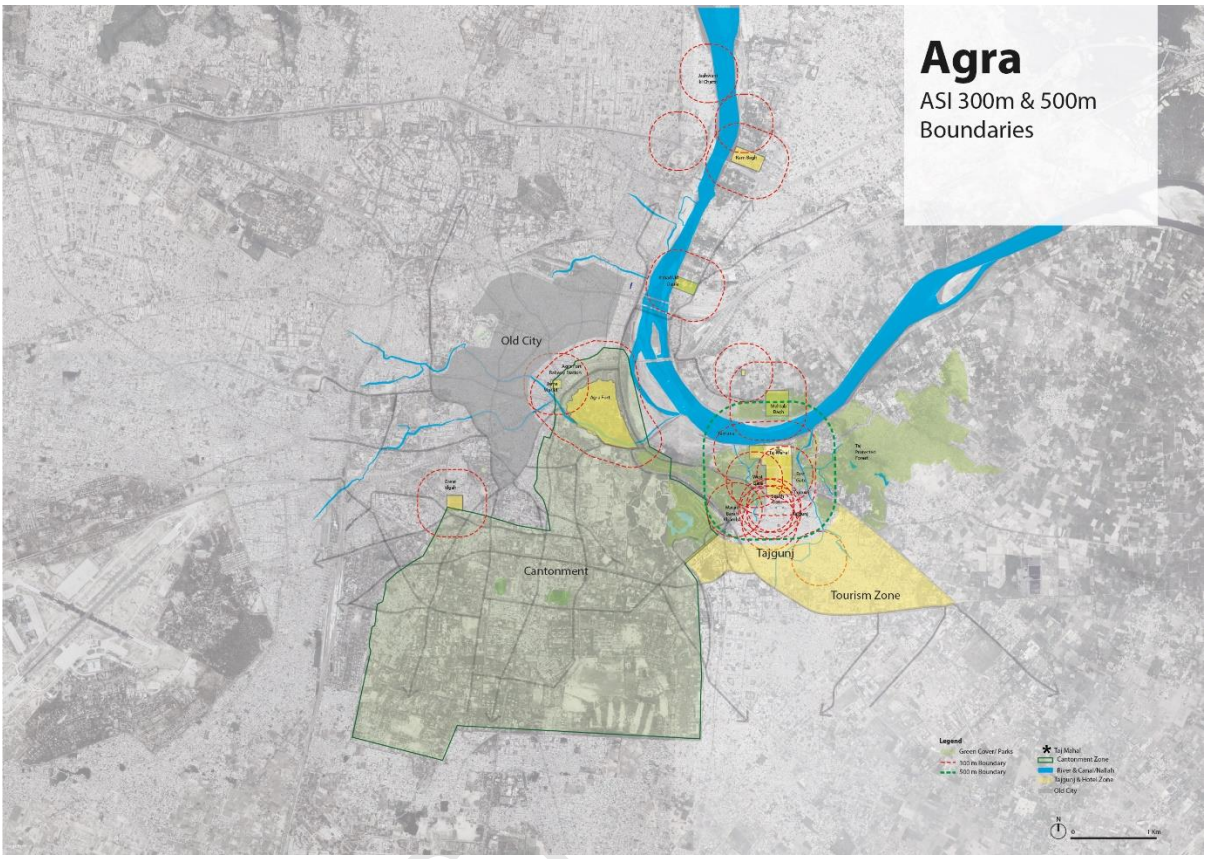

Figure 48 Agra Map with 300m & 500m boundaries around the monuments

The defined heritage zones would have a significant impact and influence on the surrounding areas. Neither the influence zones nor the edges of the precinct are taken into account in the master plan, building bye laws or any other state sponsored programs. There is no discussion about the edge treatment of the Heritage precinct. There are proposals under the smart city proposal that covers some of these character zones to redefine the urban morphology, improve walkability, provide infrastructure and revive heritage and facilities to promote tourism. Land use in these areas is a mix of commercial and residential, with houses, shops and workplaces having a long history of coexistence.

6.4.4 Movement in and around Taj Precinct

Despite a detailed footpath and lighting plan implementation at the Eastern Gate, the footpaths are not user friendly as they are without any major tree cover. As Agra remains hot for more than 8 years, pedestrian convenience around the Taj needs a sensitive design approach and proper maintenance. The E-rick and Auto movement through Tajganj East-West Spine without any demarcated or designed infrastructure

to serve as transit node or stands is also creating nuisance and disrupts in having a pleasant pedestrian experience.

The forecourt of Agra Fort, despite being a UNESCO protected monument represents a case of neglected space by the city authorities. Mixing of City and Agra Fort specific traffic creates a nuisance. Lack of any pedestrian infrastructure is also evident around the fort and other monuments.

Roads connecting Agra Fort to Taj Mahal West Parking & Purani Mandi Chowraha are major connectors for the tourists and fails to provide pedestrian friendly environment. It has narrow footpaths with high curb Stone Height. These routes are accessed through cars by most of the tourist, but if suitable edge condition is created this can enhance the quality of space for the tourist as well as for the locals. The present edge conditions of the roads and important routes to access the monuments and the Taj precinct at large is facing negligence and lacks a character.

Figure 49 Agra: underdesigned pedestrian corridor at Tajganj

Figure 50: Designed pedestrian corridor leading towards East gate

6.4.5 Visual Relationship of Taj Mahal and Agra Fort with River

Historically, Taj Mahal had an integral relationship with the Yamuna river and Mahtab Bagh across the river. The strategic location of the Taj at meandering point of the river provided a dramatic backdrop to the monument. Currently the Yamuna riverfront is in a barren condition, covered with untreated sewage, plastic and needs an ecological restoration. Currently the river cannot be accessed and enjoyed by the public. Thus, protection and enhancement of important view corridors and vantage points is required in order to reclaim and redefine the relationship of the mausoleum complex with the river and Mahtab bagh across the river.

The river bank around the fort in Agra lacks any character or access and is almost treated as an urban backyard. The fort once overlooked the river and a striking visual connection was established between the two entities. At present, the river holds no

importance around the monument and its surrounding areas and lack of accessibility presents further challenges.

The Master plan recognizes the degrading condition of Yamuna in Agra and specifically around the Taj Precinct and addresses it primarily from environmental pollution and tourism point of view. A national park has been opposed north of Taj mahal, across the river and including Mehtab bagh, Charbagh etc. In order to save Yamuna from pollution, it proposes to tap the drains discharged in the river and it is suggested to release them downstream. (Refer Annexure 6.1).

B

Part B - Strategies, Recommendation & Action Plan

7 Anchor Wise Strategies & recommendations

7.1 ANCHOR I: RESTORING THE BALANCE BETWEEN ENVIRONMENT AND DEVELOPMENT

This chapter provides sector-wise strategies and recommendations specific to settlements and spaces. At the same time, strategies wherever relevant are provided at three levels, TTZ level, Agra level and Taj Precinct level.

7.1.1 Environment & Ecology

Regional Scale

1. Strategies for restoring degraded ecosystems by afforestation, soil and water conservation, Building awareness across all sectors and social classes a sensitivity towards the negative impacts of unsustainable resource extractive growth.
2. Propogation of locally successful natural resource management measures /practices through aggressive promotional campaigns, field visits, training programmes etc.
3. Formulation of Plantation Policy w.r.t roadside plantation, shelterbelts for dust control, plantation in groves, historical precincts, riverine ecosystems, wetland catchments etc. in the TTZ area
4. In addition to above, for pollution control following are recommended:
    - Pollution mitigation measures – bioremediation, control at source, regulatory mechanisms, aggressive monitoring
    - Development of indicators to address management of pollution – pollution alerts
    - Identification of landuse and activity related sources of pollution to control propagation of polluting activities.
    - Formulation of guidelines to address occupational and indoor pollution.
    - Assessment of size and siting criteria for waste disposal sites
    - Formulation of Implementation and monitoring mechanism
    - Assessment of potential for decentralized waste management (fecal sludge and septage management systems)

7.1.2 Urban Structure, Livelihood and Infrastructure

Regional scale

1. Strategies to stop stone quarries and sand mining in and around the region
2. Use of buffers as plantation to be made compulsory in any mining, quarrying or reclaimed areas.
3. Refer Annexure 7.1 for Settlement wise Detailed Strategies & Recommendations.

7.1.3 Heritage Resources

Strategies for this sector are:

1. Recognize the natural heritage as an important ecological and environmental resource for the health and wellbeing of the people as well as the environment.
2. Rejuvenate, safeguard and enhance the natural ecology of the region by protecting and sensitively managing the heritage resources in a sustainable manner.
3. Ensure protection of the natural heritage resources by regulating urban growth around natural heritage.
4. Adopt authentic and appropriate landscape design vocabularies in heritage sites to help improve the environmental quality.
5. The historic character/ design vocabulary of the Kunds should be preserved, conserved and restored in its original shape and form.

Regional scale - Recommendations

- GIS based comprehensive database needs to be prepared through documentation, mapping and detailed inventorization of all the water and vegetal heritage resources like water reservoirs, kunds, water channels, streams (seasonal /perennial), ghats, baghs, bagichis, vans or forest. It is necessary to enable integrated planning for development of settlements which will ensure protection of these ecologically and environmentally significant sites. The inventories should have the key fields of name, location, geographical co-ordinates, boundaries, typology of heritage, condition, ownership, and protection status.
- Provide statutory protection to all the water and vegetal heritage resources listed in the data base prepared above under the Uttar Pradesh Municipal Corporation Act 1959, the Environment (Protection) Act 1986, and the Forest (Conservation) Act 1980 amended in 1988 including other applicable legal regimes by the

municipal corporations, urban local bodies and village panchayats. These natural heritage resources should also be integrated and notified within the Masterplan document

- Prepare an integrated environmental and natural heritage management plan for the region which recognizes and addresses the linkages between culture and landscape.
- All heritage kunds, water bodies and vans to be restored authentically using internationally adopted conservation norms and practices as spelt out in the UNESCO Charters such as Charter for the Conservation of Historic Towns and Urban Areas (Washington Charter 1987), Charter for the Conservation of Places of Cultural Significance also known as the Burra Charter(1979),ICOMOS-IFLA Principles Concerning Rural Landscapes as Heritage (2017) , Valetta Principles for the Safeguarding and Management Historic Cities, Towns and Urban Areas (2011) and Nara Document of authenticity (1994).The conservation and restoration policy for the kunds and vans have to respect and enhance heritage values of the site and should be framed after the assessment of natural and ecological significance, and impact assessment of the existing and proposed development around these sites.
- All the water assets attached to heritage sites need to be protected and conserved as part of the overall site conservation management plan for each of the sites. These include among others the moat around Lohagarh Fort at Bharatpur and Deeg Fort, Budhia ka taal at Eitmadpur, Gopal sagar at Deeg, Rani ka talaav and Jal Mahal at Kumher, Keshi ghat at Vrindavan, talaab at Hathras, Adam's Tank and memorial at Agra, Vrishbhanu Kund at Barsana, Manasi Ganga at Govardhan, Kusumvan Sarovar and Chattris at Govardhan
- All vegetal assets in the TTZ region in the form of historic gardens, baghs and bagichis, encompassing ASI protected, State protected and unprotected sites like Badshahi Bagh at Fatehabad, Beniram ka Bagh at Hathras, Kachha Bagh(Rani Bagh) and Gulaab Bagh at Deeg have to be conserved using internationally established norms as spelt out in the ICOMOS Florence Charter on Historic gardens . As part of the conservation exercise, replacing lawns with groves of indigenous trees which were the authentic and traditional vocabularies of design specifically in case of Mughal and Jat period gardens, will increase the bio mass, reduce pollution levels and increase water recharging capacity of the land leading to rise in water table. Restoration of the gardens of Itmad-ud-daula tomb complex, Agra under the ASI is a

case in point where the lawns have been replaced with the authentic plant species respecting the design integrity of the garden.

- Buffer zone around all water bodies including kunds in Barsana, Hathras, Govardhan, Mathura, Vrindavan, Baldeo, Agra, Roopwas, Chaumuha, Chatta need to be demarcated and notified. The boundaries of buffer are to be decided based on site specific conditions capturing the areas critical for the wellbeing of the water bodies. The soft areas as green cover using indigenous plant species should be maximized in demarcated buffer areas.
- The restoration, renewal, revival, 'beautification' in and around the natural and cultural heritage sites should be done respecting the context, using locally available materials to keep the authenticity and integrity of the heritage sites.
- Establish compatible land use and thresholds of activity around and within these natural heritage assets to ensure their efficient and healthy existence. Environmental Impact assessment needs to be done for all projects, existing and proposed around these heritage assets and necessary mitigation measures taken.
- Ensure that all natural water channels are not obstructed, blocked or courses changed due to development. The channels should be protected with a green buffer wherever possible and their connection with the sewer pipes has to be severed. The sewer and sullage network has to be linked to the Sewage Treatment Plant and only treated water should be discharged into these streams.
- Vehicular traffic in all the designated heritage precincts of settlements in TTZ needs to be curtailed and pedestrian zones introduced in the interest of heritage and well-being of residents and visitors in the area. NPVs need to be introduced in the historic inner city core of all cities.
- Afforestation should be promoted in the TTZ region by increasing the green areas through plantation of indigenous trees along all vehicular roads, open areas, public parks and parikrama routes.

Agra City scale - Recommendations

- The natural streams which were a part of the urban fabric of historic Agra and which have been converted into nallahs for the sullage and solid waste need to be restored back as storm water drains by regulating the edge treatments and land use around them and integrating them with the open space systems of the city.
- Restore both ASI protected (Taj Mahal, Mehtab Bagh, Ram Bagh, Sikandra) and unprotected historic Mughal gardens in Agra, using authentic plantation vocabularies like groves of trees instead of lawns

and authentic plant species. Replacing present day lawns with tree cover as existed originally will increase the biomass, reduce water consumption required for the maintenance and upkeep of the garden, enhance the water table through ground water recharge and also act as natural dust catchers to reduce pollution levels as a more effective and economical option. This requires preparation of a landscape plan which follows the historic plantation scheme and design principles and is based on historical and archival research, documentation of existing plantation pattern and site explorations.

- All the restored historic gardens need to be integrated with the open space systems of the city.
- Tree cover needs to be increased in the identified heritage precinct of the cantonment area by planting shade giving trees with dense foliage along the roads.

Taj Precinct scale - Recommendations

- As part of the conservation of all historic gardens, all the lawns within historic gardens, including the World Heritage Sites of Taj Mahal and Agra Fort, Mehtab Bagh, Ram Bagh, Chini ka Rauza,Bagh e Sultan Parvez, Bagh e Khan e Alam, Bagh-i-Jahanara(Jahanara Bagh), Buland Bagh, Jaswant Singh's Chattri need to be replaced with authentic and historically correct plant species and planting patterns known to have been planted in the respective Mughal garden sites, based on evidence from archival sources.
- The health of the forest cover in the forest land adjoining the East gate needs to be improved by planting more indigenous trees.
- More shade giving indigenous trees need to be planted along the newly designed east gateway entrance axis which will improve the microclimate, visitor comfort and the biomass to help reduce pollution levels in the precinct. More green surfaces need to be introduced along this axis for similar results.
- Plant groves of indigenous trees in the Paradise park on the west bank of the river to hold the soil, improve the microclimate and reduce pollution levels by acting as a dust catchers.

7.1.4 Transportation

Regional Scale

1. Equitable distribution of road spaces: It is recommended to segregate primary pilgrimage routes like Parikrama Marg of Mathura, Govardhan

and Vrindavan and retrofit the roads with equal or higher priority for pedestrians by developing pedestrian friendly walkways.

2. Restricting growth of polluting and private vehicles: The unprecedented increase in private vehicles particularly two wheelers needs to be curtailed with the objective of improving environmental quality. In addition to this, the vehicular traffic (driven by fossil fuel) is recommended to be restricted along the entry/exit points particularly in major tourist destined settlements in TTZ region like Agra, Mathura, Vrindavan and Govardhan by providing proper parking spaces along these entry/exit points.

Agra City Level

1. Enabling transition towards e-mobility and green fuels: it is recommended to advocate vehicles using clean and environment friendly fuels like electric and hydrogen with the objective of decreasing the environmental footprint due to transport modes.
2. Thus, it is proposed to replace the existing fossil fuel operated buses and complement the proposed pedestrian friendly environment with modernized non–polluting electric taxis, public and intermediate public transport system. This electric mobility needs to be encouraged in conjunction with developing requisite infrastructure parallelly.
3. Further, the city is witnessing a growth in the market of e-rickshaws, which aid in reducing vehicular emissions in comparison with diesel fleet autos. However, considering the long-term vision of environment sustainability, the market of e-rickshaws with lead acid batteries need to be replaced with lithium ion batteries.
4. Adopting integrated approach towards public mobility: At main nodes of public transport it is recommended to include , hotels, residential units, shopping arcades, office buildings and transport interchanges for different modes. This integrated approach is required for developing these locations as major transport hubs catering huge passenger flows, enhanced market value and encouraged demand for different transport services creating a winning situation for all stakeholders.
5. Such an integrated approach is recommended for different bus terminals in Agra, to encourage users towards public mobility. In addition, the different modal choices available like rail, bus and IPT needs to be provided with well-designed interchanges for seamless multi-modal connectivity, with adequate park and ride facilities, common mobility card etc.

6. Pedestrian and traffic calming facilities: Since, the city attracts huge number of tourists the safety of the tourists must not be compromised. All the transport system developments should be with the objective of improving accessibility, road safety and air quality. The entire pedestrian infrastructure shall be designed as per the IRC guidelines and can be physically protected from incursions by motorized vehicles by placing bollards. Adequate road signages must also be provided to guide the commuters. The vehicular traffic must be slowed down to protect pedestrians through speed restrictions as well through infrastructure changes along major NMT routes. Since cycling is the environmental friendly mode for shorter trips, facilities like public bike sharing must be encouraged.

Taj Precinct Level

1. Restoration of paths with pedestrian walkways and non-motorized transport: it is recommended to improve the functioning and environmental compatibility of pedestrian mobility components by promoting cycling and walking thereby supporting the objective of sustainable development. These mobility components must simultaneously adapt well-designed infrastructure to support non-motorized transport i.e. considering the extreme weather conditions, the roads must be provided with shaded sidewalks or built to pavement edge building with overhangs or arcades, proper signages and other facilities like information desk, toilets and water dispensers. In addition, high albedo materials must be used for paving road surfaces to reduce urban heat island effect. Several pathways like Agra Bagh road, road connecting Taj Mahal and Agra Fort in the Agra City should be the exclusive domain of pedestrians with necessary amenities and visually attractive environment.

7.1.5 Urban Form, Character and Image

Regional Level

As all the larger settlement of TTZ are facing sprawl along highways and periphery and it is envisaged that settlement across TTZ are going to face future pressure of urbanization due to migration and mega-infrastructure projects such as Lucknow Expressway and Jewar Airport, it is recommended to adopt following strategies for immediate development in the Region

1. In-fill, mixed use development, in all the land parcels, government and privately owned, to achieve compactness within the core of the settlements

2. Review of Corridor Development Plans of all the main corridors to check the nature of development and its impact on environment including induced trips from the core of cities

As Ecological Resources of the region, Vans, Kunds, ponds, Jheels etc, are under serious threat due to developmental pressure, it is recommended that following strategies be adopted for conservation and enhancement of ecologically sensitive sites

3. Inventory of ecologically sensitive sites and preparation of local area plans with a priority towards the protection of local ecological systems connected with the site

4. Harnessing the potential of socio-cultural beliefs associated with the various ecological sites within the local community towards protection of these sites

Under the above strategies towards urban sprawl, following are TTZ specific recommendations

- Assessment of quantity of land parcels during the preparation/revision of master plans of the cities/towns and fixing appropriate use, preferably, mixed use, for available land parcels.
- Government land parcels to be developed for community use, economic activities and low-income, low rise high density, housing apart from reserving some portion of land for green spaces
- Review of Corridor Development Plans of Yamuna Expressway, Lucknow Expressway and developments proposed along NH-2 in various master plan to ascertain total developmental activity proposed and its impact on environment. Downsizing the development and mitigation measures to be adopted in the corridor development plans for any adverse impact on environmental and ecological resources of the region

Under the above strategies towards ecological resources, following are TTZ specific recommendations

-
- Specific design controls in all the master plans of towns/cities wrt to ecological precincts covering boundary walls, landscape treatment (preferably large native trees), percentage of surface area under hard paving, design treatment of bed and walls of water bodies (preferably mud or stone pitching) etc. It is recommended here that any planning decision and design treatment must keep in mind that water bodies

are ecological precinct first and places for human recreation and enjoyment later.

Agra Level

Specific recommendations for Agra under the above strategies are given below

1. Immediate revision of Master Plan of Agra with a view to increase the compactness of the city by utilizing available government and private land parcels (except Cantonment) so that infrastructure provisions-water supply, sewerage and public transport can achieve economies of scale. The revision need to take care of reducing the sprawl by increasing the intensity of compatible functions between the existing developed area and outer ring road.
2. Cantonment of Agra is recommended to be taken up as a special character zone due to the presence of large tree cover and colonial heritage. The tree cover acts as an appropriate sink for any kind of air pollution for the city and Taj. Separate regulations are required to be prepared respecting the above two aspects of tree cover and colonial heritage and to include design controls for maintaining the tree cover, height of boundary walls, building heights and building uses.

Taj Precinct Level

1. A balanced approach towards environment and development should be adopted at the Taj Precinct level as well.

Following recommendations are proposed for Taj Precinct under this anchor:

- Alternate livelihood opportunities must be planned in the precinct (not just tourism related). Household industries, art-craft clusters must be retained and not relocated. More innovative techniques should be adopted to tackle the pollution caused by these industries rather than adopting a conventional, unsustainable approach of relocation.
- The entire precinct should be declared as a no-plastic zone, including the use of bottled water.
- The river edges must be cleared from the accumulated solid waste and no untreated sewage discharge should be allowed throughout the stretch of the river.
- The drains in the precinct should be covered and a green buffer must be designed.
- A system of active and passive green spaces should be created through-out the precinct. Existing open spaces should be conserved

through statutory plans and regulations and be utilized as passive green spaces.

- Any future development on the reserved Forest area and its extension should not be allowed.
- The existing residential settlements on the land demarcated for National park north of Taj Mahal across the river must be retained and proper infrastructure and livelihood opportunities should be provided.
- Slums located in the precinct must be retained at the same location and a different development model must be designed on case to case basis. Citizen led incremental upgradation should be prioritised over rehabilitation or relocation.
- Robust community participation must be conducted to create any development guidelines or proposal for the residential areas in the precinct.

7.2 ANCHOR II: REDEFINING THE ROLE OF RIVER

7.2.1 Environment & Ecology

1. Maintenance of environmental flow of river
2. Demarcation and protection of floodplain by protecting khader areas from development
3. Listing of permitted activities in the floodplain
4. Monitoring and regulation of activities in the flood plain
5. Regulated withdrawl of ground water
6. Promotion of soil and water conservation practices

7.2.2 Urban Structure, Livelihood and Infrastructure

Regional scale

1. Rejuvenation, reclamation and restoration projects to be taken up for River Yamuna for the entire stretch from Delhi till Allahabad.

City scale - Agra

1. Strategies to identify strict zoning ordinances to be put in place for restricting pollution causing industries along the river
2. Electric crematoriums to replace the conventional crematoriums in a phased manner along banks or relocated.
3. Strategies to bring in river front development by creating more plantation all along the course, this will save the land from erosion and creation of wastelands

7.2.3 Urban Form, Character and Image

Regional Level

Recognizing that river is the life-line of this region, it is important that all the attempts are made to revitalize the river and associated urban spaces for cultural, recreational, economic and religious purposes. From the perspective of improving the river edges and associated activities, it is recommended to adopt following strategies at TTZ level

1. Identifying points/spaces/precincts of interest- ecological, historical, cultural and economic along with key visual points along the length of river and improvement/creation of access at these points.
2.
3. In-situ improvement of basic services in the settlements located along the river edge, irrespective of their tenure and improvement of accessibility of river edge to these local communities to create local spaces and sense of ownership
4. Maintaining the prominence of historic skyline as viewed from river as well as from key visual nodes along the river by suitably regulating new built forms
5. Enhancing the activities related to river, especially religious and cultural activities by developing/improving necessary infrastructure
6. Landscape based treatment of the edges, banks and bed of all the Nallahs/streams discharging water into the river for natural recharge and pollution control

Under the above strategies towards role of river, following are TTZ specific recommendations

- Identification of significant spaces and precincts along the length of river and classification of these spaces as per their archaeological, historical, ecological, functional and cultural values.
- Each interface with the river to be treated differently as per the identified value(s), immediate physical edge and local community in the preparation of a comprehensive plan for upgradation of these spaces and precincts along with movement of people towards/from these spaces, associated activities and landscape treatment. Some of the important spaces at TTZ Level to be taken up on priority are KC Ghat till Yamuna Expressway link road at Vrindavan, Maoli Khader till Army Golf Course at Mathura and stretch of river behind Sikandra Complex near Agra

Agra Level

- A continuous green edge, keeping native plantation and water recharge on the floodplains and banks, to be envisioned for river at Agra in the Master Plan of the city along with development control regulations for protection of any significant historic skyline. Delineate, demarcate and notify the riverfront as Environmental Heritage Zone in the Master Plan of Agra. The Master plan of Agra needs to remove the residential areas that have been proposed on the river edge which will impact the flood-plainIn-situ basic infrastructure improvement for localities located along the banks of river such as near Raja Jaswant ji ki Chattri.
- Greening of all the drains entering the river with suitable landscape treatment and to restore them as natural wetlands and open spaces for the city. Paving, concretization of slopes, top or bed of nallahs is not recommended.
- There are many existing settlements along the edge of the river. These settlements have been at these location for decades and have a right to the place. Special attention must be given to uplift the state of services and proper infrastructure must be provided. The river edge must be made accessible and designed as per the community consultation to appropriate the use and create a sense of ownership within the communities.

Precinct Level

Historically, Taj Mahal had an integral relationship with the Yamuna river and Mahtab Bagh across the river. The strategic location of the Taj at meandering point of the river provided a dramatic backdrop to the monument. Currently the Yamuna riverfront is in a barren condition, covered with untreated sewage, plastic and needs an ecological restoration. Following recommendations are proposed at the precinct level;

- Protection and enhancement of important view corridors and vantage points is required in order to reclaim and redefine the relationship of the mausoleum complex with the river and Mahtab bagh across the river.
- The lost relationship between the river and the monuments must be reclaimed and reimagined, access points should be introduced at strategic locations based on interest and existing visual corridors.
- Development of infrastructure dedicated to the ghat's activities should be done. While acknowledging ghats as nucleolus of activities, the infrastructure to support activities such as bathing, aarti, boating,

worshiping and basic utilities to be provided which will accentuate the activity patterns along the ghats. Once being an asset, the river front to become a source of livelihood for many and also become a revitalized public space for the communities while maintaining hygiene.

- A guided tourist circuit through river which can help in revitalizing interface between monuments and the river. Heritage Resources

Strategy

1. Re-establish the significance of the riverfront zone in TTZ region as a repository of heritage resources and traditional systems for the protection and conservation of the river.
2. Designate the riverfront as a heritage zone and through proper management of the heritage resources along the river front improve the quality of interface of the heritage resources with the river and the community.
3. Use the heritage assets along the river edge more actively and responsibly in order to bring the river back in the lives of the local community.

Regional Scale - Recommendations

- Delineate and demarcate the riverfront in Agra, Vrindavan and Mathura as a heritage zone within the Master Plan. The delineation of the zone should be based on the identification and mapping of the protected and unprotected tangible and intangible heritage resources, the typology of heritage resources and their cultural associations. The boundaries should be additionally guided by the existing buffer of 300metres for ASI protected structures under AMASR Act 2010, and a buffer of 500 metres on both the sides of the river from high flood level line as specified in the Draft River Regulation Zone Notification by Ministry of Environment and Forest.
- Protect, conserve and restore the historic ghats and all riverfront heritage such as gardens, temples, havelis, mosques, fort and other significant structures along the ghats. Each river settlement has a unique character along the riverfront representing a diversity of heritage. Mathura has a range of heritage from ghats, havelis, temples, fort and mosque; Vrindavan has few historic ghats on the riverbank while the remaining ghats are found inside the city due to the shifting of the river course. Agra had 45 historic gardens on the riverfront of which only few are surviving at present namely Taj Mahal, Itmad-ud-daula complex, Chini ka Rauza, Ram Bagh and Mehtab

Bagh while others have been fragmented or developed as residential settlements and industrial heritage over a period of time.

- Ban open defecation along the river edge by providing toilet facilities under schemes such as Swachha Bharat Mission, AMRUT, HRIDAY. The design and location of toilets should be done so as not to compromise on the heritage quality of the river edge.
- Introduce interpretation, education and outreach methods encouraging sensitivity towards heritage through signage in appropriate location along the river front without compromising on the visual experience of the area.
- Remove all encroachments from the public lands / government owned land on the riverbank and provide alternative locations so as not to disturb livelihood patterns of the communities displaced and to prevent re-encroachments. The public lands to be identified by the Municipal Corporation with revenue records before taking necessary action.
- Development detrimental to the bio diversity along the flood plains of the river is not to be permitted along the banks of the river.
- Dredging and desilting of river and other water bodies should be done at periodic intervals to enhance the water recharge capacity.
- Disaster Management Plan specific to river front heritage resources needs to be prepared.

Agra City scale - Recommendations

- Protect the character of the riverfront zone by enabling land-uses that are compatible with the heritage resources and the environment.
- The river and its ecosystem needs to be rejuvenated by improving the groundwater recharge through adoption of water management systems within the historic gardens along the river front, which will increase the water retention capacity of the soil. This includes plantation of indigenous species of trees and shrubs.
- Incorporate water into the image of the city as a major landscape element, by providing public access to water. This can be achieved through the restoration of gardens as green open space and recreational spaces catering to the city as well as the tourists.

Taj Precinct scale - Recommendations

- Conserve Ram Bagh and Buland Bagh complex, ChinikaRauza, Bagh-e-Sultan Parvez, Mehtab Bagh, Khan-e -Alam Bagh, Rauza of Zafar Khan, Jaswant Singh ki Chattri so that the river front contributes to the open space system of the city.

- The edge treatment of the riverfront in different sections needs to be designed to have visual connection with the river. The urban fabric on the west bank needs to be connected with the river by lowering the walls along the road to have a visual connect with the river so that it becomes a part of the everyday experience of the people using the road.
- Traffic along the road edging the river along the west bank needs to be curtailed so that pedestrian movement is encouraged and both local community and visitors get to experience the river more actively.

7.3 ANCHOR III: REGIONAL EQUITY AND NETWORKING OF ECONOMIC OPPORTUNITIES

7.3.1 Urban Structure, Livelihood and Infrastructure

Regional scale

1. Closer of polluting industries in the region and promotion with incentives in alternative industries as per availability of raw materials.
2. Strategy to make the TTZ, a region that values innovative and creative industries, invests in small-scale entrepreneurialism, and places an emphasis on education, arts and culture.
3. Redistribution of the tourists to the entire region by creating more tourism hubs all around the region.

City scale - Agra

1. Planning, redevelopment and relocation of industrial hubs outside the city with only non-polluting white and green category of industries
2. Removal of sick industries and allocating lands to more economical non-polluting white and green category of industries
3. Strategies to relocate and removal of unregistered/ illegal industries from within the city limits
4. Strategies to develop not one but many Shilpagram or handicraft markets all over the city to attract the night tourist.
5. The bigger producers and retailers of the Petha industries should be encouraged and incentivised to produce the product in a hygienic manner with modern technology

Taj Precinct Level

1. Strategies can be developed to adopt sections of the neighbourhoods as craft villages or cottage industry villages.
2. Strategies to revive Tasar industries and berry industries.

3. Identifying and defining tourist circuits and providing those circuits with amenities and high grade public infrastructure facilities.

7.3.2 Transportation

TTZ Level

1. Strengthening regional connectivity for shared prosperity: urban economic vitality must be enhanced by providing regional transport system that considers the needs of the business community and create opportunities for connections between regional centres

7.3.3 Environment & Ecology

1. Mainstreaming of local skills / new economic activities through sectoral links and creation of new job opportunities.
2. Development of Green Skills to help implementation of National Action Plan for Climate Change and National Biodiversity Strategy Action Plan

7.3.4 Heritage Resources

Strategy

1. Enhance and create sustainable livelihood opportunities by strengthening interface of heritage and local economies centred around heritage.
2. Promote cultural entrepreneurs and site interpreters through capacity building of artisans and youth by harnessing their skills and abilities vis a vis care and conservation of heritage assets.
3. Practice development oriented conservation that integrates heritage with the daily lives of the people and ensures meaningful stakeholder involvement and participatory management of heritage.
4. Develop options of tourism management based on long term interests of the local community.

Regional scale - Recommendations

- GIS based documentation and mapping of creative industries in the TTZ needs to be undertaken to develop a digital platform through mobile based application enabling tourists to identify and visit the centers of craft production.
- Social and physical infrastructure within and around the identified heritage precincts needs to be improved to improve quality of life of the communities residing within and around these precincts.

Infrastructure to include provision of public amenities, proper solid waste management practices, street furniture, lighting, walkways, signage and interpretation. All projects to undertake a social impact assessment before implementation to ensure the infrastructure makes a meaningful impact on the lives of the communities.

- Heritage open spaces and community living spaces in heritage precincts need to be enhanced through urban design interventions.
- The living and working conditions of various craft sectors need to be improved by introducing modes of production and equipment conforming to universal safety standards and making their use mandatory in the various craft industries. This applies specifically to the glass bangle industry and stone carving industry.
- Adopt joint green cover management practices with the local communities and urban local bodies to rejuvenate the barren lands, lost vans and groves through introduction of social forestry that also benefits the community in economic terms. This includes tulsi cultivation, flower cultivation in Vrindavan, Mathura, Govardhan and other smaller settlements of Braj Region, and 'petha' gourd cultivation in Agra and nearby settlements.
- Various stakeholders and management systems engaged with heritage resources need to be identified and their roles in the maintenance, management and use of these resources enhanced.
- All abandoned heritage buildings need to be put to adaptive reuse, aimed at benefiting the local communities, after due conservation, repair and restoration. It should be noted that where a change of use is proposed, the new use should be compatible with the cultural heritage value of the place, and should have little or no adverse effect on the cultural heritage value as mentioned in ICOMOS New Zealand Charter for the Conservation of Places of Cultural Heritage Value (Revised 2010).The compatible uses could be heritage home stays, public amenities, museum, interpretation centre, cultural haat.
- Capacity building and promotion of cultural entrepreneurship among local community such as site interpreters, tourist guides at heritage precinct level and along identified heritage trails needs to be planned for.
- Livelihood opportunities need to be enhanced through skill development and product development of local crafts and promoting direct market access for the tourists for all the craft industries. This should include economic revitalization through revival of traditional crafts skills like Sanjhi art, by diversifying into other products.

- Crafts industry needs to be strengthened by improving marketing strategies and identifying sale outlet points and haats for traditional crafts within heritage precincts.
- Creative industries like glass manufacture needs to be linked with environmental issues by diversifying into production of glass bottles to replace plastic bottles, while adhering to environmental pollution control standards.
- Small scale cottage industries in the TTZ region, predominantly in the areas of Agra, Braj region comprising of Mathura, Vrindavan and Govardhan should be encouraged. These include are petha making, peda making, tulsi mala making, glass industries, floral garland and silver jewellery. Production of traditional culinary items should adhere to established norms and standards of hygiene. Mandate from State & Central Government is required for this action.
- Introduce NPVs in heritage zones which would also provide employment opportunities for e-rickshaw drivers.

Agra City scale - Recommendations

- Working conditions of craftsmen working in stone carving, zardozi in the heritage precincts of Gokulpura and Hing ki Mandi need to be improved by providing improved physical infrastructure. Open spaces in heritage precincts where craftsmen reside need to be promoted as outdoor working spaces wherever needed and possible as in the case of stone craftsmen.
- All abandoned heritage buildings identified through detailed inventory mapping have to be integrated with the lives of the local people through compatible adaptive reuse by introducing public amenities in these buildings. This will encourage the local community to have a stake in their upkeep and protection.
- Build capacities of local communities residing in the vicinity or within heritage precincts as tourist guides at heritage precinct level for identified trails in heritage precincts of Belanganj, Cantonment and Mall road, Colonial Agra and river front gardens and related heritage on both banks of the river.
- Develop and organize craft based walking tours in Agra to explore the areas where zardozi, pachikari (marble inlay), Carpet weaving works are carried out in the neighborhoods of historic walled city of Agra.
- Develop and organize cuisine based walks to explore the areas such as petha making street which will give the tourist an opportunity to buy directly from the shops and contribute towards improving the living and working conditions of the workers.

Taj Precinct scale - Recommendations

- Improve engagement of communities with heritage by developing spaces around heritage structures for public use. Gandhi Smarak adjacent to Itmad-ud-daula complex needs to be designed as a public space providing access to the local community. Its regular upkeep and maintenance will be ensured if the local community is made a stakeholder. The enclosure wall also needs to be made more transparent for the residents around to have a visual connect with the heritage site.
- The historic gardens Buland Bagh, Zahara Bagh, Chini ka Rauza, Bagh e Wazir Khan, Bagh e Sultan Parvez, partly converted to nurseries need to be developed as centres of Mughal plant industry providing increased job opportunities for sale and marketing of Mughal plants as a tourism product. Tourist guides from the local community need to be trained and imparted with knowledge of Mughal gardens and plants to be able to conduct heritage walks in these sites.
- Develop Nur Mahal serai between Ram bagh and Buland bagh as crafts haat selling crafts of Agra as part of the adaptive reuse strategy. The design has to be sensitive to the heritage character of the site and should not undermine its historicity in any manner.

7.3.5 Urban Form, Character and Image

Regional Level

Region is characterized by numerous creative and cultural products and both production and trade happen in specific settlements. From the perspective of enhancing the economic opportunities, following spatial strategies are proposed at TTZ level

1. Identifying the spatial attributes associated with these products in terms of production and enhancing these spatial attributes in any regeneration or redevelopment proposal for the settlements. This will promote local trade and add to the unique indigenous experience if overlapped with tourist circuits.
2. Identifying live-work relationships and spatial home-shop-workshop typology for specific trades and retaining them in any regeneration and newer proposals in the existing settlements

Under the above strategies, following are TTZ specific recommendations

2. The incorporation of craft and cultural industry shall not only include the sites of products but also the production. This will refrain the

culture consumers from partial engagements with the act of buying but also, it will make them engage with the process of production. This will also help in maintaining the spatial essence through activities and associated building typologies.

3. Indigenous creative industries shall be enhanced to promote local economy and strategies must be worked out to benefit local communities from global tourism. Be it Peda, Petha, Pachikari, Shringar poshak, Tulsi mala or Mahawan kheer, the creative industry to become the part of tourist circuits in order to promote local trade and such activities will also add to the unique indigenous experience and hence to the spatial attributes by retaining the same occupation and communities in place.

Agra Level

Small scale industries, household economic setups are facing a major set-back as Taj and its ancillary tourism industry has taken a front seat in every course of development. Art- craft clusters and other small scale economic activities are constantly driven away, causing change in livelihood patterns in the inner city fabric which in turn is also deteriorating the city fabric. Recommendations for Agra are as follows;

- Synergy between growth of inevitable small-scale industries and fragile environment for holistic development is a way forward for Agra.
- Small scale industries are inevitable due to the user demand, price and associated livelihoods. The stringent norms can be categorized based on quantity of air pollutant discharge. While this will promote the livelihood of skilled workers, the overall development will improve the quality of spaces and experience.

Precinct Level

Currently Taj precinct is primarily dependent on tourism economy and there is a dearth of other livelihood sectors in the area. The precinct is gradually getting mono-functional in nature. Due to the relocation of industries and whole sale markets, the commerce and business sector is facing a huge setback in the precinct. Relocation of these units is the only adopted approach by the local authorities. Following are the recommendations at the precinct level to address the issue;

- There needs to be not only a focus on tourism but also develop other sectors to bring livelihood opportunities for the local and create a multi-sectoral livelihood pattern in the precinct.

- The intensity of informal activity with the current trend is going to increase in the future and the future proposals must incorporate this trend.
- Retail commerce should be promoted in the precinct, serving not just to the tourists but also incorporating the local needs. A mix of such retail shops must be maintained in every market space/street.

7.4 ANCHOR IV: DEFINING GROWTH TRAJECTORIES AND FUNCTIONAL BASE

7.4.1 Urban Structure, Livelihood and Infrastructure

Regional scale

1. Preparation of Regional Plan and Master Plans of all cities in the TTZ region
2. Growth directions to be determined as per Master Plan and Regional Plan requirements
3. New land use plans being approved in the TTZ region needs intervention and monitoring

City scale - Agra

1. Master Plan to be prepared keeping the carrying capacity of the city and new developments to be taken place outside the city boundaries
2. The Master Plan of 2031 prepared for the expressway should be relooked and discourage growth of any industrial hub that is of red and orange category.

Taj precinct Level

1. Strict zoning to restrict or prohibit all non-conforming activities along the river.
2. No construction or built forms should be proposed on Flood Plains. River banks will only have natural plantations.

7.4.2 Heritage Resources

Strategy

1. Recognize the large volume and diversity of unprotected heritage and establish its role as a major functional base for tourist activity and hence a determinant for urban growth in the region.
2. Develop unexplored and low on visitation heritage sites which can help take pressure off from overburdened heritage sites and settlements.

3. Ensure that any future developments and interventions respond sensitively to the heritage resources to maintain their authenticity and integrity.
4. Enable capacity building of all engaged and involved in the care of unprotected heritage.

Regional scale - Recommendations:

- Protect all identified heritage assets identified above through statutory protection under Uttar Pradesh Municipal Corporation Act 1959 and other applicable legal regimes followed by the municipal corporations, urban local bodies and village panchayats. The concerned development authority would need to integrate these in both the Master plan and Regional development plan.
- Identify the significance of the historic settlements which help impart an identity to each settlement. This identity needs to be conserved and enhanced in any future development of the area.
- Nature of tourism activity, thematic zones and theme based circuits need to be developed based on the significance of each settlement. Tourism movement corridors need to be planned around these themes.
- Awareness and interpretation of heritage, needs to be increased with adequate and appropriate site interpretation. Interpretation centres need to be sited in abandoned and restored structures within heritage precincts.
- An Urban Heritage cell for conservation of historic buildings and precincts should be set up within each municipality wherein mechanisms are developed so that the task of conservation of heritage is shared by all urban governing bodies and coordinated and monitored by the Heritage Cell. Heritage and its protection should figure on the agenda of all civic bodies and incentives to heritage property owners for maintenance of heritage structures should be framed and be part of the planning process. The Heritage Cell should be housed in one of the abandoned and restored heritage structures in the heritage precincts.
- Heritage precincts need to be delineated based on a comprehensive data base compilation and concentration of heritage assets, and notified through Master plans as special areas in all the settlements to include Agra, Mathura, Vrindavan, Gokul, Barsana, Nandagaon, Govardhan, Baldeo, Mahavan, Chaumuhan, Bharatpur, Deeg, Bayana, Kumher, Rupwas, Firozabad, Tundla, Hathras, Sadabad, Fatehabad, Fatehpur Sikri. Heritage centric, site specific byelaws

need to be framed for these heritage precincts. Development guidelines in heritage precincts should address issues of land use, plot widths, massing, building line, skyline, building materials, openings and ornamental details, view scapes/view corridor, compatible land use and new development in heritage precincts and heritage streets.

Table 1 Settlement wise identified Heritage precinct /heritage streets with key heritage structures [1]

HISTORIC AREAS	TYPOLOGIES	KEY MONUMENTS
AGRA		
Taj Precinct and Riverfront Gardens, Agra		
Precinct 1: Taj and immediate surroundings, Agra		
Taj Ganj and *katras* , Paktola, Purani mandi , Telipara, Kachhpura	Tombs and Gardens	Taj Mahal, Agra Fort , Dara Shikoh Library , Khan-i-Alam , Mehtab Bagh, Bara Khamba , Shah Jahan's Park
Precinct 2 : Extended Riverfront Gardens		
Rajwara, Radha Nagar, Katra Wajir Khan, Rambagh, Street scape of Belanganj towards the river	Tombs, Chattris , Industrial Heritage and gardens	Ram Bagh Garden, Nur ki sarai , Chini ka Rauza , Parvez Khan ka Maqbara, Itmad-Ud-Duala, John's Mill, Jaswant Singh ki Chattri
Historic Core of Agra		
Precinct 3 : Hing ki Mandi and surrounding areas		
Hing ki Mandi, , Moti Katra, Nai ki Mandi, Raqaabganj, Mantola	Mosques, Madrasa, Residences, Historic bazaars	Motamid Khan Mosque, Mankameshwar Temple, Kalan Masjid Mosque
Precinct 4: Marble industry of Gokulpura, Agra		
Gokulpura and Loha Mandi	Residences, Temples, Historic gates, Commercial Streets	Mangleshwar Temple, Kans Gate, Gangur Gate
Precinct 5 : Belanganj and its bazaars		
Belanganj, Kashmiri Bazaar, Kinari Bazaar	Mosques, Havelis, Residences, Godowns , Historic bazaars	Kala Mahal, Shahi Madarsa Masjid, Motamid Khan Mosque, Mankameshwar Temple, Hazoori Bhawan, Mahesh Chand Bansal House
Precinct 6 :Colonial Bungalow precinct		
Cantonment Area, Civil lines, Raqaabganj	Bungalows, Churches, Institutions, Offices	NCC Officer's Mess, Adams Tank and Memorial, Agra Cantonment Railway Station, ASI Offices, St. George's Cathedral Church
Precinct 7: Colonial Institutional Precinct		

[1] These precinct boundaries are indicative in nature and need to be revised after a comprehensive data base of all the heritage assets is made. Sources on which present precincts and boundaries are identified are: Preliminary site surveys, INTACH Listing of Agra, Built Heritage Resource Mapping of Bharatpur, Braj Corridor Report for UP Pro Poor Tourism Development Project prepared by INTACH.

HISTORIC AREAS	TYPOLOGIES	KEY MONUMENTS
Dayal Bagh and Paliwal Park Precinct	Physical and social Infrastructure: School, Colleges, Hospitals	Samru Tomb, Roman Catholic Cemetery, Kandahari Begum Tomb, St. John's Inter College, Murari Lal Katri Girl's Inter , Muzaffar Khan ka Bagh, Agra College, St. John's Church, Lady Lyall Hospital, St. Peter's College, School- St. Joseph's & St. Patrick's, University Library, Akbar's Church, Queen Victoria Inter College, Chandiwali Kothi, Paliwal Park, Gol Mandri, Hessing Tomb, Civil Courts
Precinct 8: Precinct of Sikandra		
Sikandra	Tombs, Palaces, Gardens	Akbar's Tomb, Kaanch Mahal , Guru Ka Taal, Colonial Structures, Church
FATEHPUR SIKRI		
Precinct 1: City of Victory: Settlement of Fatehpur and Sikri		
Fatehpur , Sikri , Rasoolpur, Guru ki Mandi	Fortified walls, gates, Bastions, Mosques, Baradari	Lal Darwaza, Todar Mal's Baradari, Qushkhana, Tomb of Sheikh Ibrahim, Hiran Minar, Ibadatkhana, Diwan-i-Khas
Precinct 2: Mughal Imperial Highway Precinct		
Agra to Fatehapur Sikri	Kos Minars	Kos Minars , Remains of Sarai, Chhatris

HATHRAS		
Precinct 1: Baghs and Bagichis of Hathras		
Nayaganj area	Baghs, Chhatris	Beniram Ka Bagh, Sekriseriya Udya, Jhuriyan School, Borewala mandir

BARSANA		
Foot Hills and Historic Core		
Precinct 1 : Core settlement at the foot hills		
Core of the settlement	Temples, Kyari, Palace, haveli, Residences , Chatri	Shri Radha Rani Temple, Shri Gahvaran Baithak ji and bagh, Banke Bihari Temple, Chattris of Barsana, Sudama Ji ka Mandir
Kunds and Vans of Barsana		
Precinct 2 : Vrishbhanu Kund Precinct		
Heritage for Community	Kund and Chattris	Vrishbhanu Kund, Pillar with Sanskrit inscription dated samvat 1666 in the flanking tower at the Bhanakaur tank, Kirti Kund
Precinct 3 : Kunds and Temple		
Coexisting Mythology and ecology of Barsana	Temples and Kunds	Radha Raman Temple, Vihaval Kund, Krishna Kund, Shri Sanket Devi Temple, Prem Sarovar, Chatri, Radha Gopal temple, Rangeeli Mahal, Pili Pokhar
Precinct 4 : Sakhi Giri Parvat Precinct		
Hill precinct of Barsana	Temples and Hills	Dauji Temple, Deha Kund, Lalita Sakhi Temple, Trivedi Kund, Lalita Vivah Sthali, Sakhi Giri Parvat, Sakhi Kup

MATHURA		
Historic Core of Mathura		
Precinct 1: Tilas and Ghats of Mathura		
Sapta Ridhi Tila to Ganesh Tila	Tilas (mounds- few residential	Mazar Karbala/ Barakhamba, Ganesh Tila/ Ganesh Tirtha/ Ganesh Mahadev Mandir, Somtirth Ghat/ Krishna Ganga, Dhruv Ghat,

including all ghats from Ganesh Ghat to Gupta Ghat and historic structures along river front	settlements at present), Temples, Mosque, Qila and Ghats	Swami Narayan Mandir, Bali Tila, SaptaRishi Tila, Somthirth Ghat/ Krishna Ganga Ghat, Kans Qila/ Old Fort of Mathura, Surya Ghat/ Suryatirtha/ Suraj Ghat, Asikunda Ghat/ Varahatirtha, Ram Ghat, Kanakhalatirtha/ Kanakhalatirtha Ghat
Precinct 2: Bazaar Streets with Havelis and shops		
Chatta Bazaar and Sadar Bazaar	Residences, Historic Bazaars (Shops of Sarafas and Metal Workers)	Ram Dwar, Yamuna Dharamaraj Behan Bhai Mandir, Gatashram Narayan Mandir, Kishori Raman, Jain Temple- Shri Parshwanath Digambir, Keshav Ji Gaudiya Matha, Holi Gate
Archaeological and Mythological Core of Mathura		
Precinct 3: Mosque and Janambhoomi Precinct with the bazaar, Mathura		
Janam Bhoomi and Govind nagar area	Temples, Mosque, Kund and Bazaar	Janam Bhoomi Temple, Potra Kund, Idgah/ Keshav Dev Mandir, Govindpur Tila, Mahavidya Kund, Bazaar.
Precinct 4: Shiv Taal Precinct		
Shiv taal with haveli, temple and open community space	Temples, Haveli and Kund	Shiva taal and Radha Raman Shiv Taal Bihari Mandir with residences and open space for community
Precinct 5: Bhuteshwar Road Precinct		
Kacheri road	Temples, Mosque, Kund and Bazaar	Gopal Khera, Kankali Tila, Akhada Bhuteshwar, Bhuteswar Mahadev Mandir/ Patal Devi Mandir
Colonial Core of Mathura		
Precinct 6: Colonial Precinct of Mathura		
Cantonment Areas	Institutions (Library, museums etc.), residences, church and schools	Residential and administrative structures with in Cantonment, Churches

VRINDAVAN		
PARIKRAMA MARG ZONE		
Precinct 1: Ghat Precinct of Vrindavan		
Stretch of historic ghats and edge of receded river	Vans, Temples, Ghats	Keshi Ghat, Cheer Ghat, Nidhi van, Roop Sanatan Gaudiya Math, Laakhnu Temple, Tatiya Sthal, Vihar Ghat, Dwadash Aditya Tila, Shringar Vat, Temple of Jugal Kishore, Old Nand Quila, Nabha Ghat
Precinct 2: Temple precinct of Parikrama Route		
Temples and Bazaars along the parikrama Route	Temples, Bazaars, Well,	Prem Mandir, Iscon Temple, Jaipur Mandir, Bajaar selling Poshak and incense and other intangible crafts.
Significant Temples and Environs		
Precinct 3: Rangji Temple and Govind Dev Temple precinct, Vrindavan		
Rangji Temple Complex with Bagichis and vans and streets leading to the Rath Yatra Route.	Temple, Bagichi, Van, Kund, Bazaars, Residences	Rang Ji temple, Jagannath Temple, Ram Bagh, Rath Yatra Route, Residential Precinct with in the temple, Rangji Baghichi, Govind Dev temple, Market Street in the complex, Goshala, Nikunj Van
Precinct 4: Banke Bihari Temple and Bazaar lanes of Vrindavan		

Residential and Bazaar lanes leading to the Banke Bihari temple	Temples, Bazaars and Residences (turned into math and Dharamshalas)	Banke Bihari Temple, Nabha Wali Kunj, Seth Sagarmal Dharamshala, Sahajapura Temple, Rasik Bihari Temple, Shriji Temple, Thakur Radha Kant Bihari Mandir – Choti

GOVARDHAN		
Parikrama Zone		
Precinct 1: Hills enveloped by Parikrama Marg		
Mythological and Jaat period precinct of Govardhan	Temples, Chattris, Kunds, Maths, Ashram	Chhatris of Govardhan, Kusum Sarovar, Raja Randheer ki Chattri, Apsara Kund, Bilachhu Kund/ Vilas Vadana, Chakra Tirth/ Chakleshwar Mahadev Temple, Brahma Kund

NANDAGAON		
Mythological and Ecological Settlement of Nandgaon		
Precinct 1: Ecological envelope of Nandgaon		
Surrounding kunds and hills	Hills, Temples, and Kunds	Surya Kund, Charan Pahadi, Kajal Kund/ Kajrara Kund, Panihari Kund, Yashoda Maath, Surya Kund, Uddav Kyari, Milan Kund, Yashodha Kund
Precinct 2: Mythological core precinct of Nandgaon		
Core temple hill	Bajaar, Havelis, residences, Temples, Maths	Nand Bhawan/ Nand Rai Bhawan/Nand Raiji ka Mandir, Yashoda Maath, Dhowri Haveli, Haveli, Gau Khuta

GOKUL		
Mythological Settlement of Gokul		
Precinct 1: Ghat precinct of Gokul		
Temples and Ghats along the river	Temples, ghats	Yashoda Ghat, Murli Dhar Ghat, Jagannath Ghat, Yogmaya Janmasthan, Dwarka Dheesh Baithak and Mandir
Precinct 2: Mythological core of Gokul		
Core of the city with narrow streets of temples and shops leading to the Ghats	Temples, residences, Baithak, Havelis	Vasudev Darwaza, Kamal Kund/ Kamla Wala Kund, Shri Mahaprabhu Ji Ki Badi Baithak, , Mandir Shri Nand Qila Nand Bhawan, Shri Gokul Nath Ji Ka Mandir, Haveli Sri Chinta Mani Madhav, Shri Gopal Lal Maharaj Mandir

BALDEO		
Precinct 1: Temple and Kund Precinct of Baldeo		
Dauji Temple and Kund of Baldeo with approach street with historic havelis and residences	Temples, Kund and remains along the kund, Havelis, Residences	Dauji ka mandir, Shri Hardev Ji ka Mandir, Sankarshan kund

BAYANA
Precinct 1 : Group of Mughal Monuments of Bayana

Group of monuments from Satpura to Saat Kunda	Chattri, Gateway, temple, Mosque, Kunds	Jahangir gateway, Kale Khan ka Makbara, Sarai-Sad-ullah, Akbar Chhatri
Precinct 2 : Syncretic Precinct of Bayana		
Bada Bazaar and Bhitarwadi Chowk	Temple, Mosque, Minar	Usha Mandir, Lodi Minar, Mosque

RUPWAS		
Precinct 1 : Lal Mahal Precinct		
Mahal with water body	Water Tank and Palace	Lal Mahal, Water Tank

TUNDLA		
Precinct 1- Colonial Precinct of Tundla		
Residential railway colony	Church, residences and gardens	Bungalows with forecourt gardens, residences with common green spaces, company *bagh* now railway colony park, Church.

BHARATPUR		
Fortified City of Bharatpur		
Precinct 1 : Fort including the moat		
Fort precinct with its defence architectural elements	Fort, Town hall, Moat	Lohgarh Fort, Moat, Mahal Khas, Sujan Ganga, Sinsini Burj, Bihariji Ka Mandir, Kachahari Kalan , Kothi Khas, Chaman Bageechi(garden)Kamara Khas, Hansarani Mahal, Hammam &mud wall
Precinct 2 : Colonial Precinct		
Residential precinct of Pai Bagh and Namak Katra in proximity including colonial layer within the fort and surroundings	Temples, Residences, Shops, Town Hall	Janana Hospital, Jaton ki Haveli, Upadhyay haveli, Salgiram ka Kund, Chatri and mandir, Kuan, Mud fortification wall, Radha Vallabh Ji ka Mandir, Giriraj Singh ki Haveli
Precinct 3 : Historic haveli and bazaar street of Bharatpur		
Stretch from KumherDarwaza to NavgrahaMandir and kund including Daujikamandir and	City gates, Temples, Residences, Shops.	Kumher Darwaza, Sarafa Bazaar, Laxman Mandir, Saraf Haveli, Jain Mandir, Rekha Nanga ki Haveli, Sharma Haveli, Oswal Haveli, Rajkiya Shree Vrishbhan Kumari Balika Uchhya Madhamik Vidyalaya, Shri Venkatesh Purana Laxman Mandir, Anah Darwaza,

tank upto circular road		Veernarayan Darwaza, Lohgarh Press Club, Agarwal Dukan and Haveli

DEEG		
Precinct 1:Royal Garden and palaces precinct of Deeg		
Fort precinct including the gardens and the *baghs* in front of the palaces and surround water bodies.	Fort, Palaces, Gardens	Deeg fort, Gulab Bagh, Kachha Bagh, Ram Bhawan, Jal Mahal

KUMHER		
Precinct 1 : Historic and ecological precinct of Kumher		
Kumher fort and surroundings	Fort, Talaab (kund), Gaushala	Kacha Talaab, Rani ka Talaab, Gaushala and tank, Kumher fort

FATEHABAD		
Precinct 1 : Mughal Precinct of Fatehabad		
Serai and mosque precinct including the *bazaar* street with *havelis.*	Mosque, Bazaar, Residences, Serai	Mughal Serai, Humayun's Mosque, *bazaar* street*, havelis*.
Precinct 2 : Mughal Garden of Fatehabad		
Badshahi bagh	Garden	Badshahi *bagh*

FEROZABAD		
Precinct 1 : Historic Bazaar Street		
Economic and socio cultural drivers of the city : From the tomb of Feroz Shah to the entire Sadar Bazaar Street including the arterial lanes such as Bohran Wali Gali, Irfan Market	Bazaar Streets with Residential havelis and religious structures	Sheikh Khalif Masjif, Feroz Shah Maqbara, Farookihi masjid, Bohran Wali Gali, Irfan Bazaar, Residences and havelis on Sadar Bazaars and internal lanes.

SIKANDRA RAO		
Precinct 1 : Old fort/ tehsil precinct		
Ruins of Sikandra Rao	Remains of old tehsil (previously a fort) and the water body	Remains of Tehsil, Rehtom Pond and open area

SADABAD		
Precinct 1 : Nawabi Palace Complex		
Including the Nawab'a residence within the fortified walls and bastions, adjacent mosque and open space in front of the main entrance, remains of the complex across the road.	Palace, defense structures, Mosque, Ruins	Nawab's residence, Mosque, Fortified wall, bastions

- Special byelaws and guidelines need to be framed for prohibited and regulated zones around ASI protected sites as per the regulations of the Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010.
- Capacity building of the urban local bodies to tackle heritage related issues in a sensitive manner needs to be enhanced through workshops, training and outreach programs to cover aspects related to, among others, technical knowledge of traditional materials, urban conservation norms and conservation implementation mechanisms.
- Archaeologically significant sites, both protected and unprotected, need to be maintained and conserved and development around them to be monitored to enhance their significance and value. Wherever possible, the archaeological mounds should be integrated with the urban development patterns as open spaces, to ensure that there is no encroachment.
- Heritage precincts with significant architectural, cultural and natural heritage need to have sensitive tourism management plans that enhance the values of these sites. Adaptive reuse of the vacant and abandoned heritage structures for amenities for tourists should be considered.

Agra City scale - Recommendations

- Prepare GIS based database through documentation, mapping and detailed inventories of built heritage resource in Agra to recognize the wealth of heritage assets which should guide the growth trajectory.
- The historic core of Agra needs to be nominated as a World Heritage City by UNESCO. This would require legal and management systems to be developed for the protection of the Outstanding Universal Values of the city, as per the criteria set by UNESCO in the Operational Guidelines for the implementation of the World Heritage Convention.
- Within the city of Agra various heritage precincts with different thematic content need to be delineated and protected. These are Taj Heritage Precinct with the iconic Taj; Riverfront precinct with the river facing gardens; Hing ki mandi precinct with its crafts and mediaeval fabric character; Gokulpura precinct with the settlement of stone carvers; Belangunj precinct with its urban mediaeval character; Cantonment area precinct with its special Colonial bungalows character; Dayal bagh precinct with the Colonial institutional character.

Table 2 Identified Heritage Zones and Precincts in Agra

HERITAGE ZONE 1 : Taj Precinct and River front gardens, Agra			
Historic precinct / group of monuments	**Key Themes**	**Historic settlements /areas**	**Key Monuments**
Precinct 1 : Taj Mahal and immediate surroundings	• Royal structures with ancillary historic bazaars and residential Settlements • Manifestations of Mughal Capital	Taj Ganj and *katras*, Paktola, Purani mandi, Telipara, Kachhpura	Taj Mahal, Agra Fort, Dara Shikoh Library, Khan I Alam, Mehtab Bagh, Shah Jahan's Park
	Dominant Character of the Precinct: • High tourist foot fall area around • Residential houses rapidly changing in character • Shops of historic *bazaars* in Taj ganj • East and West gate of Taj Mahal have large parking areas and other tourist amenities • Paradise Park, Shah Jahanparkand protected forest area near east gate are green buffer spaces around Taj and River. • Marble inlay work is the craft still surviving in Taj Ganj.		
Precinct 2: Extended River Front Gardens	• String of royal gardens along the river • The ecological foot print of Agra • Traces of Industrial influences of Colonial Period	Rajwara, Radha Nagar, Katra Wajir Khan, Rambagh, Street scape of Belunganj towards the river	Ram Bagh Garden, Nur Ki sarai , Chini ka Rauza , Parvez Khan Ka Maqbara, Itmad-Ud-Duala, John's Mill, Jaswant Singh Ki Chattri

	Dominant Character of the Precinct: • Residential infill developments and communities along river front • Nurseries along the eastern edge of the river • Ruins of historic gardens and traces of garden elements in nurseries and within settlements. • Settlements have turned their backs towards the river leading to unhealthy state of the river and solid waste dumping along the river edge. • Layer of now abandoned industrial footprint over the historic gardens along the western edge of the river. • Urban pressure and intense development in the areas along the western river front • Commercial landuse on vehicular roads on both sides of the river		
HERITAGE ZONE 2 : Historic Core of Agra			
Precinct 3.: Hing ki Mandi and Surrounding areas	• Economic and Social drivers of the city	Hing Ki Mandi, , Moti Katra, Nai Ki Mandi, Raqaabganj, Mantola	Motamid Khan masjid, Mankameshwar Temple, Kalan masjid
	Dominant Character of the Precinct: • Residential structures with shops on ground floor • Narrow streets and dense settlements		
Precinct 4: Marble industry of Gokulpura, Agra	• Craft industries	Gokulpura and Loha Mandi	Mangleshwar Temple, Kans Gate, Gangur Gate
	Dominant Character of the Precinct : • Residences with courtyards and verandahs as working spaces. • Narrow streets • Shops on the ground floor of peripheral streets		
Precinct 5.: Belanganj and its bazaars	• Historic housing	Belanganj, Kashmiri Bazaar, Kinari Bazaar,	Kala Mahal, Shahi Madarsa Masjid, Motamid Khan Mosque, Mankameshwar Temple, Hazoori Bhawan, Mahesh Chand Bansal House, Dara Shikoh library
	Dominant Character of the Precinct : • Residential structures • Infill Developments of new structures • Narrow streets • Commercial streets • Historic social Infrastructure – Mosques and *madrasas*		
Precinct 6. Colonial Residential and Administrative precinct	Colonial bungalows	Cantonment Area, Civil lines, Raqaabganj	NCC Officer's Mess, Adams Tank and Memorial, Agra Cantonment Railway Station, ASI Offices, St. George's Cathedral Church
	Dominant character of the Precinct: • Bungalows of high architectural value sitting in large compounds • Low rise development • Wide streets • Low boundary walls helping architecture to communicate and contribute to the streetscape		
Precinct 7: Colonial Institutional Precinct	Colonial institutions	Dayal Bagh and Paliwal Park Precinct.	Samru Tomb, Roman Catholic Cemetery, Kandahari Begum Tomb, St. John's Inter College, Murari Lal Katri Girl's Inter , Muzaffar Khan ka Bagh, Agra College, St. John's Church, Lady Lyall Hospital, St. Peter's College, School- St. Joseph's & St. Patrick's, University Library, Akbar's Church, Queen Victoria Inter College, Chandiwali Kothi, Paliwal Park, Gol Mandri, Hessing Tomb, Civil Courts

	Dominant character of the precinct: • Institutional complexes with high value architecture set in large compounds • Buildings with large footprints • Wide roads • Colleges and schools as dominant use

- Special byelaws and development guidelines need to be formulated for identified heritage precincts which maintain their character, through regulations that are context specific, heritage sensitive and community responsive.
- Heritage sites and precincts within the city of Agra need to be conserved and promoted and developed with tourist infrastructure which can help take pressure off from the already overburdened heritage sites of Taj.
- Heritage Impact Assessment, Environmental Impact Assessment and Social Impact Assessment should be undertaken for all upcoming development projects within the immediate vicinity of both protected and unprotected heritage sites and precincts.
- Heritage precincts identified should be brought under 'Adopt a Heritage scheme' to improve basic civic amenities and built environment for the residents within. This is especially needed in crafts clusters like Gokulpura with pachikari (marble inlay) work, Nai ki Mandi for zardozi, Tedhi Bagiya for carpet weaving.
- Site Management Plans for the World Heritage Sites, namely Taj Mahal, Agra Fort and Fatehpur Sikri complex need to be prepared and periodically monitored as per the mandatory requirement for all World heritage sites as per the Operational guidelines laid out by UNESCO.
- A Historic Building Bank needs to be set up by the Development Authority in an abandoned heritage structure for depositing all the neglected pieces of heritage buildings lying scattered and uncared for in the streets of Agra.

Taj Precinct scale - Recommendations

- The precinct needs to be promoted as a garden district.
- Other heritage sites within the precinct need to be conserved and interpreted to take visitor pressure off Taj. The sites identified are Mehtab Bagh, Chini Ka Rauza, Ram Bagh, Itmad-ud-daula, GyarahSidhi, Khan-i-Dauran Bagh, Buland Bagh, Jahanara Bagh, Jaswant Singh kiChattri and Haveli of Agha Khan.

- Eco-tourism trails to be developed in the protected forest reserve on the east of Taj Mahal to create awareness among the locals and visitors about the biodiversity in nature.

7.4.3 Transportation

TTZ Level

1. Planned approach towards future mobility planning: To establish a planned future growth several detailed studies are recommended to enhance the mobility for inhabitants and tourists/visitors. These include
   - Developing a regional level integrated landuse transport plan, with special focus on strengthening public transport.
   - Preparing low carbon mobility plans for settlements with a population more than 5 lakhs.
   - Prepare Comprehensive Mobility Plan for settlements with a population ranging between 1-5 lakhs.

2. Parking Management: Since, on-street parking has been a major concern within the TTZ region, strict guidelines needs to be adopted discourage private vehicles in the settlements. High parking charges needs to be introduced in TTZ along with provision of public transport. Also, the building norms must have mandatory provision of parking at each individual's house. Un-authorized on-street parking must be penalized and strict monitoring of compliance of defined rules to be enforced.

Agra City Level

1. Influencing travel behaviour and mode choices: .it is proposed to provide travel information and incentives to encourage people to walk, cycle and use public transport. Facilities of electric tourist buses should be introduced to facilitate mobility for tourists and make them aware of other unexplored tourist destinations.

Taj Precinct Level

1. Restricted developments in Taj Precinct

It is recommended that the approach roads in this zone should primarily be pedestrianized with restricted mobility through electric vehicles. The roads should be made clutter free by removing/relocating all encroachments.

7.4.4 Environment & Ecology

1. The growth trends of rural and urban areas should factor in the carrying capacity of the existing infrastructure
2. The functional base should factor in the local skills and available resources
3. Assessment of induced growth due to development outside the region and controlling the impacts for prevention of environmental stress.
4. Sectoral Policies and Projects (existing and in pipeline) to be reviewed and modified if required, to address sustainable development.
5. Adoption of Land suitability approach for protection of forests, flood plains, aquifers, prime agricultural land, drainage corridors, habitats of fauna, grazing lands etc. to identify highly suitable, moderately suitable and unsuitable lands for future development.

7.4.5 Urban Form, Character and Image

Regional Level

Region has rich architectural heritage and is well known for religious tourism and Mughal heritage based-tourism. Following are the strategies for promotion of tourism in the region

1. A comprehensive tourism plan for the region after considering all the spaces- ecological, religious, architectural, historic settlements and products offered by the region. Identification of actors and graded audience need to be part of this tourism plan.
2. Strengthening of regional dependencies through unique and specific work opportunities

Under the above strategies towards enhancing functional base and defining growth trajectories, specific spatial recommendations for the region are

- A robust tourist triangle of TTZ with three main nodes in the form of Mathura-Vrindavan, Agra and Bharatpur-Deeg-Fatehpur Sikri need to be developed and the spaces and sites can be developed around existing urban geography and triangular tourist urban structure, a kind of mini golden triangle (Delhi-Agra-Jaipur).
- Short-term and long-term tourism circuit in the region is recommended around the above urban structure with upgradation/improvement of areas around tourist attractions and basic services for tourists at key locations

- It is further recommended that balance between tourism and everydayness of the city (site specific everyday spaces with the attention to locals as well and their socio-cultural practices) needs to be maintained by articulating the relationship between everyday spaces used by locals and tourist sites.
- To retain the essence and genius loci of the places in TTZ, it is recommended to strengthen the spaces and activities associated with cultural and creative industries within the settlements
- Apart from day-to-day need-based functions, each settlement of TTZ has more or less unique identity due to historical, ecological, cultural or functional dominance. It is recommended here that future functional role of these settlements needs to be undertaken keeping their unique identities and protection of spaces and activities associated with this unique identity

Agra Level

Recommendations are as follows

- There needs to be spaces and sites developed for short term tourism and long term tourism. Guidelines and policies need to be prepared to encourage long term tourism in the city.

7.5 ANCHOR V: ASSESSING INFRASTRUCTURE (PHYSICAL AND SOCIAL) AND INCORPORATING FUTURE NEEDS

7.5.1 Urban Structure, Livelihood and Infrastructure

Regional scale

1. Proper energy supply plan for the TTZ region to reduce dependency on diesel and other sources of pollution
2.

City scale - Agra

3. Strategies to prepare an infrastructure Plan for all the sectors and implement the same in the city
4. A Sewage management plan needs to be developed and put into action.
5. Sewage recycling system should be developed and incorporated particularly in slums.
6. Use of solar panels and other energy sources should be made mandatory with incentives.
7. Bio-gas or natural gas can be other alternative

8. The SWM Regulations of 2016 needs to be adopted for the city and followed
9. Bulk waste generators are to handle and treat their own waste
10. Strategies should be based on a zero waste management system
11. A scientific landfill site to be identified and constructed outside the city with waste composting and waste to energy components added to it.

7.5.2 Transportation

TTZ Level

1. Planned future growth: The urban development needs to be restructured with the objective of an integrated development of transport system, regulated transport and travel patterns which would promote mobility, mixed use of public spaces and lower per capita movement. Thus, it is recommended to prepare an integrated landuse and low carbon mobility plan suggesting development of dense transport networks and combination of transportation modalities for seamless passenger transfer to meet the local community as well as the regional needs. The inadequacies of the road network must be eliminated to tackle the problems of people preferring car for travelling.
2. In addition to public transport, individual mobility must be an important factor in network planning. The mobility plan must consider the principle of polycentrism and give priority to walking and cycling to significantly improve the environmental conditions. A considerable part of the road network needs to be made cyclist-friendly in order to encourage the spread of cycling. Alongside this, pedestrian traffic must also enjoy priority in the development of transport and public spaces.
3. Provide connectivity / accessibility to major activity centres : Major activity centres in the settlements must allow for greater degree of association with the tourists and locals. However, presently these centres lack an identity as well as accessibility. Thus, it is recommended to ensure all activity centres/ tourist spots have high quality public transport and non-motorised transport facilities that are appropriate to the role of the centre/ tourist spot.

Agra City Level

1. Enhance existing public transport services: The key to smart mobility is high standard, well-organised, integrated public transport network covering most of the city. Thus, it is recommended to plan a coherent multimodal public transport system making public transport an

increasingly realistic alternative for local population and tourists. The appeal of existing public transport services must be increased by improving reliability of services, quality i.e. replacing existing diesel fleet to electric, raising comfort standard and establishing an adequate system of passenger information.

7.5.3 Urban Form, Character and Image

Regional Level

Both older and newer parts of the settlement suffer from poor quality of open spaces for recreation and public spaces for interaction of people. Following are the strategies for improvement of liveability of settlements of TTZ from the perspective of everyday spaces for locals

1. Utilization of local assets such as river front, nallah edges, unprotected heritage structures, kunds, any government owned structure and defunct industrial areas for improvement of public realm and creation of additional open space in TTZ settlements.

Under the above strategy towards promotion of everyday spaces in TTZ settlements, following are specific spatial recommendations for the region

- Taking three riverfront at Agra, Vrindavan and Mathura as first stage projects for improvement of open space for surrounding local community and city at large. It is recommended that these riverfront projects are conceptually structured around the 'Recreation' and not 'Entertainment'. Recommendations proposed under Anchor II to be duly considered during the riverfront projects.
- Other spaces recommended under this strategy are, edges of Govardhan Parbat, Moat at Bharatpur, John's Mill at Agra, edges of Deeg Palace, Shani Mandir at Kosi, and gardens along the bank of Yamuna at Agra

Agra Level

- Other than tourism oriented needs, the neighborhood concept shall be deployed for fulfilling basic day to day need at walkable distances for social and physical infrastructure as the town has other functions too other than the predominant one.
- Provision of attractive public transport both for short and long journeys shall be provided. The drop-off and pick-up points will become a potential for integration with place making.

Precinct Level

Recommendations are as follows;

- Provisions for handling large pedestrian footfall shall be dealt with wider and accessible shaded footpaths with universal access.
- The visual clutter, including electric cables, water supply and sewerage pipelines and drains along with hoardings shall be minimized to enhance the overall experience.

7.5.4 Heritage Resources

Strategy

1. Enhance the quality of the physical and social environment within and around heritage precincts through provision of infrastructure that is sensitive to heritage.
2. Introduce tourism related infrastructure and requisite amenities across TTZ.

Regional scale - Recommendations

- All vacant and abandoned heritage structures need to be reused to house public amenities and infrastructure facilities such as museum, interpretation centre, libraries, community centres, adult literacy centres to enable the integration of heritage structures with the community needs and demands. The ICOMOS Charter for the Interpretation and Presentation of Cultural Heritage Sites (2008) which sets internationally recognized guidelines for the interpretation and presentation of cultural heritage sites needs to be followed.
- The kunds and vans need to be revived and conserved and made part of the open space system of the region as social infrastructure.
- Risk preparedness and risk mitigation plans need to be prepared for all heritage sites and precincts.
- Improve access to heritage sites and precincts and provide parking areas outside heritage precincts. Heritage precincts should be planned to prioritize pedestrian movement with provision for transport for physically challenged, elderly and sick persons. Existing pedestrian routes should be designed to be pedestrian friendly and new routes should be developed to form the pedestrian network connecting various heritage sites.
- Road widening activities in the heritage precincts with heritage facades to accommodate more vehicular traffic should be prohibited.

Traffic should be restricted to threshold levels established by carrying capacities of the roads and heritage precincts.

- All infrastructure development of any scale in heritage precincts should be given clearance only after an exhaustive Heritage Impact Assessment and providing adequate mitigation measures. For example in Govardhan, a heritage structure located at the corner of the Mansi Ganga kund, (part of the historic precinct) was demolished to provide for parking facilities.
- Heritage precincts should be cattle free and cattle traps should be strategically located.
- Tourist information centres/kiosks should be located strategically, close to heritage sites and precincts, along heritage trails and in heritage buildings wherever possible.
- Improve and provide for infrastructural facilities and amenities like drinking water, public toilets, litter bins at all heritage sites and precincts. A management plan should be in place for regular maintenance and upkeep of the public amenities. The physical infrastructure such as garbage collection points and electric transformers should be placed in discreet locations to avoid visual marring of heritage sites. Infrastructure which is destroying the visual quality of heritage needs to be removed and relocated. Underground wiring needs to be introduced in all heritage precincts.
- A battery bus service that would pick and drop visitors need to be introduced wherever possible to ensure improved access opportunities to the various heritage spots within the settlements. This will also ensure effective tourist dispersal so that they do not concentrate on only the major, more visible tourist destinations.

Agra City scale - Recommendations

- Physical infrastructure needs to be improved in heritage precincts identified which have living heritage such as stone craftsmen in Gokulpura, petha making units and zardozi workers in Nai ki Mandi, carpet weavers in Tedhi Bagia to improve quality of life and working conditions of the craftsmen. Other areas with living crafts need to be identified for physical infrastructure improvement.
- Risk Preparedness and Risk mitigation plans for the World Heritage Sites and the sites with high visitor footfall need to be prepared.
- Given the quantum of heritage in Agra different hierarchies of trails need to be planned out and itineraries worked out for various time spans available to tourists. Nodes or pause points need to be

strategically located as resting spots along the heritage trail. Trails have to be designed at both pedestrian and vehicular scales.

- Park and ride facilities for visiting heritage precincts and heritage zones, with nodes for parking at strategic points along heritage trails need to be introduced.
- Public amenities, to include drinking water kiosks, public toilets and dust bins at key locations, discreetly located along heritage trails and within heritage sites need to be provided.

Taj Precinct scale - Recommendations

- The road presently running along the river front and cutting the city from the river should be planned to have limited traffic to encourage pedestrian movement and to help recover the riverfront garden landscape. Pedestrianisation would also significantly help to emphasize the historic character of the site.
- Access to river and river front gardens needs to be improved. The following spots need to be made more accessible: Bagh-Shah Nawaz Khan, Buland Bagh, Ram Bagh, Jahanara Bagh, Chini ka Rauza, Bagh-e-Wazir Khan, Bagh-e-Sultan Parvez, Bagh-e- Mausawi Khan, Haveli of Khan-e-Dauran, Haveli of Aga Khan, Rauza of Zafar Khan and Jaswant Singh ki Chattri.

7.5.5 Environment & Ecology

1. Addressing inadequacy of infrastructural needs
2. Development of new and decentralised methods of waste management – waste water, municipal waste, e-waste.
3. Monitoring of implementation of Hazardous and Biomedical Waste Management Guidelines
4. Formulation of Guidelines for temporary infrastructure for pilgrimage sites
5. Connection of Grids to non-conventional energy sources for clean energy generation
6. Roads to be surfaced to control dust emissions
7. Emission assessment of transport corridors to continuously monitor traffic related emissions
8. Greening of traffic terminals and freight handling areas
9. Promotion of Energy plantations to meet fodder requirements
10. Stoppage of wood burning and other inefficient non-commercial energy sources
11. Alternatives to use of diesel for backup of mobile network towers

12. Increased of piped gas supply in urban and rural areas
13. Guidelines for rural housing to address all weather proof structures and usage of local materials
14. Promotion of urban and peri-urban agriculture to reduce import of food grains, fruits and vegetables to the region
15. Promotion of Agro-Forestry
16. Capacity building and training for manufacturing of organic fertilizers
17. Identification, Protection ,and Enhancement of grazing lands
18. Inoculation for prevention of growth of diseases
19. Adoption of industrial ecology concept for reusing waste of industrial areas
20. Study of indoor pollution in existing industries
21. Formulation of monitoring measures for maintenance of green industrial character
22. Assessment of impact of sandmining on the floodplains
23. Adoption of dust management measures in existing quarries
24. Formulation eco-tourism guidelines for natural, cultural heritage sites
25. Preparation of calendar of religious festivals, mapping of locations and population pressure, associated activities for promotion of green pilgrimage strategies

7.6 ANCHOR VI: MULTI-MODAL URBAN STRUCTURE AND PUBLIC PLACES AND MOVEMENT PATTERNS

7.6.1 Urban Structure, Livelihood and Infrastructure

Agra City Level

1. Proper access, congestion free and hygienic conditions to be provided to all regulated slums
2. Unregulated slums to be taken up and registered and pulling them under the same scheme.
3. Livelihood options, skill building and education to be part of the Slum Development Plan
4. Squatters are to be relocated to a nearby designated land and made regular with livelihood options.
5. In-situ development should be the first option to be taken up.
6. Migration should be stopped by adopting strategies like by promoting more development and economic growth in the surrounding villages and towns.

7.6.2 Transportation

TTZ Level

1. Enhancing regional public transportation: Develop a long-range transportation plan to establish a regional road-based environment friendly public transport system, operated and managed by tourism or transport department or could be through partnership model. This would serve to connect residents of constituent settlements as well as tourists/visitors easily and comfortably to the diversified tourism options offered in the TTZ region.

Agra City Level

1. De-concentration of activities: Increase in urban sprawl and motorized movements are a major cause for degrading environmental conditions. Thus, to reduce the existing pressure on the settlements it is recommended to limit the further expansion based on settlements carrying capacity and then adopt policies for well-planned transport infrastructure expansion, de-concentration of activities and managing the land-use structure.
2. Restrict/regulate entry of heavy goods vehicles: Presence of wholesale markets/mandi severely affect the operational efficiency of transport system. Thus, it is proposed to have any additional wholesale/mandi facilities at the outskirts of other settlements of Agra district. Further, no heavy vehicular/truck movement should be permitted within the city centre. Internal movement of goods should be restricted to LCV's and small pick u cargo vehicles at specific times of day and night. This would eliminate the issues of on-street parking of goods traffic as well as loading and unloading operations thereby augmenting the carrying capacity of roads in the city and also reduce the veh-kms travelled by the goods vehicles.
3. Promoting Public Transport Travel: Increasing the efficiency of public transport can deliver benefits of enhanced road capacities, accessibility and safety and security. Thus, it is proposed to improve the efficiency of existing public transport system and bring in new fleet for tourists. New electric hop-on-hop-off tourist buses must be introduced covering the other less explored tourist spots in the cities. In addition, common mobility card for residents an separate tourist cards must be introduced. These tourist cards must comprise of parking charges at the entry/exit points of the settlements, local public transport travel and entry fee to various tourist spots within the city.

7.6.3 Urban Form, Character and Image

Regional Level

Along with the predominant historic cores and their unique urban image, which is also considered as the only image generated out of its function, the new layers of development, predominantly based on the functions, shall represent the images (which at present are mostly chaotic) of the character zones significantly and add to the overall unity of muilt-nodal functional districts and associated image character zones. To achieve this, following strategies are considered for TTZ towns.

1. With various layers of transformation due to technological and need base evolution, the cities and towns under TTZ shall visually represent various images of evolution with prominence to historical core. Rather than enforcing singular image of a city or town, based on the transforming functional roles, the new images need to be strengthened. Like in case of Vrindavan, new sense of spirituality and religiosity can be identified as a unique character from the inner city. Multi-image based zones can be identified radially from the core and through the specific landuse parcels.
2. Not only overall image but the components of generator of urban image such as unique functional morphology, spatial typologies and activities to strengthen the experience.

Under the above-mentioned strategy, following recommendations will ensure the recognition of specific urban functions and hence the establishment of various evolving multi-nodal urban images and there relationship.

- Based on the additive layers of development such as, historic core, production units of the town, real-estate ventures, etc. to be identified under specific functional character zones.
- Once established, suitable urban image reflecting the predominant function need to be identified.
- Such image districts to be linked with each other with specific attention to their edge conditions and activity patterns along the movement corridors.
- Along with the promotion of mixed land use development, the character of each functional district to be enhanced through morphological interventions specific to respective character district for redevelopment of brown field and upcoming green field developments.

Agra Level

Following are the recommendations at Agra city level

- While recognising multiple functional nodes such as peripheral real-estate zones, extension of Taj ganj, Old city precinct and cantonment, the masterplan and development regulations shall pertain to strengthen functional distinctions which will cater to the urban image.
- The edge conditions need to follow urban design guidelines for setbacks, activity allocation and morphological treatment to accentuate the character districts and their experience.

Precinct Level

Following are the recommendations at Taj precinct level.

- In Taj Dharohar kshetra, not the land use but the historic significance need to be taken up for delineation the character zones to formulate multi-nodal precinct structure. The nodes to vary from ecological precincts encompassing Baghs and nurseries, craft and cultural districts, existing non historic residential localities and protected monuments and view corridors/vantage points. Each zone need to then identify the key imageble component followed by edge relation with other distinct nodal zones.
- Within Taj Ganj, the four katras to be considered as multi-nodal functional zones which can enhance the experience based on the historic function of each katra such as perfume manufacturing, Pachchikari, etc.

7.6.4 Heritage Resources

Strategy

1. Establish heritage sites as hubs to become nodal points as new civic spaces for both the local community and visitors.
2. Develop heritage sites to become part of the multi-nodal development to enable dispersal of visitors and convergence of local communities.

Regional scale - Recommendations

- Neglected and relatively unknown heritage sites need to be developed to help disburse visitors and take pressure off over visited heritage sites. This will also encourage visitors to stay overnight in locations, ensuring their contribution to local economy. These new nodes to be developed with tourist infrastructure include Bayana, Deeg, Rupwas,

Firozabad, Itmadpur and should be developed as theme based destinations and circuits catering to different tourist interest.

Agra City scale - Recommendations

- The character and quality of key open spaces within heritage precincts and around heritage resources need to be enhanced to become nodal spaces as part of community open space networks. Organized public open spaces around monuments would ensure their protection against unwanted development in the future.
- Nodes of varying hierarchies need to be developed around heritage sites to take load off the Taj area.

Taj Precinct scale - Recommendations

- Develop various heritage sites along the river front precinct as nodes to accommodate various functions of the city and take pressure off the Taj area.

Table 3 Proposals

Garden no.	River front Gardens/sites	PROPOSALS
East Bank Garden		
Garden 1	**Bagh-i-Shah Nawaz Khan**	
Status of Existence : Partially Exists **Current Use:** Residences **Protection Status :** Partially Protected (Ruins Protected)		1. Protection and conservation of ruins (preparation of Conservation Management Plan /Site Management Plan) 2. Demarcation of the buffer boundary of protected site 3. Improve accessibility to Garden from Rambagh Garden Road(Hathras Road) 4. Improve access to the river 5. Interpretation of ruins as part of the Historic garden (Site Interpretation Plan) 6. Develop nursery specializing in Mughal plant species as used in historic Mughal gardens and promote their marketing 7. Residents of Kushwaha market and surrounding areas need to be engaged in the upkeep of the historic garden through community outreach programs and workshops.
Garden 2	**Buland Bagh**	
Status of Existence : Partially Exists **Current Use:** Nursery /Residences **Protection Status :** Partially Protected		1. Restoration of the historic garden along with its water channel and authentic plantation scheme (scientific investigations for site exploration are required) 2. Demarcation of the buffer boundary of protected site 3. Improve access to the garden 4. Improve access to the river 5. Residents of Kushwaha market and surrounding areas needs to be engaged in the upkeep of the historic garden through community outreach programs and workshops. 6. Develop nursery specializing in Mughal plant species as used in historic Mughal gardens and promote their marketing 7. Training and capacity building of the community youth and engaging them as custodians of heritage.

Garden no.	River front Gardens/sites	PROPOSALS
	Nur ki Serai	
Status of Existence : Exists **Current Use:** Monument (Sarai) **Protection Status :**Unprotected		1. Conservation and Restoration of the Serai 2. Integrate the water channel, at present a *nallah*, into the landscape scheme. 3. Improve access from the Rambagh Bagh Road to the Serai through sensitive design of road 4. Provide accessibility to the river from the rear gateway of the Serai 5. Adaptive reuse of the serai as a crafts haat
Garden 3	**Bagh-i-Nur Afsan (Ram Bagh)**	
Status of Existence : Exists **Current Use:** Monument **Protection Status :**ASI Protected		1. Conservation and authentic Restoration of the garden using the principles of Mughal Garden design 2. Improve access to the garden from Rambagh Road to Garden. 3. Provision of visitor amenities, signage and upgrading the parking 4. Site Interpretation
Garden 4	**Bagh-i-Zahanara (Zahara Bagh /Zora Bagh)**	
Status of Existence : Partially Exists **Current Use:** Nursery /Residences **Protection Status :** Partially Protected		1. Conservation and Restoration of the garden around the surviving ruins 2. Corner *chattris* need to be conserved 3. Developed as a community space 4. Landscape improvement through urban design intervention of the Chatta Ghat 5. Mughal plant species to be planted to evoke the memory of the space 6. Green area to be protected from encroachments and change of land use from open space to residential 7. Livelihood of people should be linked with the management of nursery 8. Improve access to garden
Garden 5	**Unnamed garden**	
Status of Existence : Lost **Current Use:** Residences **Protection Status :** NA		1. Develop as a green public open space
Garden 6	**Chini Ka Rauza**	
Status of Existence : Partially Exists **Current Use:** Nursery **Protection Status :** ASI Protected (Tombs Protected)		1. Conservation and Restoration of the Chini ka Rauza and Kala Gumbad 2. Restoration of the historic garden along with its water channel and authentic plantation scheme (scientific investigations and site explorations are required) 3. Site development and landscape improvement of the area between Chini ka Rauza and Kala Gumbad as a community space 4. Improving accessibility from Rambagh road to the complex 5. Improve accessibility to the river from the precinct 6. Develop nursery specialized in Mughal plant species as used in historic Mughal gardens 7. Site interpretation of the Complex (Chini ka Rauza, Kala Gumbad and nursery as part of one garden complex)
Garden 7	**Bagh-i-Wazir Khan**	
Status of Existence : Partially Exists **Current Use:** Nursery /Residences **Protection Status :** Unprotected		1. Restoration of the ruins 2. Improving accessibility from Rambagh road to the ruins 3. Provide access to the river
Garden 8	**Bagh-i-Sultan Parvez**	

Garden no.	River front Gardens/sites	PROPOSALS
Status of Existence : Partially Exists **Current Use:** Nursery /Residences **Protection Status :** Unprotected		1. Conservation and authentic Restoration of the Garden with the tomb of Sultan Parvez 2. Scientific exploration for the historic remains 3. Improving accessibility from Rambagh road to the complex 4. Provide access to the river 5. Site Interpretation Plan for the garden complex
Garden 9	**Maqbara Itmad-ud-Duala**	
Status of Existence : Exists **Current Use:** Garden /Monument **Protection Status :** Protected		1. Improvement of parking facilities.
		1. Gandhi smarak should be opened to the public and developed as a public open space. Walls to be made transparent by designing a MS grill wall.
Garden 10	**Bagh-i-Mausawi Khan Sadar**	
Status of Existence : Partially Exists(a dome roof structure exists) **Current Use:** Residences **Protection Status :** Unprotected		1. Restore the structure 2. Provide access to structure through school 3. Improve access to river
Garden 11	**Bagh-i-Padshahi**	
Status of Existence : Lost **Current Use:** Railway station **Protection Status :** NA		-----
Garden 12	**Moti Bagh**	
Status of Existence : Lost **Current Use:** Residences **Protection Status :** NA		-----
Garden 13	**Bagh Padshahi**	
Status of Existence : Lost **Current Use:** Residences/Agricultural **Protection Status :** NA		1. Plant three rows of trees of the Mughal period along the riverfront to evoke the memory of the historic riverfront gardens 2. Development control regulations to prohibit the change of land use from agriculture 3. Scientific investigation to include GPR surveys and other exploration techniques to recover the footprint of the historic gardens. 4. Site Interpretation Plan
Garden 14	**Lal Bagh Padshahi**	
Status of Existence : Lost **Current Use:** Residences/Agricultural **Protection Status :** Partially Protected (Gyarah Sidhi Protected)		
Garden 15	**Char Bagh Padshahi**	
Status of Existence : Lost **Current Use:** Agricultural **Protection Status :** NA		
Garden 16	**Bagh-i-Bisht**	
Status of Existence : Lost **Current Use:** Agricultural **Protection Status :** NA		

Garden no.	River front Gardens/sites	PROPOSALS
Garden 17	**Bagh-i-Mehtab Padshahi**	
Status of Existence : Exists **Current Use:** Garden /Monument **Protection Status :** Protected		1. Planting of authentic plant species through phasing plans which phase out the inauthentic plant species 2. Site Interpretation Plan 3. Provision of parking and public amenities
West Bank Gardens		
Garden 18	**Haveli of Khan-i-Duran**	
Status of Existence : Partially Exists **Current Use:** Haveli, Gateway **Protection Status :** Unprotected		1. Conservation of remains of the garden 2. Adaptive reuse of the structure 3. Improvement of accessibility from the Taj Mahal - East corridor to the interior of the gardens 4. Afforestation in the area 5. Development of eco-trails 6. Site Interpretation 7. Landscape Improvement of East Corridor 8. Nullah to be integrated in the landscape design 9. Development of View point of Taj
Garden 19	**Haveli of Agha Khan**	
Status of Existence : Structure Exists **Current Use:** Temple trust **Protection Status :** Unprotected		1. Conservation of remains of the gardens 2. Afforestation in the area 3. Nullah to become part of the landscape 4. Development of View point of Taj
Garden 20	**Rauza of Shah Jahan (Taj Mahal)**	
Status of Existence : Exists **Current Use:** Garden/ Monument **Protection Status :** ASI Protected		1. Preparation of Site Management Plan (as per the recommended norms for World Heritage Site)
Garden 21	**Bagh-i-Khan-i-Alam**	
Status of Existence : Exists **Current Use:** Garden/ Monument **Protection Status :** ASI Protected		1. Conservation of the historic garden elements which include the water channels, water systems, and historic plantation scheme. 2. Improved visibility and accessibility from the West gate of Taj Mahal through signage 3. Site Interpretation 4. Promote it as an extension to Taj Mahal to understand the waterworks of the Taj Mahal
Garden 22	**Haveli of Aslat Khan**	
Status of Existence : Lost **Current Use:** Shahjehan park **Protection Status :** NA		1. Interpret the gardens in the landscape by emphasising the footprints of the various historic gardens and their ruins in the area through landscape design to enhance the experience of the visitor 2. Scientific investigation to include GPR surveys and other exploration techniques 3. Site Interpretation Plan
Garden 23	**Haveli of Mahabat Khan**	
Status of Existence : Partially Exists **Current Use:** Shahjehan park **Protection Status :** Unprotected		
Garden 24	**Haveli of Hoshdar Khan**	
Status of Existence : Lost		

Garden no.	River front Gardens/sites	PROPOSALS
Current Use: Forest Land **Protection Status :** Unprotected (Protected by Forest Department)		
Garden 25	**Haveli of Azam Khan**	
Status of Existence : Lost **Current Use:** Forest Land **Protection Status :** Unprotected (Protected by Forest Department)		
Garden 26	**Haveli of Mughal Khan**	
Status of Existence : Lost **Current Use:** Forest Land **Protection Status :** Unprotected (Protected by Forest Department)		
Garden 27	**Haveli of Islam Khan**	
Status of Existence : Lost **Current Use:** Forest Land **Protection Status :** Unprotected (Protected by Forest Department)		
	Paradise Park	
		1. Plant groves of indigenous trees known to have been planted in Mughal period to evoke the memory of the lost landscape
Garden 28	**Agra Fort**	
Status of Existence : Exists **Current Use:** Monument **Protection Status :** ASI Protected		1. Preparation of Site Management Plan (as per the recommended norms for World Heritage Site)
Garden 29	**Haveli of Dara Shikhoh**	
Status of Existence : Structure Exists **Current Use:** Monument **Protection Status :** ASI Protected (Structure protected)		1. Conservation of haveli 2. Improve accessibility to Haveli 3. Efficient solid waste management system to be adopted to recover the historic nullah 4. Site Interpretation by enhancing the footprints of the garden through design of floorscape to evoke the memory of the lost garden 5. Adaptive Reuse 6. Open space in front of Dara Shikoh to be developed as a community open space 7. Urban Design Guidelines 8. Planting of indigenous trees along the river edge to recover the imagery of lost riverfront gardens when viewed from across the river 9. Change material of the road along the stretch to capture the footprint of the garden
Garden 30	**Haveli of Khan-i-Jahan Lodhi**	
Status of Existence : Lost **Current Use:** Residences **Protection Status :** NA		1. Urban Design Guidelines for facade fronting the river 2. Planting of indigenous trees along the river edge to recover the imagery of lost riverfront gardens when viewed from across the river

Garden no.	River front Gardens/sites	PROPOSALS
Garden 31	**Haveli of Hafiz Khitmadgar**	
Status of Existence : Lost **Current Use:** Residences **Protection Status :** NA		1. Urban Design Guidelines for facade fronting the river 2. Planting of indigenous trees along the river edges to recover the imagery of lost riverfront gardens
Garden 32	**Haveli of Asaf Khan**	
Status of Existence : Structure Exists **Current Use:** Residence **Protection Status :** Unprotected		1. Urban Design Guidelines for facade fronting the river 2. Planting of indigenous trees along the river edges to recover the imagery of lost riverfront gardens
Garden 33 **Garden 34** **Garden 35**	**Haveli of Alamgir**	
Status of Existence :Lost **Current Use:** Residence **Protection Status :** NA		1. Urban Design Guidelines for facade fronting the river 2. Planting of indigenous trees along the river edges to recover the imagery of lost riverfront gardens
Garden 36	**Haveli of Sasat**	
Status of Existence : Lost **Current Use:** Residence **Protection Status :** NA		1. Urban Design Guidelines for facade fronting the river 2. Planting of indigenous trees along the river edges to recover the imagery of lost riverfront gardens
Garden 37	**Haveli of Jafar Khan**	
Status of Existence Lost **Current Use:** Residence **Protection Status :** Partially Protected		1. Urban Design Guidelines for facade fronting the river 2. Planting of indigenous trees along the river edges to recover the imagery of lost riverfront gardens
Garden 38	**Rauza of Sasat, tomb of Shaista Khan**	
Status of Existence : Lost **Current Use:** Residence **Protection Status :** NA		1. Urban Design Guidelines for facade fronting the river 2. Planting of indigenous trees along the river edges to recover the imagery of lost riverfront gardens
Garden 39	**Haveli of Wazir Khan**	
Status of Existence : Lost **Current Use:** Multiple Use : Residences offices, industrial **Protection Status :** NA		1. Urban Design Guidelines 2. Planting of indigenous trees along the river edges to recover the imagery of lost riverfront gardens 3. Johns Mill area needs to be developed as a public amenities area and a major node of the city with restaurants, crafts centre and recreation without compromising on the spatial and visual integrity of the site and its significance as an outstanding example of industrial heritage. 4. Improve access
Garden 40	**Haveli of Mukim Khan**	
Status of Existence : Lost **Current Use:** Multiple Use : Residences offices, industrial **Protection Status :** NA		
Garden 41	**Haveli of Khalil Khan**	
Status of Existence : Lost **Current Use:** Multiple Use : Residences offices, industrial		

Garden no.	River front Gardens/sites	PROPOSALS
Protection Status : NA		
Garden 42	**Bagh-i-Rai Shiv Das**	
Status of Existence : Lost **Current Use:** Multiple Use : Residences offices, industrial **Protection Status :** NA		
Garden 43	**Bagh-i-Hakim Kazim Ali**	
Status of Existence : Lost **Current Use:** Water works area **Protection Status :** NA		1. Urban Design Guidelines for facade facing river 2. Planting of indigenous trees along the river edges to recover the imagery of lost riverfront gardens
Garden 44	**Rauza of Zafar Khan**	
Status of Existence : Partially Exists **Current Use:** Tomb and Mosque , Gaushala along the river **Protection Status :** ASI Partially Protected		1. Urban Design Guidelines for facade facing river 2. Planting of indigenous trees along the river edges to recover the imagery of lost riverfront gardens
Garden 45	**Chattri of Jaswant Singh**	
Status of Existence : Exists **Current Use:** Monument **Protection Status :** ASI Protected		1. Site Interpretation Plan - signage and interpretation 2. Prohibit use of riverfront as a garbage disposal ground

7.7 ANCHOR VII: REDEFINING THE IMAGE STRUCTURE

7.7.1 Urban Form, Character and Image

Regional Level

The towns and cities in TTZ are facing constant degradation of character and overall image structure due to lack of attention and provisions to retain the existing old city character as well to create a distinctive new image structure. The TTZ expresses a wide pallet of rich heritage cores which are going through a transition and in-turn accelerating the pace of losing unique character districts. The multiple towns are going through rapid urbanisation and pressure of global forces and local aspirations is bringing a change in the character of inner city cores as well as a contextual enclaivic development in the peripheries. It is recommended to adopt following strategies for immediate development in the region:

1. Delineation of Historic Cores based on multi-sector criteria and creation of an urban conservation and design plan towards protection

and enhancement of heritage areas through specific development controls and strategies for continuity and change- spatial types for conservation, adaptive re-use, retro-fitting and pockets for renewal, redevelopment or revitalization etc.

2. Incorporation of the elements of regional landscape, archaeological sites and urban heritage in the Master/Development Plans of all the towns with specific directions and immediate revision of Master/Development Plans of TTZ Towns.
3. Management of land along highways with suitable landscape measures for dust reduction.

Under the above strategy towards redefining and creating a comprehensive image structure in TTZ settlements, following are specific spatial recommendations for the region:

- Since the settlements showcase unique identities, movement corridors such as NH 2 and expressways to utilize the vehicular intersections (urban nodes) and built edges (urban edges) to reflect the cultural and built identity. Also, the transition from change of architecture from one cultural precinct to another in TTZ to be consciously dealt with urban design guidelines.
- Almost in all TTZ towns, such as Mathura, Vrindavan, Deeg and Bhartpur, the way built asset is revealed is quite unique and this needs to be consciously dealt with area level interventions to enhance the overall experience.
- The river edge is pertaining to high potentials for creating a proscenium for built heritage and cultural activities. Desilting of such assets post monsoon and development of continuous links across the ghats, while considering the flood plains, will enhance the usage of the river front and it will provide a new identity to the cities.
- Built edge conditions of the prominent attractions such as Deeg Palace, Buland Darwaza, etc. to be considered important. Significant buildings in the region not to be considered in isolation and the overall built environment, especially around the culturally significant structures to be considered as a whole and urban design guideline to be prepared and followed.
- In case of inner cities, the charm of narrow lanes shall be maintained through appropriate degree of enclosure. Both, the vantage and vistas to be maintained without misappropriation by individual's form-based intervention.

Agra Level

The changing character of historic neighbourhoods in Agra and the loss of associated cultural heritage is a matter of concern. Following strategies are proposed to handle this issue at the city level in Agra;

1. Emphasis to be given on the larger character districts and precincts than just focusing on building level conservation.
2. Improving the pedestrian infrastructure and quality of public spaces along all the major city roads used by locals and tourist/pilgrims and creating urban design guidelines for a pedestrian friendly environment.
3. Creating a public realm for the historic inner city areas that incorporates the existing heritage and accommodates future aspirations.
4. The traditional building, cluster and larger spatial typologies needs preservation and enhancement. Conservation of spatial values, spatial typologies, spatial character, building typologies and architectural character needs to be undertaken through detailed statutory guidelines. A comprehensive conservation strategy is required to be worked out with urban design and conservation guidelines and to be included in Local Area plans, Zonal Development Plan, Master Plan and Building Bye Laws.

Area specific recommendations for Agra are as follows;

- Apart from Taj Precinct, there are three more areas of significance in the city- Cantonment, Old City and Extensions of Tajgnaj, south of Taj Mahal. These areas require specific urban design guidelines for conservation and redevelopment and renewal
- An immediate revision of the Master plan and building regulations is recommended to incorporate and revitalize the historic cores of the city.
- A robust community participation needs to be adopted in order to revitalize the Old City areas, Tajganj, Kachpura, Jama Masjid area and settlements around Agra Fort.
- Create an inclusive and sustainable public realm by improving pedestrian infrastructure and quality of public spaces along Fatehabad road, Road from Agra fort station to Agra fort and further leading to Taj Mahal. Emphasis to be given to introduce climate and culturally responsive pedestrian infrastructure along the Bazaar streets proposed in Agar Master Plan 2021.
- The approach of the tourism needs to be contextual integration, through an understanding of the immediate as well as larger urban

fabric of the city of Agra, while concurrently providing a novel space of experience for both the local inhabitants and tourists alike.

Precinct Level

Following strategies can be adopted at the precinct level to address this issue;

1. Delineation and revision of Taj Heritage Precinct based on ground conditions through a detailed survey, while incorporating the already existing Taj Dharohar Kshetra demarcated in the Master Plan.
2. Identified different character zones in the Precinct and proposing area specific development guidelines.
3. Pedestrian oriented development with local and sustainable modes of transport should be encouraged.
4. Conserving the unique building and spatial typologies in the entire precinct portraying a distinctive image and character of the neighborhood and its communities.
5. Detailed urban design and conservation guidelines to accommodate historicity and contemporary urban development in the precinct. The regulations and guidelines must be contextual and differ as per the nature, history and socio-economic profile of the settlement.
6. Any recommendation for existing settlements falling under Taj Heritage Precinct must be contextual and must consider each settlement's valid and legitimate histories, socio-economic profile and differential tenurial rights.
7. A shift in focus is required from tourism to a wholistic and balanced approach towards the precinct and its surrounding.
8. More viable, practical and innovative solutions must be provided to deal with water pollution in Yamuna.

Area specific recommendations for the Taj Precinct are as follows;

- The existing residential settlements (Kachpura, Taj Ganj, area around Agra Fort etc) in the demarcated precinct including the slums, must be retained and reserved for residential/mixed use. Proper infrastructure and suitable area specific development guidelines should be designed for each settlement.
- Detailed urban design guidelines must be designed around heritage sites to create an inclusive, integrated and pedestrian friendly public realm.
- Important visual corridors and vantage points overlooking the heritage sites and the river needs to be conserved.
- Design active public spaces for tourists as well as the locals.

7.7.2 Heritage Resources

Strategy

1. Strengthen the ability of heritage to contribute towards the urban character and image of the settlements by developing heritage sites as urban landmarks through place making activities.

Regional scale - Recommendations

- Settlements need rediscovery of their specific visual identity achieved through built heritage expressions. These expressions in the form of heritage streets, heritage precincts need to be strengthened.
- The GIS based mapping documenting the concentration and typology of the heritage resource forms the base for identification of character zones. Urban Design Guidelines for the identified character zones in the settlements need to be formulated to address height controls, boundary wall treatment, and streets furniture, landscape design, which will enhance the visual character of these heritage sites and improve their interpretation. These guidelines should be prepared in consultation with team of technical experts from the field of Urban Design, Landscape Architecture, Urban Planning and Conservation.

Agra City scale - Recommendations

- The character zones in the city of Agra forming the image of the city are identified as heritage precincts. Urban Design Guidelines for the identified character zones for height controls, boundary wall treatment, streets furniture, landscape design need to be made which will enhance the visual character of these heritage sites and improve their interpretation.
- Monuments need to be integrated in public chowks and open spaces through sensitive urban design to enhance the imagery of the place.

Precinct scale - Recommendations

- The heritage structures within Shahjahan Park need to be conserved and interpreted to bring back the memory of the river facing gardens.
- Indigenous and historically authentic species need to be planted in Paradise Park to enhance the historic character, increase the green cover and improve the imageability of the riverfront.
- Urban Design guidelines need to be framed for the Belanganj facade area, to preserve the character of the riverfront.

7.7.3 Transportation

Agra City Level

1. Improving environment for all entry/exit corridors: The city has 10 major entry/exit points to Agra which should provide a sense of conviviality and also define the image of the city to the tourists/visitors entering the city. These stretches must be clutter free from on-street parking proposed in the traffic management plan. All the roads should have an equitable distribution of road spaces, giving more priority to pedestrians and public transport. The infrastructure to the primary route to Taj Mahal i.e. Fatehabad Road should be improved.

Taj Precinct Level

1. Improve environment for all approach roads to Taj: The pedestrian walkways should be as per the guidelines including provision for universal accessibility with clearly demarcated zones i.e. static pedestrian activity areas along shops, multi-utility areas for street furniture, amenities like toilet blocks, drinking water, information kiosk etc. Further, considering the exiting site conditions, functional classification of roads & available right of way, the approach roads to Taj needs to be improved in terms of balance between softscape and hardscape. The quality of public places along all the access roads to Taj particularly along the West Gate Road and Agra Bah road needs to be improved. The south entrance to Taj also needs to be revived.

8 Action Plan & Timeline

8.1 FIRST DRAFT ACTION PLAN

The draft action plan is a first attempt to logically bring together multiple strategies and recommendations presented in Chapter 7 of the draft report. This is also an exercise to bring multi-sectoral issues under an umbrella to formulate one specific action into clearly defined step. Each action is thus an interdisciplinary approach to set in processes of change either at Regional, Agra city or Taj precinct scale. The actions are proposed for primarily three time frames short (1-3 yrs), Medium (3-7 yrs), Long (7+ yrs) along with different possible agencies involved to carry out the task. It is further categorized under various aspects such as legal, Policy, Planning, Implementation, Monitoring, Design, Education, Documentation etc. to create a better understanding of the nature of action.

It is proposed here that this action plan is to be discussed and deliberated among various agencies, departments of Uttar Pradesh, Rajasthan and the relevant authorities of Government of India in order to finalize the action plan.

8.1.1. Regional Scale

S. No.	Actions	Agencies	Action Type *
	Short, Medium and Long Term Actions		
1.	Seven Regional Plans to be prepared for the TTZ with respect to: A) Analysis of Regional Resources based on Land Suitability Analysis • Restoration of Degraded Ecosystems, Wastelands by afforestation, soil and water conservation measures • Identification, creation and protection of grazing lands • Promotion of Agroforestry in Agricultural lands, and Social Forestry. • Preparation of Protected Area Management Plan like Keetham Sanctuary B) Preparation of Peoples Biodiversity register to promote medicinal plants and forest produce to create new economic activities. D) EIA (Environmental Impact Assessment) of proposed Development projects as per 2006 notification and amendments thereof and HIA (Heritage Impact Assessment), SIA (Social Impact assessment)of existing and proposed development. E) Preparation of TTZ Integrated Sustainable Land use Transport Plan. F) Preparation of TTZ Freight Transport Plan. G) Tourist circuit in the region to be identified that ensure accessibility to all key destinations. through well-organized electric public transport modes H) Segregated primary pilgrimage routes and retrofit the roads with equal or higher priority for pedestrians by developing pedestrian friendly walkways through well-organized electric public transport modes	DH in Uttar Pradesh and Rajasthan (Regional Planning Authorities), Biodiversity Board, Forest Department, TCPO,ADA, DC, TTZA	Planning, Implementation and Monitoring
2.	Master Plans to be prepared for all class I, II and III Category Cities in TTZ with respect to: A) Preparation of Environmental Plan • Setting up of air monitoring stations in areas acquired for development of new townships and industrial areas. B) Preparation of Infrastructural Plan • Infrastructure plans with respect to water supply, Sewerage, Solid waste management and power supply to be prepared by all cities in the region. • Adoption of new and renewable energy systems in all sectors • Social and physical infrastructure within and around the identified heritage precincts needs to be papered. C) Preparation of Comprehensive Mobility Plan for settlement with population ranging between 1 to 5 lakh D) Preparation of Heritage Development Plan	URLTA, DA/ULB/NGO/CSA, UPTD, MC, PWD	Planning Implementation and Monitoring

S. No.	Actions	Agencies	Action Type *
	• Heritage precincts need to be delineated based on a comprehensive data base compilation and concentration of heritage assets, and notified through Master plans • Heritage centric sites specific Byelaws and Urban design Guidelines needs to be framed. • Special byelaws and guidelines need to be framed for prohibited and regulated zones around ASI protected sites • All historic gardens, *baghs* and *bagichis* in the region encompassing ASI protected, State protected and unprotected sites, have to be conserved using internationally established norms as spelt out in the ICOMOS Florence Charter on Historic gardens. E) Rules and Regulation • Preparation of urban design guidelines and streetscape for major movement corridors F) Preparation of Comprehensive Mobility Plans for all settlements with population 1-5 lakhs and Low Carbon Mobility Plans for all settlements with population >5 lakhs		
3.	A) Regulations, Control and Monitoring of Polluting Industries in entire TTZ B) Re -classification of Red, Orange, Green and White industries as per latest notification.	TTZ Authority, CGSC (to be formulated), UPSIDC and DIC, Govt. of UP	Legislative, Implementation and Monitoring
4.	Rejuvenation, reclamation and restoration projects to be taken up for River Yamuna with respect to: • Demarcation and Protection of Yamuna flood plain in the TTZ region • Maintenance of environmental flow of the River • Regulation of Ground Water Withdrawal – maintenance of reserves and quality standards. • Listing permitted and not permitted activities in Yamuna flood plains. Extension of Integrated Watershed Management Practices in watersheds of Middle Ganga Basin.	UPIWRD, Irrigation and Flood control, GP, BDO, ULB,DC, TTZA	Planning, Design, Implementation and Monitoring

S. No.	Actions	Agencies	Action Type *
5.	A) Strengthening of Taj Trapezium Zone Authority- creation of departments to address all aspects (Air, Water, Forest, Built Heritage, Land, Industries, Roads, Irrigation and Flood Control, Ground Water etc.) • An Urban Heritage cell for conservation of historic buildings and precincts should be set up within each municipality. The task of conservation of heritage to be shared by all urban governance bodies and coordinated and monitored by the Heritage Cell. Strengthening of TTZ Authority by Setting up of TTZ Unified Regional Land use Transport Authority (URLTA)	Central Govt.,State Government	Planning , Legislation, Implementation and Monitoring
6.	Urban Governance • Capacity building , Awareness and Promotion of land, air, water and vegetation management practices • Prepare GIS based database of built heritage resources, creative industries, water and vegetal heritage resources in the TTZ region (both state protected and ASI protected) through documentation, mapping and detailed inventories, Grade all the heritage assets inventorised based on their significance and values to enable different protection regimes and norms. • Capacity building of the urban local bodies to tackle heritage related issues in a sensitive manner needs to be enhanced through workshops, training and outreach programmes Capacity building and promotion of cultural entrepreneurship among local community such as site interpreters, tourist guides at heritage precinct level and along identified heritage trails.	ULB,DC, TTZA, DA, MC, PWD, UPTD, DoA, ASI	Planning , Legislation, Implementation and Monitoring
7.	Policies: • Ban further sale and registration of petrol and diesel vehicles. • Introduce vehicles registration quota on the low occupancy vehicles Ban vehicles older than 10 years and strict enforcement of pollution checking norms.	Govt. of UP/RTA	Planning and Legislation

8.1.2. Agra City Scale

S. No.	Actions	Agencies	Action Type *
	Short Term Actions		
8.	• Develop charging infrastructure and promote E mobility. • Initially replace existing PT fleet with electric buses and introduce hop-on-hop-off tourist buses. • Restrict heavy vehicular/truck movement within the city centre and Internal movement of goods should be restricted to LCV's and small pickup cargo vehicles at specific times of day and night. • Provide high capacity mobility corridors through high occupancy public modes	UPSRTC/ TTZA/ ADA / MVDA	Planning
9.	Preparation of Plan for creative of Household Industries: • Encouraging Creative and household Industries like petha, stone inlay, zardosi, etc. • Preparation of Heritage Conservation Plan to include creative household industries built heritage. • Carrying capacity of all heritage sites need to be conducted in order to plan out heritage trails	IIDDUP, MSME, SISI, AMC,	Planning, Design, Implementation and Monitoring
10.	Preparation of Environmental Plan with respect to: • Setting up of new Air monitoring stations as per Land use and activity. Setting up of new Water monitoring stations at outflow of drain and doption of Decentralized Water management system in areas where STP are not present.	SPCB, ADA, ULB	Planning Implementation and Monitoring
11.	Preparation of Infrastructural Plan with respect to: • City Sanitation Plan • Decentralized Solid Waste Management , E-waste management, CD waste management and Adoption of Recycling and Reuse systems • Desilting of storm water drains Development of Greenways	SPCB, ADA, ULB	Planning Implementation and Monitoring
12.	Site Management Plans for the World Heritage Sites need to be prepared:	ASI, ADA, UPTD, DoT Lucknow,	Conservation

S. No.	Actions	Agencies	Action Type *
	• The historic core of Agra needs to be nominated as a World Heritage City by UNESCO. This would require legal and management systems to be developed as required for the nomination dossier. • Within the city of Agra various heritage precincts with different thematic content need to be delineated and protected. Special byelaws and development guidelines need to be formulated for identified heritage precincts which maintain their character Urban Design Guidelines for the identified character zones. • Given the quantum of heritage in Agra different hierarchies of trails need to be planned out and itineraries worked out for various time spans available to tourists. Trails have to be designed at both pedestrian and vehicular scales. Build capacities of local communities residing in the vicinity or within heritage precincts as tourist guides at heritage precinct level for identified trails in heritage precincts	ASI, INTACH, ADA, AMC	
13.	Streetscape Improvement Plan for the City starting with Historic core and other character zones:	ADA/AMC	Planning, Design
14.	Conservation of Yamuna river and design of identified public access points: Riverfront Development Plan.	ADA/ULB/UPIWRD/ASI	Planning, Design
	Short, Medium and Long Term Actions		
15.	Preparation of integrated Master Plan for Agra with respect to: • Immediate revision of Master Plan with specific consideration to mixed land use, public spaces and maintaining an appropriate morphological character of the city Immediate revision of Development control regulations responsive to city context, character zones, historic core, Taj heritage precinct etc.	ADA, AMC	Planning, Design, Implementation and Monitoring
16.	Industrial Development Plan with respect to: Planning, redevelopment and relocation of industrial hubs and non-conforming active industries, outside the city with only non-polluting white and green category of industries within the Municipal Boundary.	TTZ Authority, CGSC (to be formulated), UPSIDC, DIC, ADA, AMC	Legislation, implementation and monitoring

8.1.3. Taj Precinct Scale

S. No.	Actions	Agencies	Action Type *
	Short Term Actions		
17.	Delineation of Taj Heritage Precinct after detailed on ground survey of ownership, tenure, social impact assessment etc.	ADA/ASI	Legislative, Documentation
18.	Preparation of Detailed Local area plan for the heritage precinct with respect to: • Focus on creating an integrated and inclusive public realm and infrastructure with robust community participation and public awareness programmes • Comprehensive plan and design for creating diverse livelihood opportunities and integrating traditional livelihoods of the community at Tajganj. • Streetscape improvement plan and urban design guidelines for all the major movement corridors to create a safe and inclusive environment. Tourist guides from the local community need to be trained and imparted with knowledge of Mughal gardens and plants to be able to conduct heritage walks in these sites.	ADA/AMC/CSA/NGO	Planning, Design, Education
19.	Preparation of urban design guidelines for conservation/retrofitting and redevelopment of heritage building and spatial typologies at Tajganj and other residential neighborhoods.	ADA/ASI	Design
20.	Other Heritage Precinct in Agra: • Other heritage sites within the precinct need to be conserved and interpreted to take visitor pressure off Taj. • The historic gardens BulandBagh, ZaharaBagh, ChinikaRauza, Bagh e Wazir Khan, Bagh e Sultan Parvez, partly converted to nurseries need to be developed as centres of Mughal plant industry for sale and marketing of Mughal plants as a tourism product. • Prevention of densification of Civil Lines and Cantonment areas.	ADA, MSME, UPDT, Cantonment Board, DC, TTZA	Policy Design Education
21.	More shade giving indigenous trees need to be planted along the newly designed east gateway entrance axis.	DoH	Design

S. No.	Actions	Agencies	Action Type *
22.	Appropriate Riverine landscape development and adoption of Phyto remediation and Bio remediation measures for treating water.	Forest Department	Planning Implementation and Monitoring
23.	Delineated Taj Precinct zone should be developed as a pedestrianized zone,	ADA / PWD	Planning Design

ADA Agra development authority

AMC – Agra Municipal Corporation

ASI Archaeological Survey of India

BDO Block Development Officer

CGSC Central Government Special Committee

CPCB Central Pollution Control Board

DA Development authority

DIC District Industrial Center

DH District Head quarters

DC District Collectorate

DoA Directorate of Archaeology, Govt of Uttar Pradesh

DoH Department of Horticulture and food processing, UP

DoT Lucknow Department of Tourism, Lucknow

FD – Forest Department

FWD Forest and Wildlife Department

GP Gram Panchayat

GWD Ground Water Department

GP Gram Panchayat

IIDD Infrastructure and Industrial Development Department

IIDDUP - Infrastructure & Industrial Development Department, Uttar Pradesh

INTACH - Indian National Trust for Art and Cultural Heritage

IWRD Irrigation and Water Resource Department

MC Municipal Corporation

MoEF Ministry of Environment, Forests and Climate Change

MSME Ministry of micro, small and medium enterprises

NDMA National Disaster management authority

NGO Non-Governmental Organisation

PWD Public Works Department

RRRD - Representative from Rehabilitation and Resettlement Department

SISI - Small Industries Service Institute

SPCB State Pollution Control Board

TCPO Town and Country Planning Organization

TTZ Authority – Taj Trapezium Zone Authority

TTZA - Taj Trapezium Zone Authority

ULB – Urban Local Bodies

UPEDA - Uttar Pradesh Energy Development Agency

UPIWRD Uttar Pradesh Irrigation and Water Resource Department

UPJN UP Jal Nigam

UPPCB UP Pollution Control Board

UPSIDC – Uttar Pradesh State Industrial Development Corporation

UPSRTC- UP State Road Transport Corporation

UPTD UP Tourism Department

URLTA Unified Regional Landuse Transport Authority

YEIDA - Yamuna Expressway Industrial Development Authority

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