

INTEGRATED REGIONAL DISASTER MANAGEMENT PLAN FOR PUNE CITY AND PUNE MUNICIPAL COUNCILS (SUMMARY REPORT)



**REGIONAL DISASTER MANAGEMENT CENTRE,
PUNE MUNICIPAL CORPORATION, PUNE
2014-2015**

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Profile of Pune City

Table 1

1	Head quarters	Pune
2	Location (of the Headquarters)	Pune
3	Total Area (district)	15,642 km ²

Table 2 Geography and Topography

1	Major Rivers	Pushpavati, Krushnavati, Kukadi, Meena, Ghod, Bhima, Bhama, Andhra, Indryani, Pavna, Mula, Mutha, Ambi, Mose, Shivganga, Kanandi, Gunjavni, Velvandi, Neera, Karha, Velu etc.
2	Lakes	Bhushi, The Lonavla lake, INS Shivaji, Pavna, Valvhan, Tungarli, Andhra, Shirawta lake.
3	Reservoirs	Khadakwasla Dam, Panshet Dam, Mulshi Dam, Bhatghar Dam, Temghar Dam, Varasgaon Dam, Manikdoh Dam, Yedgaon Dam, Dhom Dam, Venna Lake, Pashan Lake, Katraj Lake, Vishrantwadi Lake, Kaas Lake

Table 3 Weather and Climate

Average precipitation days	0.0	0.1	0.6	1.1	2.8	7.5	12.8	10.6	7.4	4.6	2.0	0.4	49.9
Average relative humidity (%)	56	46	36	36	48	70	79	82	78	64	58	58	59.3
Mean monthly sunshine hours	291.4	282.8	300.7	303.0	316.2	186.0	120.9	111.6	177.0	248.0			

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	35.3 (95.5)	38.9 (102)	42.8 (109)	43.3 (109.9)	43.3 (109.9)	41.7 (107.1)	36.0 (96.8)	35.0 (95)	36.1 (97)	37.8 (100)	36.1 (97)	35.0 (95)	43.3 (109.9)
Average high °C (°F)	30.3 (86.5)	32.8 (91)	36.0 (96.8)	38.1 (100.6)	37.2 (99)	32.1 (89.8)	28.3 (82.9)	27.5 (81.5)	29.3 (84.7)	31.8 (89.2)	30.5 (86.9)	29.6 (85.3)	32.0 (89.6)
Daily mean °C (°F)	20.5 (68.9)	22.0 (71.6)	25.6 (78.1)	28.8 (83.8)	29.7 (85.5)	27.4 (81.3)	25.3 (77.5)	24.5 (76.1)	25.1 (77.2)	25.0 (77)	22.3 (72.1)	20.2 (68.4)	24.7 (76.4)
Average low °C (°F)	11.4 (52.5)	12.7 (54.9)	16.5 (61.7)	20.7 (69.3)	22.5 (72.5)	22.9 (73.2)	22.0 (71.6)	21.4 (70.5)	20.7 (69.3)	18.8 (65.8)	14.7 (58.5)	12.0 (53.6)	18.0 (64.4)
Record low °C (°F)	1.7 (35.1)	3.9 (39)	7.2 (45)	10.6 (51.1)	13.8 (56.8)	17.0 (62.6)	18.9 (66)	17.2 (63)	13.2 (55.8)	9.4 (48.9)	4.6 (40.3)	3.3 (37.9)	1.7 (35.1)
Average precipitation mm (inches)	0 (0)	0.5 (0.02)	5.3 (0.209)	16.6 (0.654)	40.6 (1.598)	116.1 (4.571)	187.2 (7.37)	122.3 (4.815)	120.1 (4.728)	77.9 (3.067)	30.2 (1.189)	4.8 (0.189)	721.7 (28.413)

Table 4 Total Population

1	Male	4,924,105
2	Female	4,505,303
3	Sex Ratio	910 females for every 1000 males
4	(0 to 6 yrs) Age Group Population	1,104,959
5	Population Density	603 inhabitants per sq km

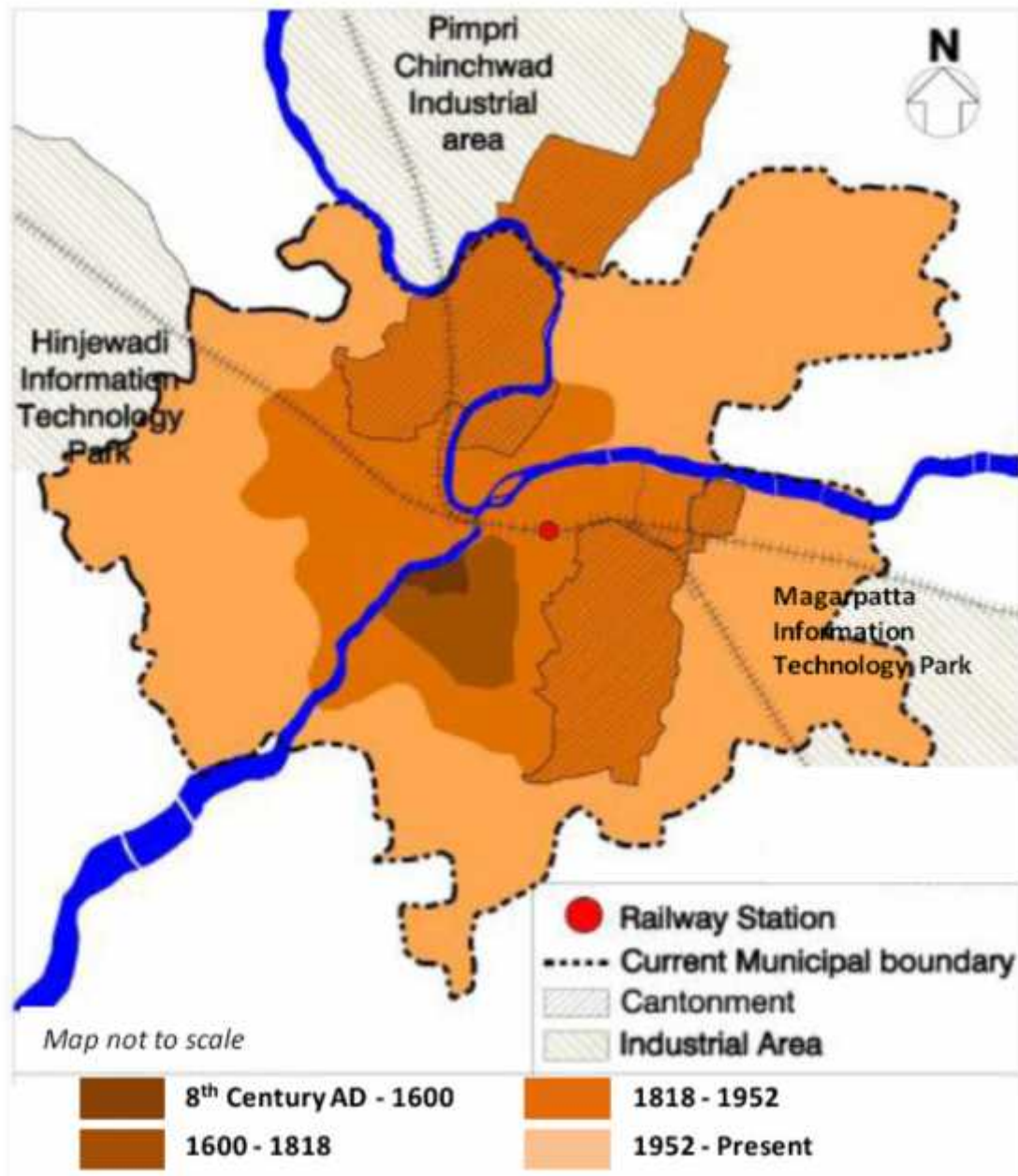
Table 5 Education

1	Institution	5,287
2	Lower Primary	2,657
3	Upper Primary	1,828
4	High Schools	1,342
5	Vocational H.S. and	25
6	University	14
7	Arts and Science College	31

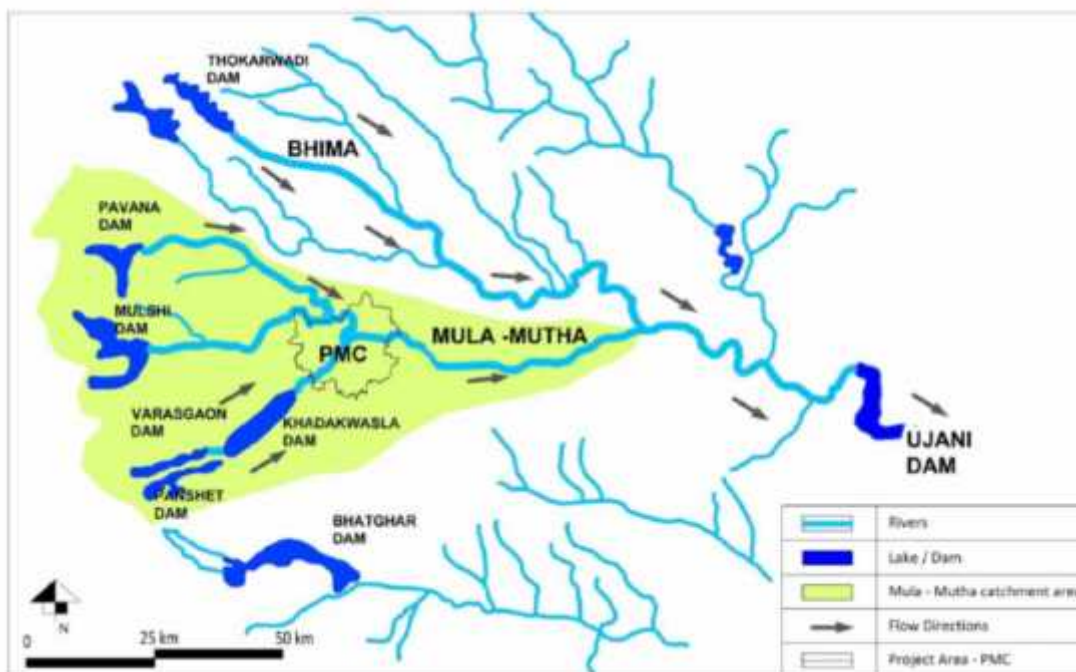
Pune Municipal Corporation (PMC) is administratively divided into 15 ward offices.

Table 8 Maps of Pune

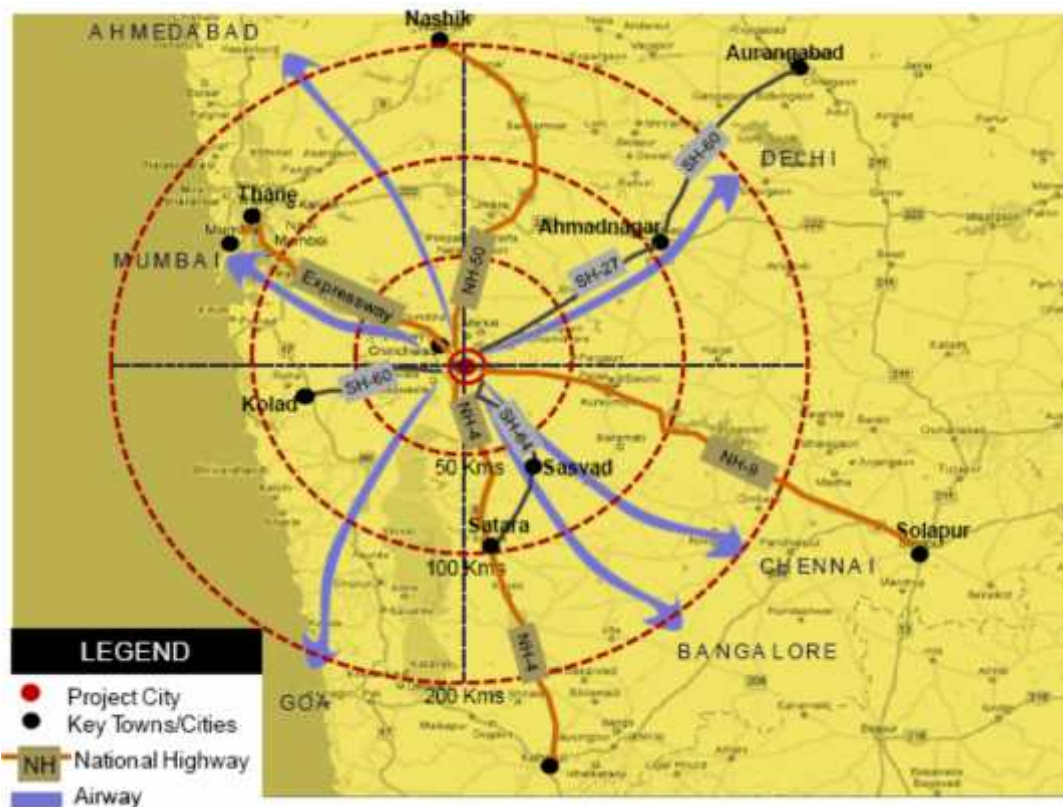
1. Chronological Growth of the city



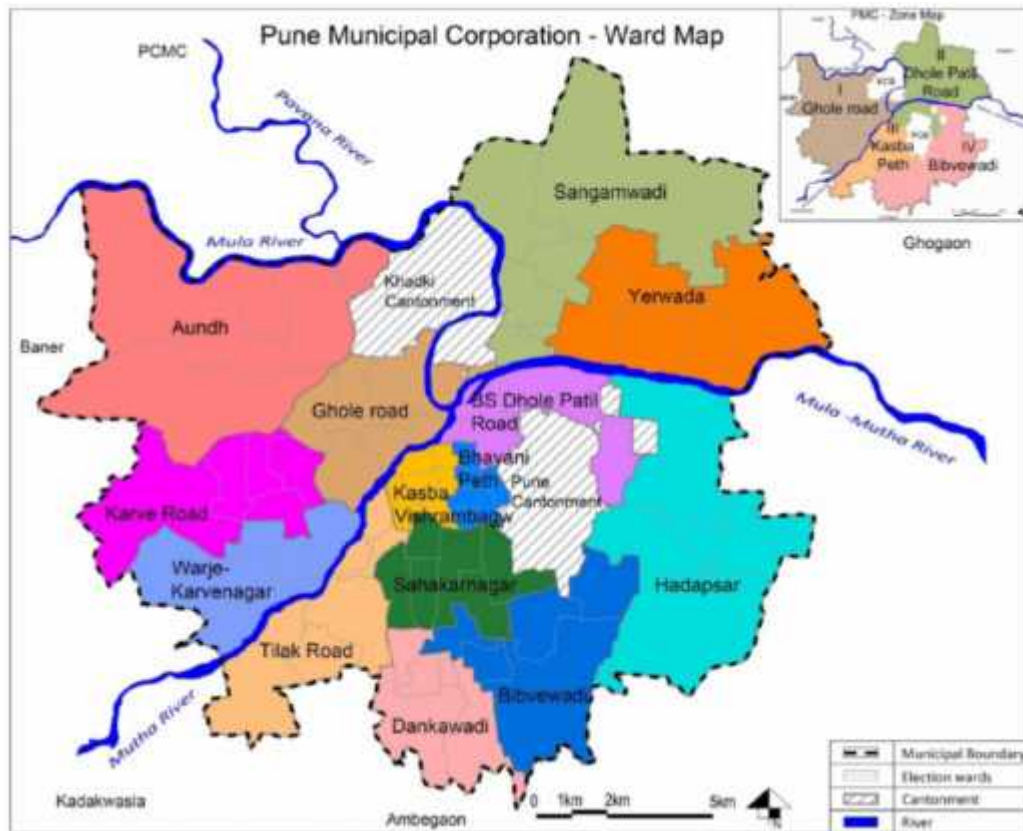
2. Pune location in North Bhima river:



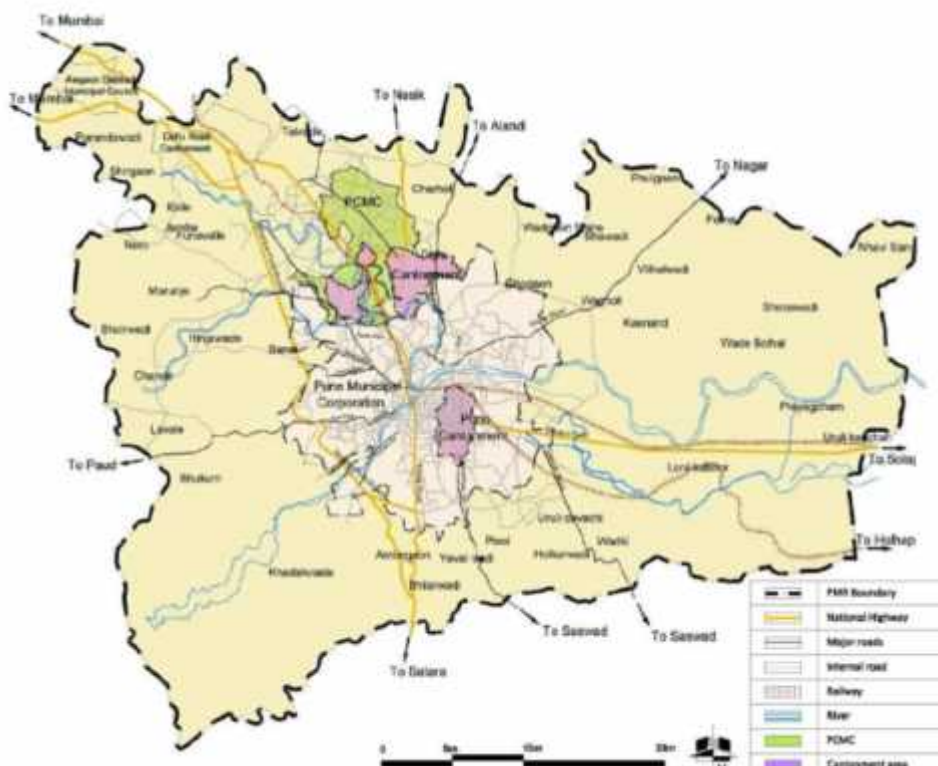
3. PuneLinkage and connectivity:



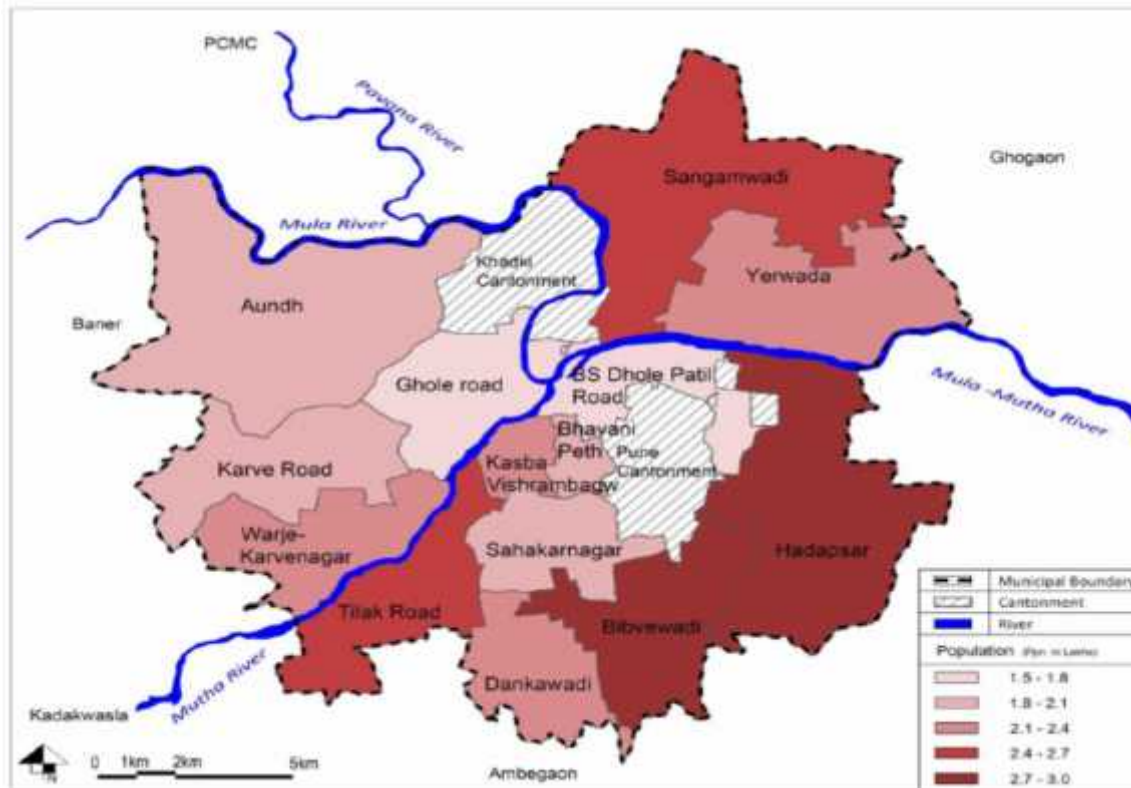
4. Municipal Corporation ward map:



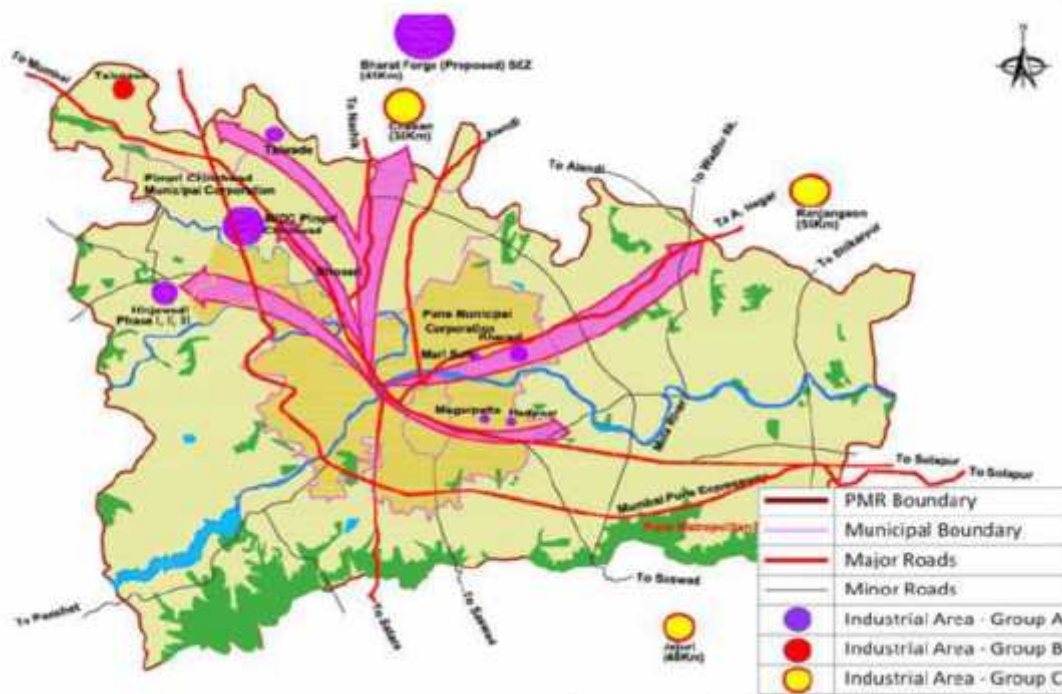
5. Google Map and PuneMunicipal Corporation:



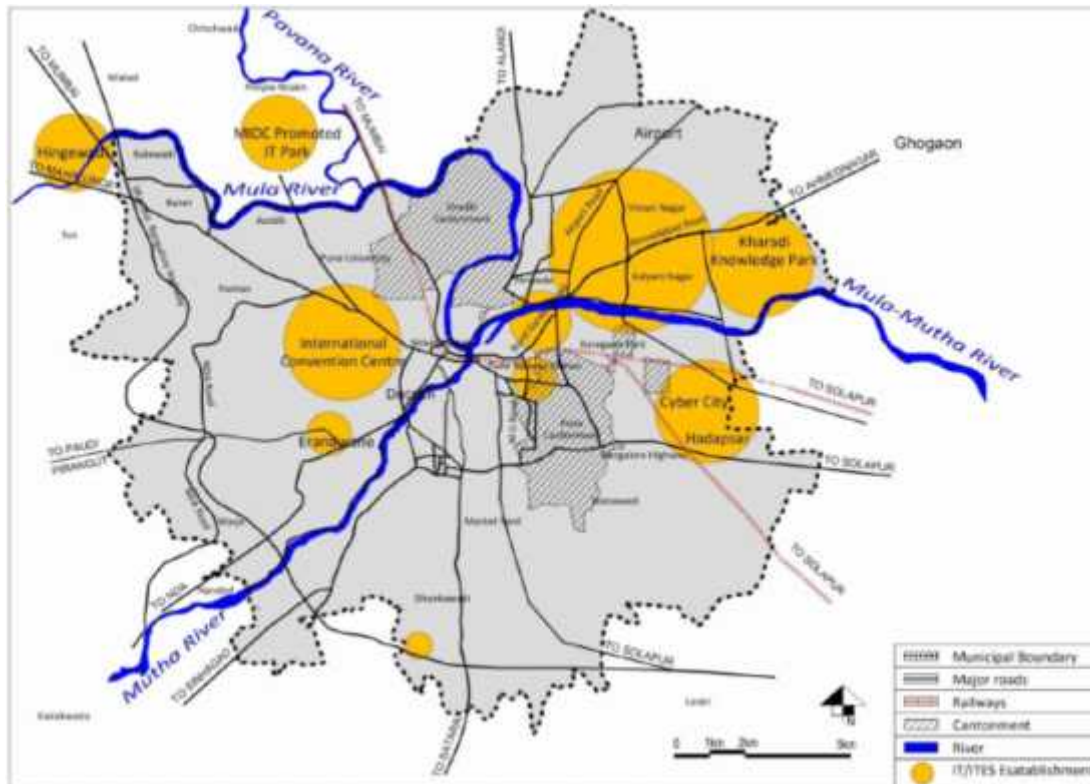
6. Ward wise population:



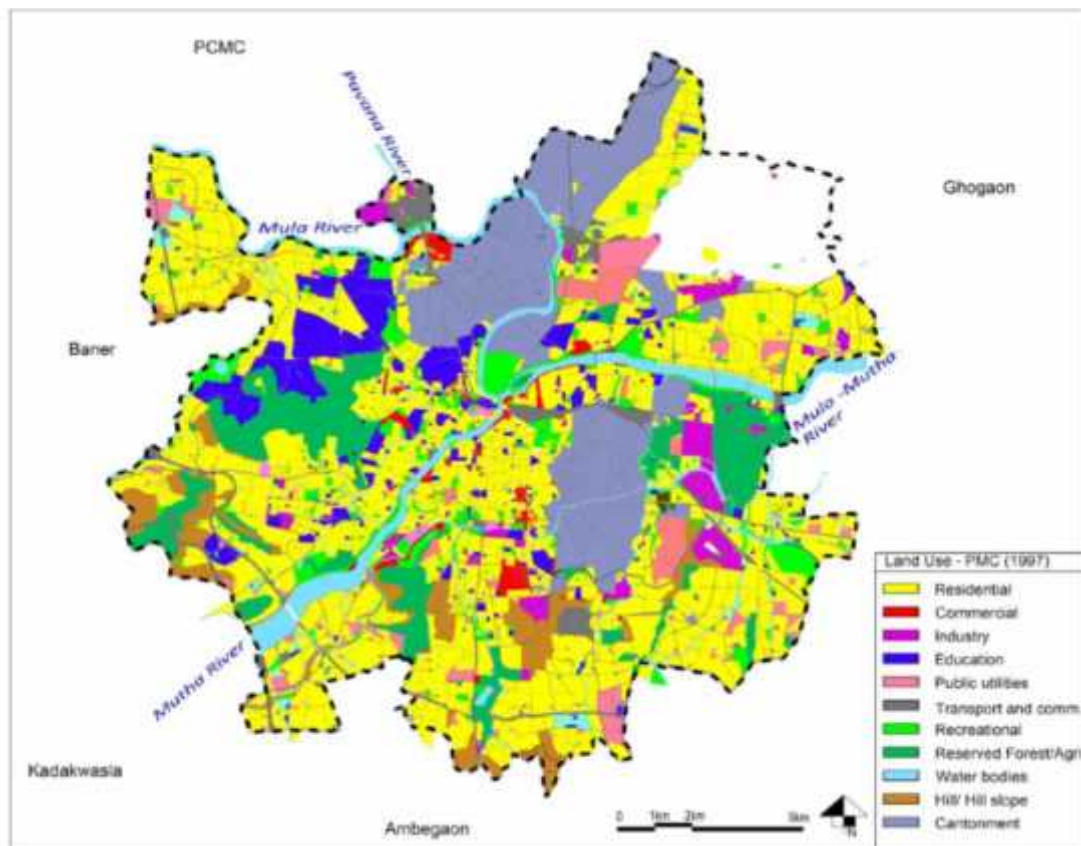
7. Industries Map:



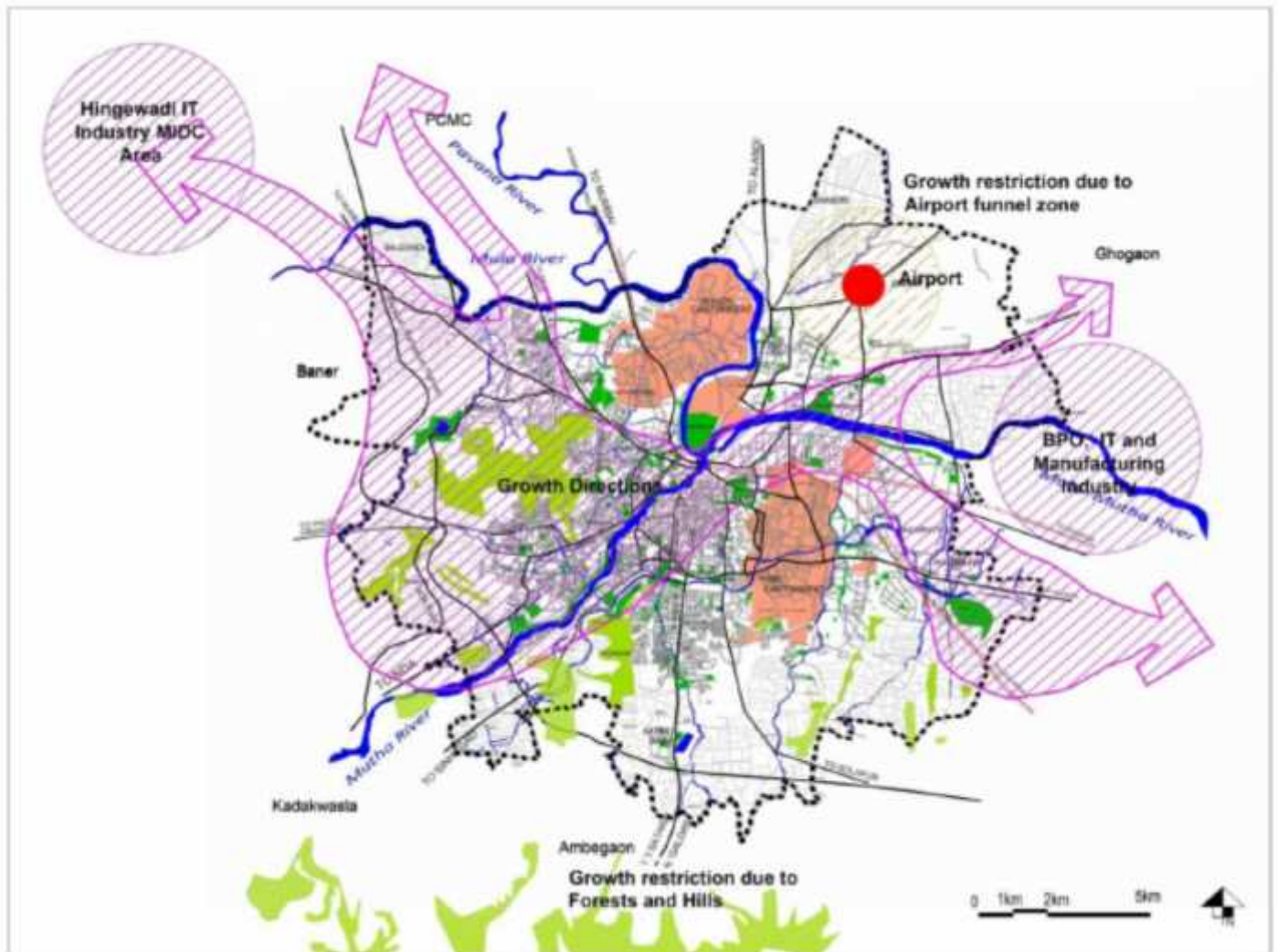
8. IT & ITES establishment in Pune:



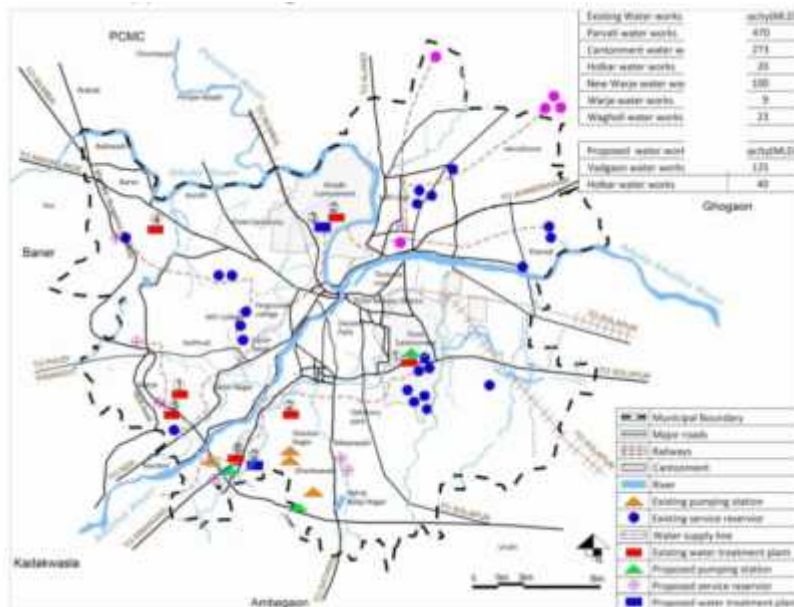
9. Land Use map:



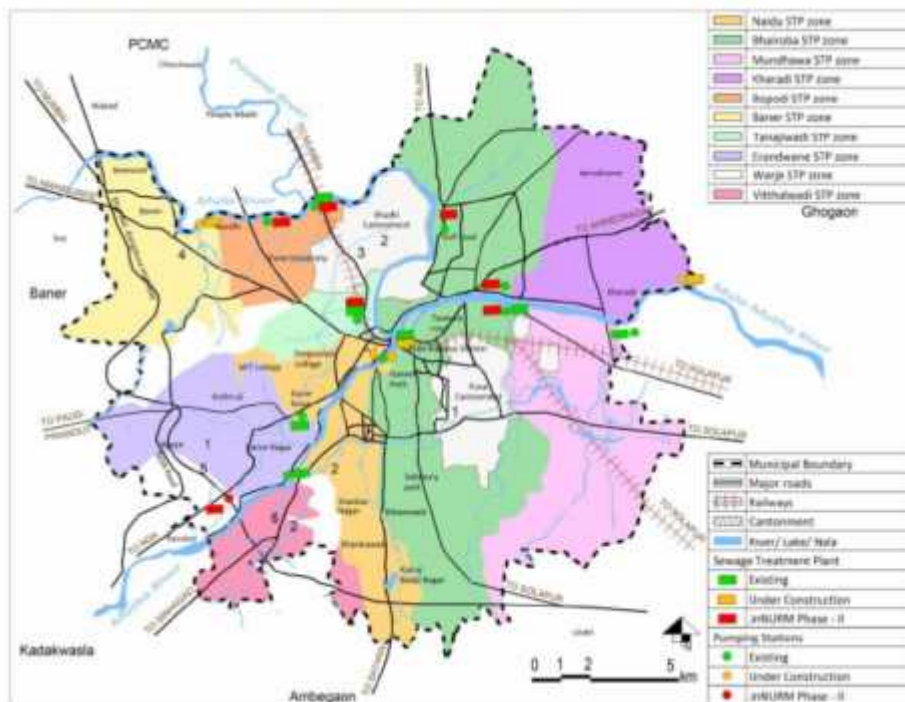
10.Future growth direction Pune:



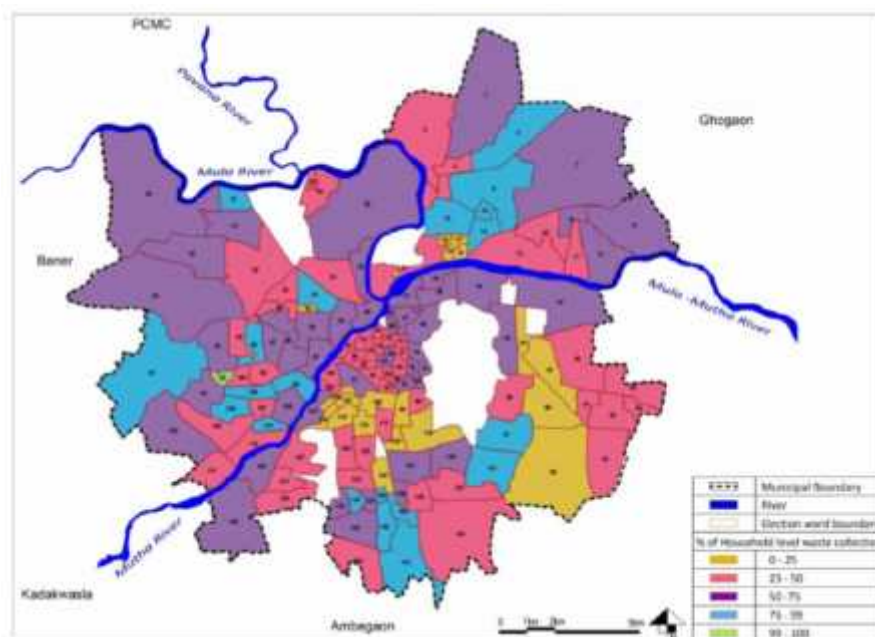
11.Existing proposed water distribution plan



12.Existing sewerage zone:



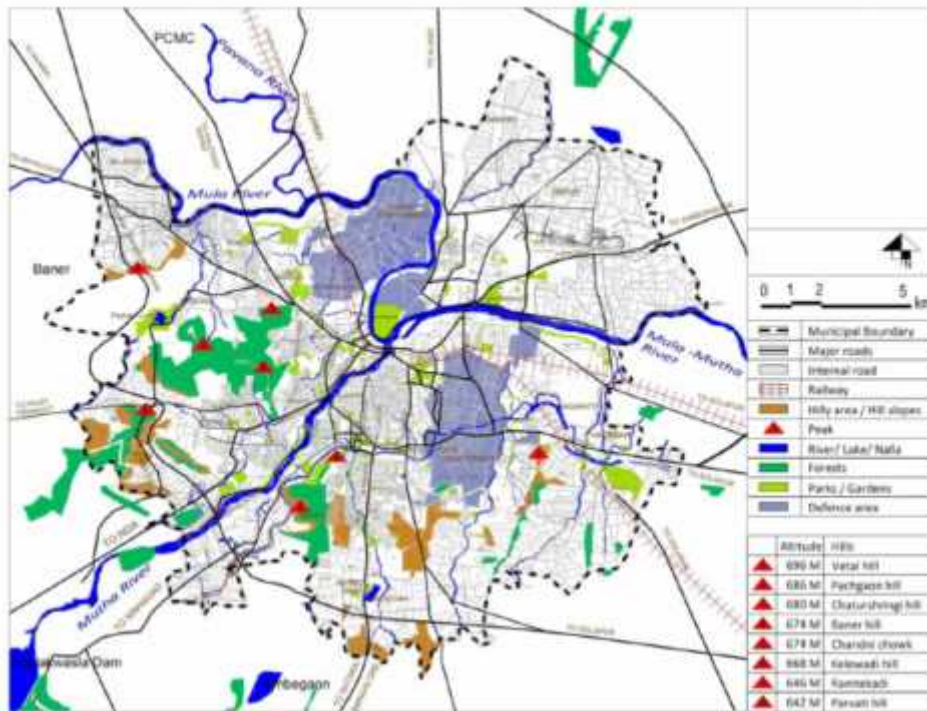
13.SWM , Household level collection:



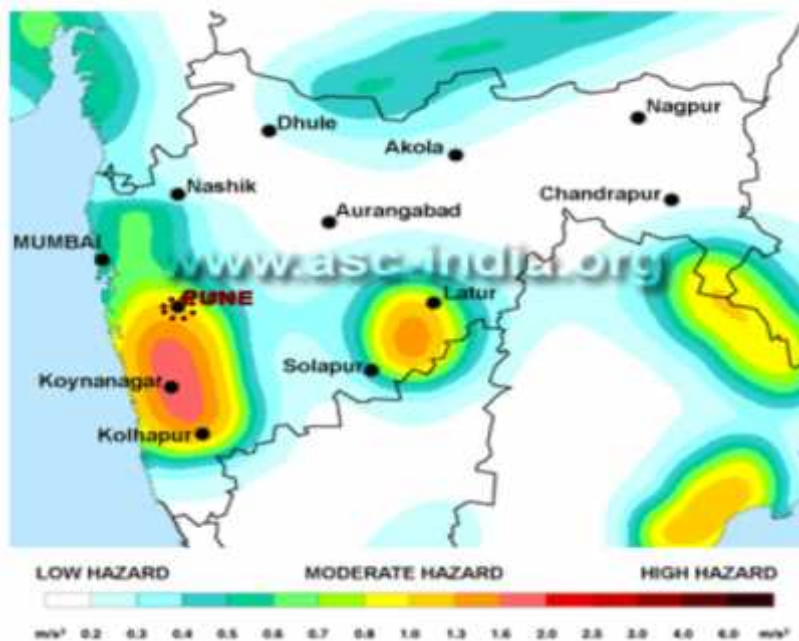
14.Existing major road network:



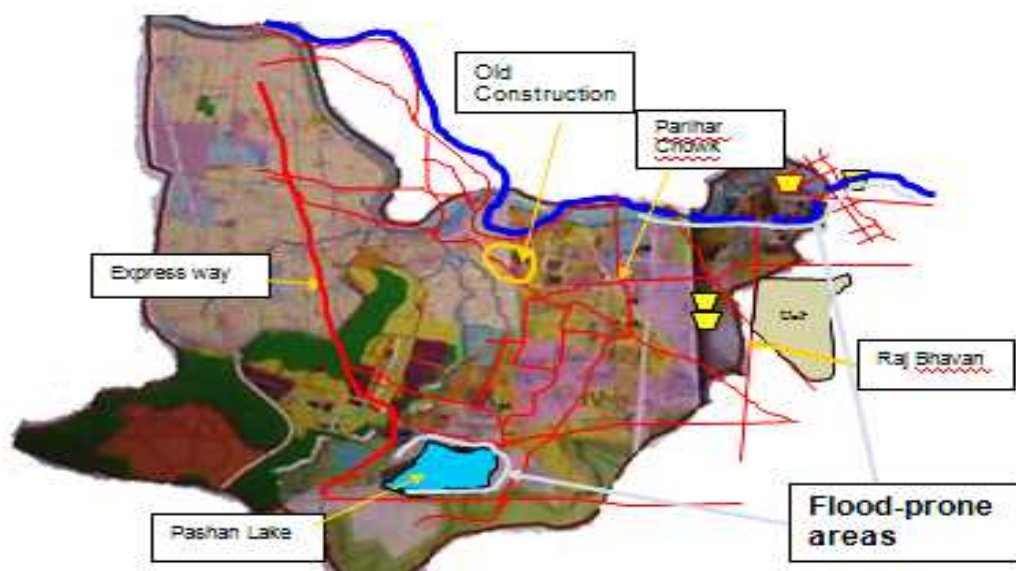
15. Physical features map of Pune:



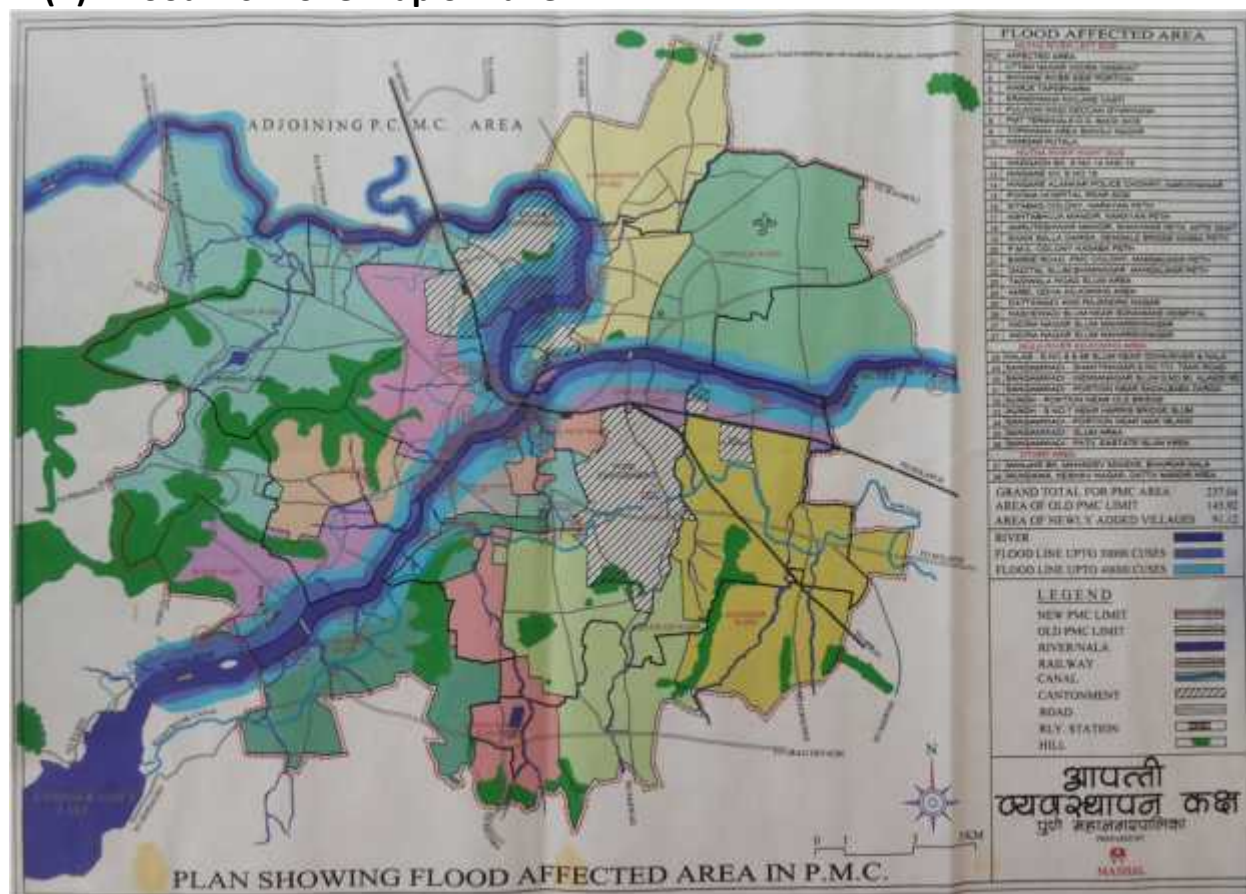
16. Seismic zone map of Pune:



17(A). Flood Risk zone map of Pune:



17(B). Flood Risk zone map of Pune:



**TABLE 18 SHOWING HAZARDS, VULNERABILITY, CAPACITIES AND RISKS (HVCR)
FOR PUNE WARDS**

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
1	Aundh Ward	Earthquakes	Medium	Medium	Medium
		Floods & Flash Floods	High	High	Fairly High
		Landslides/Lightening/Storms	High	Low	High
		Bio-Disasters	High	Medium	Medium
		Fire	High	Medium	Low
		Riots	High	High	Fairly High
		Chemical & Industrial Hazards	Low	Medium	Low
		Building Collapse	High	Medium	Fairly High
		Road/Railway/Water/Air Accident	High	Medium	Medium
		Terrorism	High	High	Fairly High
		Communal Riots & Stampedes	High	High	Medium

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
2	Warje Karve-nagar Ward	Earthquakes	High	Medium	High
		Floods & Flash Floods	Medium	High	Low
		Landslides/Lightening/Storms	LS- High	Medium	FairlyHigh
		Bio-Disasters	Medium	High	Low
		Fire	High	Medium	Medium
		Riots	Medium	High	Low
		Chemical & Industrial Hazards	Medium	High	Low
		Building Collapse	Medium	High	Medium
		Road/Railway/Water/Air Accident	Medium	High	Medium
		Terrorism	Medium	High	Low
		Communal Riots & Stampedes	Medium	High	Medium

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
3	Ghole Road Ward	Earthquakes	Medium	Medium	Medium
		Floods & Flash Floods	Medium	High	Low
		Landslides/Lightening/Storms	LS- High	Medium	Low
		Bio-Disasters	High	High	Low
		Fire	High	High	Medium
		Riots	Low	Medium	Low
		Chemical & Industrial Hazards	NIL	NIL	Low
		Building Collapse	Low	High	Low
		Road/Railway/Water/Air Accident	Low	High	Low
		Terrorism	High	High	Fairly High
		Communal Riots & Stampedes	High	High	Medium

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
4	Kothrud Ward	Earthquakes	High	High	High
		Floods & Flash Floods	High	High	Medium
		Landslides/Lightening/Storms	LS- High	Medium	LS - High
		Bio-Disasters	Medium	High	Low
		Fire	High	High	Low
		Riots	Low	High	Low
		Chemical & Industrial Hazards	High	High	Medium
		Building Collapse	High	Low	Fairly High
		Road/Railway/Water/Air Accident	High	High	Medium
		Terrorism	High	High	Medium
		Communal Riots & Stampedes	Low	High	Medium

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Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
5	Dhole Patil Ward	Earthquakes	High	Medium	Fairly High
		Floods & Flash Floods	High	High	Medium
		Landslides/Lightening/Storms	L - Low	High	Medium
		Bio-Disasters	Medium	High	Low
		Fire	High	Medium	Fairly High
		Riots	High	High	Medium
		Chemical & Industrial Hazards	Low	Medium	Low
		Building Collapse	Medium	Medium	Medium
		Road/Railway/Water/Air Accident	Medium	Medium	Low
		Terrorism	High	Medium	Fairly High
		Communal Riots & Stampedes	Medium	Medium	Medium

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
6	Yerawada Ward	Earthquakes	High	Low	Fairly High
		Floods & Flash Floods	High	High	Medium
		Landslides/Lightening/Storms	LS-Medium	Medium	Low
		Bio-Disasters	High	Medium	Medium
		Fire	High	Medium	Medium
		Riots	Low	High	Low
		Chemical & Industrial Hazards	No	No	Low
		Building Collapse	Low	Medium	Low
		Road/Railway/Water/Air Accident	High	High	Fairly High
		Terrorism	High	Medium	Fairly High
		Communal Riots & Stampedes	Medium	Medium	Medium

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Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
7	Nagar Road Ward/ Wad-goan sheri	Earthquakes	High	Low	Fairly High
		Floods & Flash Floods	Low	Medium	Low
		Landslides/Lightening/Storms	Low	Medium	Low
		Bio-Disasters	Low	Medium	Low
		Fire	High	High	Medium
		Riots	Low	Medium	Low
		Chemical & Industrial Hazards	Low	Medium	Low
		Building Collapse	Low	Medium	Low
		Road/Railway/Water/Air Accident	High	High	Fairly High
		Terrorism	High	Medium	Medium
		Communal Riots & Stampedes	High	Medium	Medium

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
8	Bhavani Peth Ward	Earthquakes	High	High	Fairly High
		Floods & Flash Floods	High	High	Fairly High
		Landslides/Lightening/Storms	High	High	Fairly High
		Bio-Disasters	High	High	Fairly High
		Fire	High	Medium	High
		Riots	High	Medium	High
		Chemical & Industrial Hazards	High	High	Fairly high
		Building Collapse	High	High	Fairly High
		Road/Railway/Water/Air Accident	Low	Medium	Low
		Terrorism	Medium	High	Medium
		Communal Riots & Stampedes	Medium	High	Medium

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Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
9	Kasba-Vishram	Earthquakes	High	High	Fairly High
		Floods & Flash Floods	High	High	Low
		Landslides/Lightening/Storms	Tree falling-High	Medium	Fairly High
		Bio-Disasters	High	High	Fairly High
		Fire	High	High	Fairly High
		Riots	Medium	Medium	Fairly High
		Chemical & Industrial Hazards	Low	Low	Low
		Building Collapse	High	High	Fairly High
		Road/Railway/Water/Air Accident	Low	Medium	Low
		Terrorism	High	High	Fairly High
		Communal Riots & Stampedes	High	High	Medium

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
10	Tilak Road Ward	Earthquakes	Medium	High	Medium
		Floods & Flash Floods	High	High	Fairly High
		Landslides/Lightening/Storms	LS-High	High	Fairly High
		Bio-Disasters	High	Medium	Medium
		Fire	High	High	Medium
		Riots	Low	High	Low
		Chemical & Industrial Hazards	Low	High	Low
		Building Collapse	High	High	Fairly High
		Road/Railway/Water/Air Accident	High	High	Medium
		Terrorism	High	High	Fairly High
		Communal Riots & Stampedes	High	High	Medium

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Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
11	Sahakarnagar Ward	Earthquakes	High	High	Fairly High
		Floods & Flash Floods	Medium	High	Low
		Landslides/Lightening/Storms	Medium	High	Low
		Bio-Disasters	Low	High	Low
		Fire	High	High	Medium
		Riots	Low	Low	Low
		Chemical & Industrial Hazards	Low	High	Low
		Building Collapse	High	High	Fairly High
		Road/Railway/Water/Air Accident	Medium	High	Fairly High
		Terrorism	High	High	Medium
		Communal Riots & Stampedes	High	High	Medium

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
12	Bibvewadi Ward	Earthquakes	Medium	Medium	Medium
		Floods & Flash Floods	High	High	Medium
		Landslides/Lightening/Storms	LS-Low	Medium	Medium
		Bio-Disasters	High	Medium	Medium
		Fire	High	Medium	Fairly High
		Riots	Low	Low	Low
		Chemical & Industrial Hazards	Low	Low	Low
		Building Collapse	High	Medium	Medium
		Road/Railway/Water/Air Accident	High	Medium	Medium
		Terrorism	High	Medium	Medium
		Communal Riots & Stampedes	High	Medium	Medium

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
13	Hadapsar Ward	Earthquakes	High	Medium	Fairly High
		Floods & Flash Floods	High	High	Medium
		Landslides/Lightening/Storms	L - Low	High	Medium
		Bio-Disasters	High	High	Medium
		Fire	High	Medium	Fairly High
		Riots	High	High	Fairly High
		Chemical & Industrial Hazards	High	Medium	Fairly High
		Building Collapse	High	Low	Fairly High
		Road/Railway/Water/Air Accident	High	Medium	Fairly High
		Terrorism	High	Medium	Fairly High
		Communal Riots & Stampedes	Medium	Medium	Medium

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
14	Kondhwa	Earthquakes	Medium	Medium	Medium
	Wanawdi	Floods & Flash Floods	High	High	Medium
	Ward	Landslides/Lightening/Storms	High	Medium	Medium
		Bio-Disasters	High	Medium	Fairly High
		Fire	High	Medium	Fairly High
		Riots	Low	Low	Low
		Chemical & Industrial Hazards	No	No	No
		Building Collapse	High	Medium	Medium
		Road/Railway/Water/Air Accident	High	Medium	Medium
		Terrorism	High	High	Low
		Communal Riots & Stampedes	High	High	Medium

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
15	Dhanakawadi Ward	Earthquakes	High	Medium	Fairly High
		Floods & Flash Floods	High	High	Medium
		Landslides/Lightening/Storms	LS-High	High	Fairly High
		Bio-Disasters	Medium	High	Low
		Fire	High	High	Fairly High
		Riots	Low	High	Low
		Chemical & Industrial Hazards	No	No	No
		Building Collapse	High	High	Fairly High
		Road/Railway/Water/Air Accident	High	High	Fairly High
		Terrorism	High	High	Fairly High
		Communal Riots & Stampedes	Medium	Medium	Medium

3. Summary of Risk Analysis for Pune city

Earthquakes

Hazard - Pune lies very close to the seismically active zone around Koyna Dam, about 100 km (62 mi) south of the city, and has been rated in Zone 3 by the India Meteorological Department and intensity upto 7 on Richter scale . Probability of occurrence is 'Indeterminate'.

Vulnerability - The whole of the city is at the risk of earthquakes. The wards in Pune are typically been evolved from villages. Hence the arrangement is similar, like having a goathan area in the center and other activities surrounding it and connected to each other by main roads of city.

Buildings - All the wards have dense population and congested areas making the population vulnerable to earthquakes. The vulnerability is high for Vishrambaugwada, Tilak road, Bhavanipeth, Sahakarnagar, Kothrud, Karvenagar and Dhankawadi ward, the reason being mix use areas with high population and high density buildings, haphazard development. The vulnerability of earthquakes further increases due to accessibility issues. If a 6-7 richter scale earthquake strikes, 30 to 40 percent buildings shall get damaged or fall blocking the roads and further areas. There are old wadas in main city area, old structures, dialapted structures in all the wards, there are many half constructed buildings which shall not stand earthquakes and which shall add to the vulnerability. Building construction mostly is in three trends, one done by builders, contractors, which gets sanctioned through PMC and is mostly earthquake resistant construction (prerequisite of PMC). The second is done by individuals for their personal use, which may or may not be sanctioned by PMC, especially in the fringe areas, and which adds to vulnerability. The third trend again by individuals for residential and commercial use, which does not follow any norms and ethics of construction practice and are threat to the occupants and populations in vicinity. The saying 'Earthquakes do not kill people, Buildings do' is the rightly fits the city, as the buildings add to the vulnerability. Almost 50% of buildings constructed shall not stand the intensity of 5-7 Richter scale earthquakes.

The other reasons which add to the vulnerability are the city is evolved rather than planned. Hence development plan is induced and keeps on evolving without any considerations to disaster management planning.

The religious buildings like temples, mosque, gurudwaras, and synagogues, church are always crowded, especially temples like Dagduseth, with population of 500-600 at any point of day are vulnerable not building per se, but due to congregation of people.

Infrastructural Amenities - The open areas in each ward getting reduced due to high urban land pressures and spaces for evacuation, routes of evacuation are diminishing. Change of landuse is adding population to be vulnerable. Earthquakes upto 7richter scale can damage the natural lakes, bridges, roads, flyovers and vital services like water lines, sewage systems, electrical system and others.

Heritage structures –The heritage structures in Pune like Pataleshwar temple, AgaKhan palace, Parvati temple, Pune university Building, College of engineering building, though have survived an earthquake of 4 richter scale, the damage to such structures shall be irrecoverable.

Capacity – Pune is capacities to fight the disastes like earthquake morally. Capacities in terms of prevention is low, preparedness is good and mitigation is better. The main reason for this the presence of NDRF and CRPF, NCC, NSS in the city. In terms of Infrastructural facilities like spaces of identified temporary shelters, water facilities, and sanitation facilities can be sourced quickly. In terms of tools and equipments there are many private agencies which can provide such facilities. Pune Municipal Corporation can facilitate the process faster in emergency scenario. However Pune Municipal Corporation has to build its own capacity in terms of strategy, tools and equipments.

Healthcare (government and mostly private) facilities in the city are good and can be extended to large number of populations in emergency scenarios.

Capacities with the fire department are low compared to the risk of earthquake to the city.

Risk Analysis – The risk from earthquake is high to the city. More than the frequency and intensity of earthquake, the risk is high due the vulnerabilities and low capacities.

Floods and Flash Floods

Hazards - Central Pune is located at the confluence of the Mula and Mutha rivers. The Pavana and Indrayani rivers, tributaries of the Bhima River, traverse the northwestern outskirts of metropolitan Pune. There are 3 dams which store water for Pune and which are upstream. The water is released from the dams on occasions and in monsoons when the dam capacity is full. Hence flooding of Mula and Mutha happens only during heavy monsoons. PMC and irrigation Department have already marked the low flood line and high flood lines. Constructions are not allowed in flood zone by PMC. However there are old and unauthorised constructions and slums in flood zones.

The highest risk of floods is of Khadakwasla Dam burst. The loss of life and property would be high.

Vulnerability - The ward that are affected and threatened are Aundh (partial), Ghole Road (Prabhag 36) Warje (Prabhag 105 and 113), Dhole Patil (Prabhag 49 and 37), Sangam Wadi (18, 19 and 5), Kasba (very minimal), Tilak Road (128 and 129). The wards which have low lying areas like Vittalwadi and Anandnagar of Tilak road ward are more vulnerable as flood water enters buildings and parking's. The Slums of Sangamwadi have to be relocated every monsoons during floods. The slums and chawls of Mahrashinagar in Swargate ward are more vulnerable to flood water. Flooding happens during heavy rains in catchment areas of Khadakwasla dam and the dam overflows and water is released from dam.

Flash floods are occur during heavy rains, the main reasons being, choking of drains, construction in nallas especially in Bibvewadi ward, encroachments on natural waterways and nallas, debri dumping in nallas especially in Hadapasar ward. The occurrences of flash floods are evident in almost all the wards.

Capacity

Floods and Flash floods are regular events in PMC limits with low to moderate impact. PMC has the SOP ready for Floods and flash floods. There is the coordinated effort with PMC, Police and Fire Department for early warning system, relocating the populations in flood zone and

low lying areas of slums. The temporary shelters are identified and food, water and sanitation facilities are provided by PMC and other NGO's in the city. Refer Annexure for Flood SOP.

Landslides

Hazards – Pune has a saucer shape profile and is surrounded by hills. As the city is growing, the city limits are increasing putting stress on real estate. PMC is permitting the use of and foot hills slopes for construction activities. Roads are constructed cutting the hills, the remaining hill is prone to landslide and mudslide like the NH4 constructed cutting hills in Kothrud ward and Dhankawdi ward. Many unauthorised stone quarrying activities are going unchecked. This may result into stressing the hill slopes resulting in landslides.

Vulnerability - The workers class forms slums and has occupied steep slopes of hills of Parvati, WarjeMalewadi ward, Dhankawdi ward. The non - engineered cutting of hills for roads has resulted in increasing the probability of landslides. Dhankawdi ward has high risk of such landslides and population of almost 7000 is at risk of landslides. The wards of Aundh, Kothrud, Ghole road, Warjemalewadi, Bibwewadi, KondhwaWanowarie and YerwadaSangamwadi have threats of landslide from low to moderate scale. The Sahakarnagar, Tilak road, Dhankawdi have fairly high risk of landslide and high population is at risk. JantaVashat of Tilak road and partly of Sahakarnagar has 50000 vulnerable population. YerawadaSangamwadi Ward has stone mining making the 2000 population of Laxminagar vulnerable.

Capacity - PMC has capacity in terms of tools and equipments in emergency scenario. The NDRF located in PCMC has all the required mechanism for response and recovery in case of emergencies. However there is no strategy implemented to prevent the disaster, by either relocating the populations, banning constructions and road construction or mining. There is no strategy to make people aware of the risk. The other capacities in terms of hospitals, temporary shelters etc are available. However the loss of life and property would be high in case of landslides.

Biodisasters

Hazards – The growth of the city has also shown the growth in the decline of health of citizens and rise in epidemics and newer epidemics. The current threatening diseases are Swine Flu (H1N1), Dengue, Malaria, Chikungunya and Flu. From 01 January 2015 to 31May 2015, 881 patients have been diagnosed with swine flu.

Epidemic	2009 (jan-dec)	2010 (jan-dec)	2011 (jan-dec)	2012 (jan-dec)	2013 (jan-dec)	2014 (jan-dec)	2015 (jan-may)
Swine Flu (H1N1)	1495	1655	21	730	275	35	818
Casualties in PMC limit	51	72	0	20	11	1	36

Table showing Swine Flu scenario in PMC limits

Vulnerabilities – The increase in the deadly epidemics of H1N1 and Dengue partly can be attributed to the climate change effects and partly to the unhygienic conditions maintained in the city. Moreover the PMC and the citizens have equipped with curative strategies and not preventive measures. The overflowing solid waste bins, inappropriate surface drainage system and choking of drains in monsoons adds to the vulnerability from outbreak of epidemics. The slums have 40% population, exposed to various threats. Open defecation, defecation in nallas and around houses makes the hygiene scenario worse in slums affecting the health of populations. The patients of burns in fire are fairly high and PMC does not have hospitals to cater to burnt patients.

Capacities – PMC has Kamla Nehru General hospital and Naidu Hospital for infectious diseases, 15 maternity hospitals, 38 dispensaries (OPD) and 2 mobile dispensaries and 1 immunization center. Other than PMC there is Sassoon Hospital, Aundh Civil Hospital, Cantonment board hospital with 1076 bed capacity and 615 private hospitals with 12469 bed capacity. The health

care facilities in the city are good, but unaffordable for poor. PMC is implementing Urban Poor Health Scheme for poor with coverage upto 1 lakh rupees. The strategy of PMC is focused on Curative measures more than prevention measures.

The measures taken by PMC health department to stop the outbreak of epidemics are

1. Abatement, identification and destroying of mosquito breeding sites.
2. 100 % treatment tap water to citizens including slums.
3. Distribution of chlorine tablets where epidemics are identified.

Fire

Hazard – The threat of fire is evident in all the wards. The fire cases reported vary from domestic fuel fire cases, electrical fires, chemical and hazardous material fires, electrocution and others. The fire department and city police attend the fire cases. The capacity of fire department is less compared to the fire cases. Following table gives the statistics of fire calls attended.

Details of calls	2011	2013	2013	2014	2015
Fire calls					
Rescue calls					
No of Gas leaks					
Building Collapse					

Vulnerability – The incidents of fire are increasing threatening life and property. All the wards have mixed landuse, the commercial activities like shopping centers, malls, multiplexes, temples, hospitals are more vulnerable, with high population and high probability of fires mainly due to electrical short circuits. The complex design and electrical and air conditioning systems and no system to track the hazard, no appropriate fire detection and prevention system makes the public buildings more vulnerable to fire. Recent example is of fire at Cross Words in Sourabh hall in September 2015, burning down thousands of books of few lakh rupees.

The slums are most vulnerable to fire. The incidents occur due to open cooking, LPG cylinder burst, electrocution and illegal tapping of electrical open wires.

Dense population, hotels, restaurants, open eateries add to the risk of fires. The burning of solid waste is reason of fires since 2014, wherein there are cases of fire caught by vehicles in parking.

Fire can be singularly dangerous risk to the city.

Capacity

PMC fire department is equipped to handle all types of fire and other disasters like gas leaks, rescue, building collapse, hazardous material accidents and animal rescue. Fire Department have their own 'Fire Hazard and Mitigation Plan' ready which is annexed. To support the fire department, the huge capacity of the city is presence of NDRF. In any emergency situation NDRF has all the capacity to tackle different types of hazards.

Communal riots and Stampedes

Hazard – Pune has populations of different religions staying peacefully. However there is history of communal riots and wards which are probable to the risk. Pune has the history of communal riots. The Kothrud, Ghole road, Dhole Patil road, Bhavanipeth, Kasbapeth, Tilak road and Sangamwadi ward have high probability of communal riots as its old gothan areas and has population of different religions.

Vulnerability – The commercial enterprises and public infrastructure is most vulnerable to communal riots and political riots. The main City area and the surrounding areas are densely populated and can hamper businesses and all the commercial activities. Each ward of Pune has commercial areas, residential areas which are densely populated; any riot event can cause turbulence which can spread in the nearby wards. Pune is also a political active city; hence political riots are not new to the city. Though there have not been any major incidence of political riot in last 10 years, probability is high and vulnerability is high due to high population.

Capacity -

Stampedes - Pune has huge congregation of people during two main celebrations Warri in month of July and Ganpati Festival in month of September. During Waari, almost 3-4 lakh warkaris walk on road from Alandi to Pandharpur. The Waarkaris of two palkhis, SantTukaramMharaj and SantDyaneshwarMaharaj reside in Pune for two days, a floating population of almost 5 lakh. Different organisations take the responsibilities of their food, water and sanitation. Similarly during 10 days of Ganpati festival the floating population increases by 3-4 lakhs. The 10th day GanpatiVisarjan Procession has floating population of almost 10lakh on procession road. Both the events are highly probable to terrorist activities. Though there is not history of any disastrous incidents, probability is very high.

Chemical and Industrial Hazards – The industrial areas are earmarked in the MIDC adjoining the PMC limits. However there are small industrial estates in many wards. These industrial estates mainly conduct job work and machining activities. The MIDC areas of Bhoasri, Sanaswadi are adjoining the city limit with all types of industries handling manufacturing and chemicals. The MIDC is equipped with fire brigade tools and equipments but do not have capacity to handle chemical and leakage poisonous gases hazards.

Vulnerability – The small industrial estates in the PMC limits do not have any strategy for handling hazards and are dependent on fire brigade stations. In few cases the industrial estates are located in areas which cannot be accessed by fire brigade vehicles, due to narrow roads and vehicles parked on narrow roads. The commercial and the residential population in such areas are vulnerable to risk of industrial hazards. For example Stayam industrial and Sangam press industrial estate in Karvenagar Ward. Also the polluted water from such industrial units is drained directly into adjoining nalla or in drainage lines. In some cases, the industrial solid waste is disposed in the regular solid waste bins. This makes the population residing in that ward and also the solid waste collectors more vulnerable to industrial hazards.

Capacity - Fire department has the capacity to handle Chemical industrial hazards. Presence of NDRF in Pune has an added advantage. NDRF also has the capacity in terms of tools, equipment and trained personnels to attend chemical and industrial hazards.

Roads, Railways and Air Accidents –

Road Accidents Hazards – - Pune city has high rate of road accidents (more than 2600 road accidents per year) an estimated casualties per year in road accidents are more than 2000 in the age group of 18 – 22years. The reason being

1. No discipline of driving (breaking signal rules, no zebra crossing, no lane discipline)
2. High density of vehicles
3. Narrow roads with no provision of footpaths
4. Speeding of vehicles
5. Very limited use of helmets

Vulnerability – The year 2014-2015 has changed the hazard profile of road accidents with Santosh Mane case and the NH4 Tempo driver case with high number of casualties and damage to vehicles on road. Both the events generates a need of introspection of road accidents. Though both the cases are rare incidents, it does not reduce the vulnerability of commuters to road accidents. The VIP corridor from Airport to NH4 highway is vulnerable to terrorist activities.

Capacity – The responsibility of the transportation plan and traffic lies with the Traffic department of police. The department has fewer capacities in terms of manpower and equipment, but it's supported by civil society organisations like 'Police Mitra' to manage traffic in peak hours and during festivals. The facilities for traffic police on roads are very less.

Railway Accidents

Hazards – Pune railway station is busy all along the year, as Pune is well connected to the other parts of country by railway network. The peak population at Pune railway station is almost 1,00,000 and 25000 at any point of time. Pune railway station is exposed to threat of railway accidents, Fire, stampede and terrorist activities.

Vulnerability – The vulnerability to railway accidents increases as the railway station is situated at the heart of the city and railways lines pass through the city. Any railway accidents can be disastrous to the population in the vicinity. The slums are growing along the railway line at many places in the city.

Capacity – The Railway station security and surveillance is handled by CRPF. The ministry of railways have independent strategy and SOP for disaster management for railways and railway stations. Pune railways station premises have high compound wall all around hence safety is ensured. There manned gates at railway crossings in all wards, wherever the railway line passes. There is no compound wall or fencing or if present not in good condition at many locations in the city especially in Wanowrie ward.

Air Accidents– Pune Airport is located at Vimannagar. Once a defence airport now is getting busier with civilians and international flights. The increasing air traffic adds to the probability of air accidents. The development around the airport area is not in accordance with the byelaws and policies of Airport authority of India. Airport authority does not allow the construction of more than 4 floors that is height of 12m in 90m radius around airport. This needs to be investigated and studied further, but it still makes all the construction in the 90 m radius vulnerable to air accidents. The growing settlements and construction in vicinity of airport makes the population vulnerable to air accidents and terrorist activities on airport. The airport premises which was once outside the city limits, with growing city limits is surrounded by crowd attracting activities like Ishanya Mall and international hotels like Courtyard Marriot and Hyatt Hotel.

Terrorism

Hazard - Pune has high probability of terrorism. The bomb blast in recent years in Germany Bakery, series of bomb blast on JungleeMaharaj road and Faraskhana Police chowky bomb blast has placed Pune on the terrorism map. With the military installation like DRDO, NDA and military colleges Pune is target for national and international terrorism.

Vulnerability – The highly crowded areas in all the wards and public places like malls, multiplexes, shopping centres', markets, bus stands, Railway station, Airport, temples are soft targets for terrorist activities like bomb blast. The mere rumour in such places can led to stampedes and loss of life, for example in Tulsi Baugh. The bomb blast in Faraskhana police chowky would have claimed more lives 100ft away near Dagduseth temple. Secondly the carrying capacity of the roads is decreasing with increasing number of vehicles, the parking on the roads reduce the driveway, making it difficult for accessibility of emergency services like Ambulances and Fire brigade vehicle.

Pune has huge congregation of people during two main celebrations Warri in month of July and Ganpati Festival in month of September. During Waari, almost 8-10 lakh warkaris walk on road from Alandi to Pandharpur. The Waarkaris of two palkhis, SantTukaramMharaj and SantDyaneshwarMaharaj reside in Pune for two days, a floating population of almost 12 lakh. Different organisations take the responsibilities of their food, water and sanitation. Similarly during 10 days of Ganpati festival the floating population increases by 3-4 lakh. The 10th day GanpatiVisarjan Procession has floating population of almost 10lakh on procession road. Both the events are highly probable to terrorist activities. Though there is not history of any disastrous incidents, probability is very high.

The defence installations in Pune and Cantonment boards can be targets for terrorist activities. Many important organisations like ARAI, DRDO, HEF, and Airport make Pune vulnerable for terrorism activities.

The recent example was of bomb blast at Faraskhana Police chowky in vicinity of Dagduseth Ganpati temple, a very densely populated area.

Capacity – The responsibility of any terrorism incidents is primarily on police. The map showing the locations of police stations is annexed. The police department is understaffed to cater to the growing crime rates and terrorism activities. The capacity of police force needs to be build, in terms of manpower, artillery, tools and equipments. The police force is supported by para military staff and NGO's like Police Mitra and ChanakyaMandal during the festivals like Ganpati Visarjan. There is a Bomb detection squad with the police and with NDRF. The presence of NDRF has hugely contributed to the response and recovery measures of Pune City in emergency scenarios.

Infrastructural Threats – Infrastructural threats exists in all the wards.

Following are the generic infrastructural threats

Water and Drainage pipe leakage – Citizens of Pune get 135 liters of water per person per day. On an average daily 2500 valves are operated for equitable distribution of water. Sampling is done across the city to check the water quality with 200samples collected on daily basis. The topography of the city is like a saucer shape, wherein the core city gets more water as compared to the fringe areas.

The water distribution system is laid in 1960 and since then any problem of leakage is tackled only by window dressing system. Additional network is continuously increasing as the city is growing, but the core distribution system is not changed. Hence there is stress on the existing system. There are redundant water lines below ground. The crossing of water lines and drainage lines and both the lines at same level create water contamination threat especially in slums where water lines are unauthorised tapped. Drainage system is 100% underground for the entire city and collection and conveyance is from each household. PMC lacks the capacity to treat the sewage 100% and untreated water is disposed in river.

Transport – The growing city put stress on roads. The vehicle density of Pune is high. Every year thousands of new vehicles are on roads causing traffic problems. Public transport system is weak and people prefer to use private vehicles. This adds to congestion of traffic and pollution. Secondly the encroachments on pedestrian pathways and roads make the transport scenario worse. Accident cases are high in Pune and pedestrians are vulnerable. Thirdly the traffic jams

and congestions add to the vulnerability of emergency services like ambulances and fire brigades.

Roads – In the year 2005-2010 the roads of Pune were worst and the city was known for its potholes. The conditions of roads have improved since with concrete roads. The level of roads keeps on increasing with the addition of new material for maintenance. The increasing elevation of roads, adjoining the old buildings, with the level difference of almost 1.2 m in some cases gives rise to Flash Floods. Encroachment on roads and pedestrian pathways expose the commuters to the risk of accidents. Quality of construction of roads is questioned by citizens.

The lack of coordination between various PMC departments for construction or maintenance of roads, water lines, drainage lines, erecting bus stops, pedestrian pathways, Traffic signal system, CCTV cameras etc adds to the vulnerability of population.

Old trees on roads expose the people and vehicles on the roads to threat of tree falling. Pune had a nice green cover of trees with almost all the roads covered by shade of tree. Many of big and mature trees were removed while extending roads, the trees which are retained are not properly guarded while constructing roads hence there are chance of trees falling damaging the vehicles on roads.

Storm water Drains – The surface drainage system at overall city level is not complete and not appropriate. Hence there is water logging issues in almost all the wards, especially in heavy rains. The drains get choked with the solid waste overflowing from the bins and plastic waste, increasing the water logging issues

The storm water drains, drainage lines, waterlines, telephone cables, electrical cables and other services are not integrated with the construction of roads and each service is handled, individually by independent departments. This leads to malfunctioning of services creating hazardous conditions to commuters, residents and vehicles on roads.



Electrical Services on roads – The open wires, wrong placements of electrical poles, open DP's unfenced transformers also pose a threat to citizens, especially in slum areas.

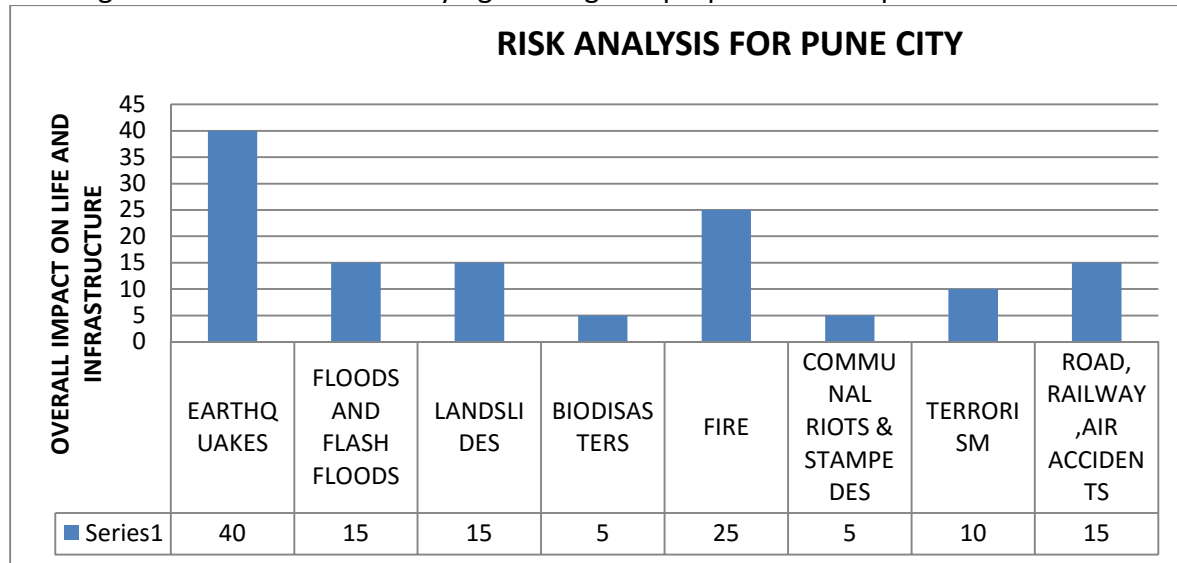
PMC has very limited capacity of maintenance of electrical services in PMC owned public buildings. There is no system of auditing the electrical services and regular maintenance of services. Most of the PMC owned buildings have old electrical wiring, and there is no preventive maintenance, which pose threat of electrical fires.

Solid Waste Management –The solid waste (wet waste 60% and dry waste 40%) is collected from each household by ghantagaddis and sent to dumping yards and treatment plants set up in various locations. The stress on collection of solid waste is huge and inspite of PMC's efforts there are overflowing solid waste bins in each ward. This creates not only shabby looks but unhygienic conditions leading to air borne diseases, skin diseases and throat infections. The burning of solid waste adds to the vulnerability. There are cases of fire due to burning of solid waste. The overflowing waste bins add to the population of stray dogs, pigs etc, which in turn adds to the unhygienic conditions. In rains, the garbage and plastic from overflowing waste bins flows down to the drains choking drains and nallas. Currently there is no sustainable technology with PMC to treat waste.

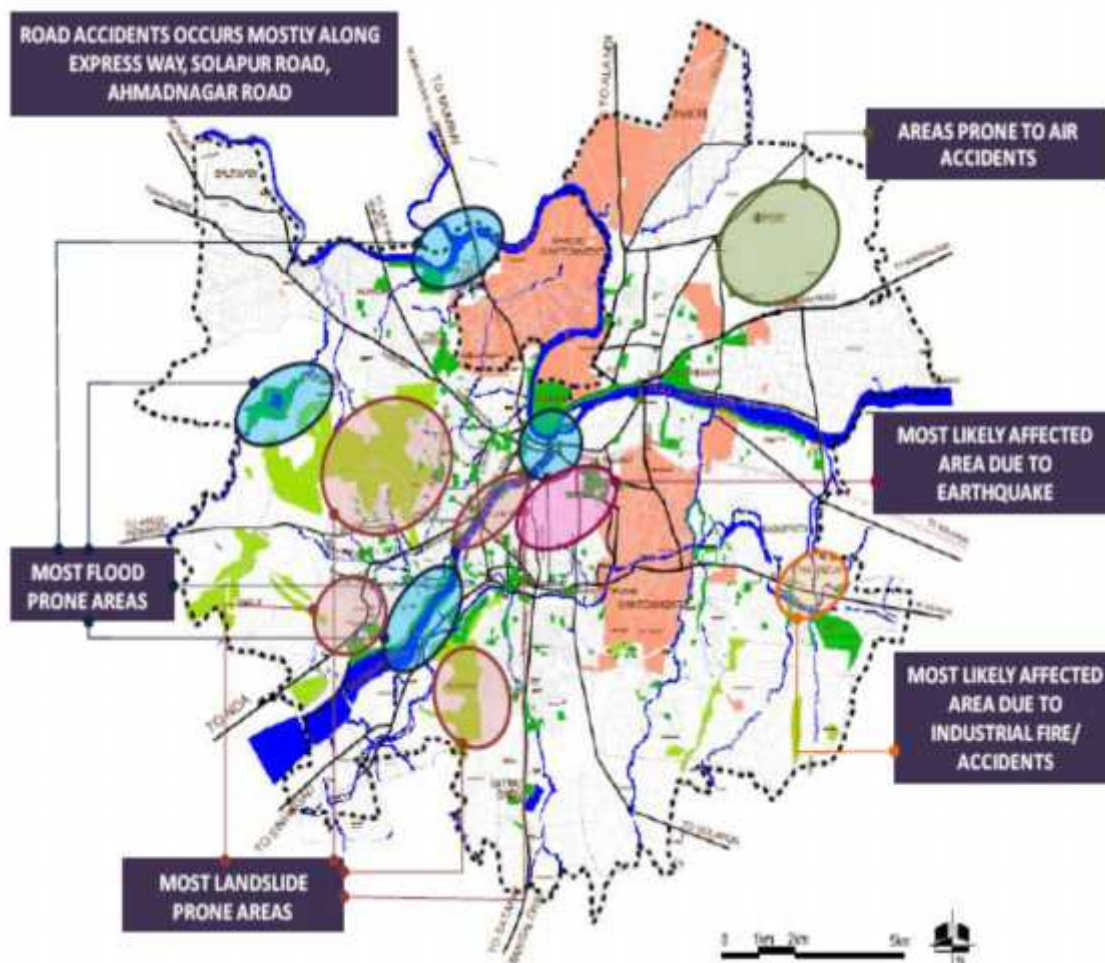
A detail HVCR needs to be carried out to study the vulnerabilities due to in appropriate or lacunas in infrastructural amenities and the threat it poses to the population. The vulnerability increases as there is no system to proactively track the issues.

The following graph shows the overall impact of hazards on life and infrastructure. The impact is calculated on the basis of following things

HVCR workshops conducted at ward level. Physical site visits. Interviews and consultation meetings with stakeholders. Studying existing and proposed development.



Overall hazard map of Pune:



Environmental Threats

The speed of development of Pune has been tremendous since 1995. The IT image of Pune has attracted population, infrastructure, economy and with all the issues of urbanisation. The stress of housing and infrastructure is threatening to natural environment of Pune. If Pune has achieved development in terms economic growth and infrastructure, it is losing its green cover, its hills, its air quality, ground water quality and quantity and its river.

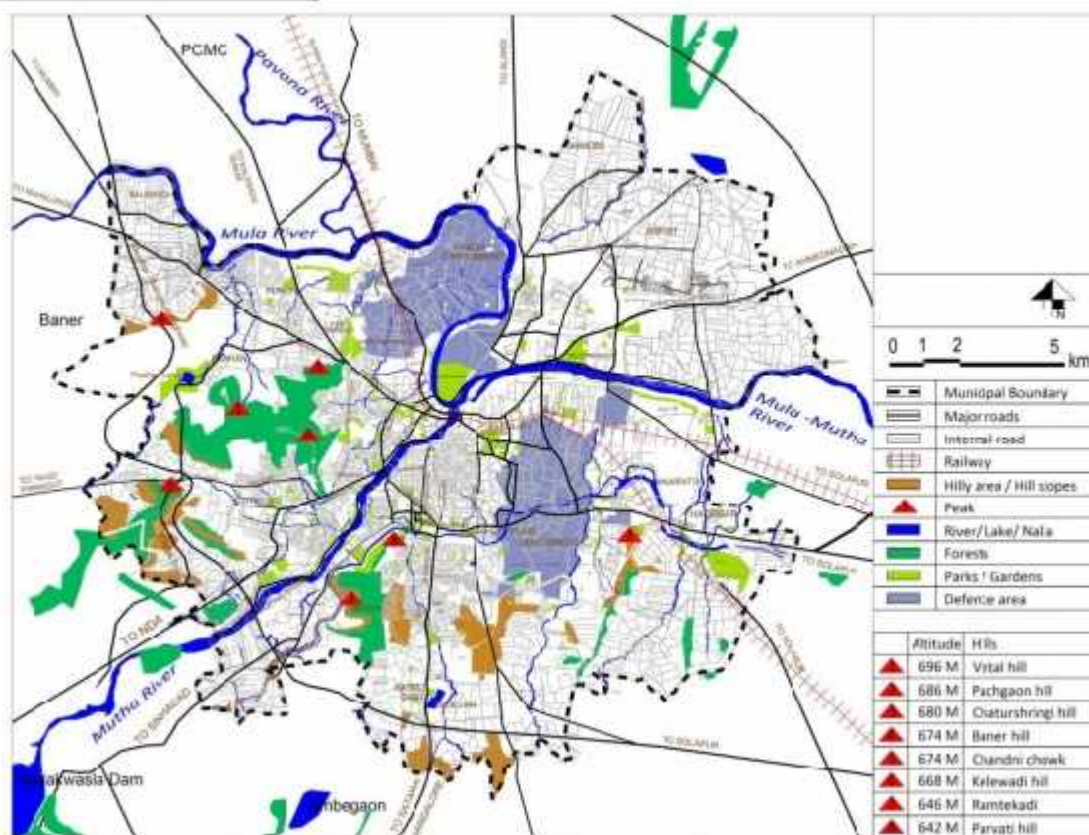
The impacts of environment degradation are huge and long lasting. The climate change effects are impacting the micro climate of the city. The rise in the diseases and introduction of new diseases are creating havoc. Swine Flu and chikungunya were unheard before 2005.

The growth in population is not natural; the economy growth has attracted migrated population changing the cultural fabric of city. It has put stress on housing sector and slums growth. The haphazard growth in suburban areas has led to unauthorised and illegal constructions. The stress on land is also reflected in rise of constructions on natural assets like hill slopes, nallas, river banks etc. The demand in construction sector is snatching the natural resources like soil, sand and ground water. The poor construction practices are adding to risk of occupants the surrounding inhabitants.

The increasing solid waste, quantity and quality wise are issues require serious attention. Life style changes and globalisation has only not added to solid waste management issues, but the solutions to dispose the solid waste are also implied and not evolved, which will led to further environmental degradation, mainly soil, air and water pollution.

The existing sewage treatment capacity does not match the required sewage treatment, disposing the untreated waste water directly into the river and Nalas causing river pollution. Citizens dispose anything and everything in river under the pretext of religious context especially during festivals.

This is only the overview of environmental threats to Pune; the environmental Status Report portrays the actual facts and figures.



Map No. 6-1: Physical feature map of Pune City



River Pollution



Construction on hills

TABLE SHOWING HAZARDS, VULNERABILITIES, CAPACITIES AND RISK ANALYSIS (HVCR) FOR PUNE MUNICIPAL COUNCILS MUNICIPAL COUNCILS

TABLE SHOWING IMPACTS OF HAZARDS ON WARDS												
Sr. No.	Name of the Ward	Earthquake	Floods & Flash floods	Lightning/Landslides/Storms	Bio disasters	Fire	Riots	Chemical & industrial Hazard	Building Collapse	Roads/Railways/Airways	Communal Riots & Stampedes	Overall Risk
1	Aundh Ward	Medium	Fairly High	High	Medium	Low	Fairly High	Low	Fairly High	Medium	Fairly High	Fairly High
2	Wairje	High	Low	Fairly High	Low	Medium	Low	Low	Medium	Medium	Medium	Medium
3	Karvenagar Ward	Medium	Low	Low	Medium	Medium	Low	Low	Low	Low	Fairly High	Medium
4	Ghore Road	High	Medium	Low	Low	Low	Low	Medium	Fairly High	Medium	Medium	Medium
5	Kothrud Ward	Fairly High	Medium	Medium	Low	Fairly High	Medium	Low	Medium	Low	Fairly High	Fairly High
6	Dhole Patil Ward	Fairly High	Medium	Low	Medium	Medium	Low	Low	Low	Fairly High	Medium	Medium
7	Yerwade Ward	Fairly High	Medium	Low	Medium	Medium	Low	Low	Low	Fairly High	Medium	Medium
8	Nagar Road	Fairly High	Low	Low	Low	Medium	Low	Low	Low	Fairly High	Medium	Medium
9	Ward/ Wadgaon cheri	Fairly High	Fairly High	Fairly High	Fairly High	High	High	Fairly High	Fairly High	Low	Medium	High
10	Bhamburda Peth Ward	Fairly High	Fairly High	Fairly High	Fairly High	Medium	Fairly High	Low	Fairly High	Low	Medium	High
11	Kasba- Vishrambagwada ward	Fairly High	Low	Fairly High	Fairly High	Medium	Low	Low	Fairly High	Medium	Medium	Fairly High
12	Tilak Road Ward	Medium	Fairly High	Fairly High	Medium	Medium	Low	Low	Fairly High	Medium	Medium	Medium
13	Sahakarnagar Ward	Fairly High	Low	Low	Low	Medium	Low	Low	Fairly High	Fairly High	Medium	Medium
14	Bibrewadi Ward	Medium	Medium	Medium	Medium	Fairly High	Low	Low	Medium	Medium	Medium	Medium
15	Hadapsar Ward	Fairly High	Medium	Medium	Fairly High	Fairly High	Fairly High	Fairly High	Fairly High	Fairly High	Medium	Fairly High
16	Kondhwa Ward	Medium	Medium	Medium	Fairly High	Fairly High	Low	No	Medium	Medium	Medium	Medium
17	Dhankawadi Ward	Fairly High	Medium	Fairly High	Low	Fairly High	Low	No	Fairly High	Fairly High	Medium	Fairly High
18	Khadki Cantonment Board	Fairly High	Fairly High	No	Low	Fairly High	Fairly High	Medium	Fairly High	Medium	Fairly High	Fairly High
19	Pune Cantonment Board	Low	Medium	Low	Medium	Fairly High	High	Low	Medium	Medium	High	High

Legend
High
Fairly High
Medium
Low

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
1	Jejuri	Earthquakes	Medium	Medium	Medium
		Floods & Flash Floods	Medium	High	Low
		Lightening/Storms	L-Low	Low	Low
		Landslides	LS-Medium	Medium	Medium
		Bio-Disasters	High	Medium	High
		Fire	High	Medium	Medium
		Riots	Medium	High	Low
		Chemical & Industrial Hazards	Medium	Medium	Medium
		Building Collapse	Medium	Medium	Medium
		Road/Railway/Water/Air Accidents	High	Medium	Fairly High
		Terrorism	High	Medium	Medium
		Communal Riots & Stampedes	Low	Medium	Low

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
2	Saswad	Earthquakes	Medium	Medium	Medium
		Floods & Flash Floods	Medium	High	Low
		Lightening/Storms	L-Low	Low	Low
		Landslides	LS-Medium	Medium	Medium
		Bio-Disasters	High	Medium	High
		Fire	High	Medium	Medium
		Riots	Medium	High	Low
		Chemical & Industrial Hazards	Medium	Medium	Medium
		Building Collapse	Medium	Medium	Medium
		Road/Railway/Water/Air Accidents	High	Medium	Fairly High
		Terrorism	High	Medium	Medium
		Communal Riots & Stampedes	Low	Medium	Low

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
3	Talegoan	Earthquakes	Medium	Medium	Medium
		Floods & Flash Floods	Medium	High	Medium
		Lightening/Storms	Low	Low	Low
		Landslides	Nil	Nil	Nil
		Bio-Disasters	Medium	Medium	Medium
		Fire	High	Medium	Fairly High
		Riots	Low	Low	Low
		Chemical & Industrial Hazards	Fairly High	Fairly High	Fairly High
		Building Collapse	Medium	Medium	Medium
		Road/Railway/Water/Air Accidents	High	Medium	Medium
		Terrorism	Fairly High	Medium	Fairly High
		Communal Riots & Stampedes	Low	Medium	Low

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
4	Shirur	Earthquakes	Medium	Medium	Medium
		Floods & Flash Floods	Medium	Medium	Medium
		Lightening/Storms	Low	Low	Low
		Landslides	Nil	Nil	Nil
		Bio-Disasters	Low	Medium	Low
		Fire	Fairly High	Medium	Fairly High
		Riots	Low	Low	Low
		Chemical & Industrial Hazards	Medium	Medium	Medium
		Building Collapse	Low	Medium	Low
		Road/Railway/Water/Air Accidents	Medium	Medium	Medium
		Terrorism	Medium	Medium	Medium
		Communal Riots & Stampedes	Low	Medium	Low

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
5	Alandi	Earthquakes	Medium	Medium	Medium
		Floods & Flash Floods	Medium	Medium	Medium
		Lightening/Storms	Low	Low	Low
		Landslides	Medium	High	Low
		Bio-Disasters	Fairly High	Medium	Fairly High
		Fire	Fairly High	High	Medium
		Riots	Medium	Medium	Medium
		Chemical & Industrial Hazards	Low	Low	Low
		Building Collapse	Medium	Medium	Medium
		Road/Railway/Water/Air Accidents	Fairly High	Medium	Medium
		Terrorism	Fairly High	Fairly High	Medium
		Communal Riots & Stampedes	Fairly High	Medium	Fairly High

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
6	Baramati	Earthquakes	Medium	Medium	Medium
		Floods & Flash Floods	Medium	Medium	Medium
		Lightening/Storms	Low	Low	Low
		Landslides	Nil	Nil	Nil
		Bio-Disasters	Fairly High	Medium	Fairly High
		Fire	Medium	Medium	Medium
		Riots	Medium	Medium	Medium
		Chemical & Industrial Hazards	Medium	Medium	Medium
		Building Collapse	Medium	Medium	Medium
		Road/Railway/Water/Air Accidents	Fairly High	Medium	Fairly High
		Terrorism	Medium	Medium	Medium
		Communal Riots & Stampedes	Low	Medium	Low

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
7	Bhor	Earthquakes	Fairly High	Medium	Fairly High
		Floods & Flash Floods	Medium	Medium	Medium
		Lightening/Storms	Low	Low	Low
		Landslides	Nil	Nil	Nil
		Bio-Disasters	Fairly High	Medium	Fairly High
		Fire	Fairly High	Medium	Fairly High
		Riots	Nil	Nil	Nil
		Chemical & Industrial Hazards	Nil	Nil	Nil
		Building Collapse	Fairly High	Medium	Fairly High
		Road/Railway/Water/Air Accidents	Fairly High	Medium	Fairly High
		Terrorism	Low	Medium	Low
		Communal Riots & Stampedes	Medium	Medium	Medium

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
8	Junnar	Earthquakes	Fairly High	Medium	Fairly High
		Floods & Flash Floods	Medium	High	Low
		Lightening/Storms	Low	Low	Low
		Landslides	Nil	Nil	Nil
		Bio-Disasters	Fairly High	Medium	Fairly High
		Fire	Medium	High	Low
		Riots	Medium	Medium	Medium
		Chemical & Industrial Hazards	Nil	Nil	Nil
		Building Collapse	Medium	Medium	Medium
		Road/Railway/Water/Air Accidents	Fairly High	Medium	Fairly High
		Terrorism	Medium	Medium	Medium
		Communal Riots & Stampedes	Low	Medium	Medium

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
9	Lonavala	Earthquakes	Fairly High	Medium	Fairly High
		Floods & Flash Floods	Fairly High	Medium	Fairly High
		Lightening/Storms	Medium	Medium	Medium
		Landslides	Fairly High	Medium	High
		Bio-Disasters	Medium	Medium	Medium
		Fire	Fairly High	Medium	High
		Riots	Low	Medium	Low
		Chemical & Industrial Hazards	Medium	Medium	Medium
		Building Collapse	Medium	High	Low
		Road/Railway/Water/Air Accidents	Fairly High	Medium	High
		Terrorism	Fairly High	Medium	Fairly High
		Communal Riots & Stampedes	Fairly High	Medium	Fairly High

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
10	Rajguru-nagar	Earthquakes	Fairly High	Medium	Fairly High
		Floods & Flash Floods	Low	Medium	Low
		Lightening/Storms	Low	Low	Low
		Landslides	Nil	Nil	Nil
		Bio-Disasters	Fairly High	Medium	Fairly High
		Fire	Fairly High	Medium	Fairly High
		Riots	Medium	Medium	Medium
		Chemical & Industrial Hazards	Nil	Nil	Nil
		Building Collapse	Low	Medium	Low
		Road/Railway/Water/Air Accidents	Fairly High	Medium	Fairly High
		Terrorism	Medium	Medium	Medium
		Communal Riots & Stampedes	Fairly High	Medium	Fairly High

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
11	Daund	Earthquakes	Fairly High	Medium	Fairly High
		Floods & Flash Floods	Medium	Medium	Medium
		Lightening/Storms	Low	Low	Low
		Landslides	Nil	Nil	Nil
		Bio-Disasters	Fairly High	Medium	Fairly High
		Fire	Fairly High	Medium	Fairly High
		Riots	Medium	Medium	Medium
		Chemical & Industrial Hazards	Nil	Nil	Nil
		Building Collapse	Fairly High	Medium	Fairly High
		Road/Railway/Water/Air Accidents	Fairly High	Medium	Fairly High
		Terrorism	Medium	Medium	Medium
		Communal Riots & Stampedes	Low	Medium	Low

Sr.No.	Name of the Ward	Hazards	Vulnerability	Capacities	Risk
12	Indapur	Earthquakes	Fairly High	Medium	Fairly High
		Floods & Flash Floods	Fairly High	Medium	Fairly High
		Lightening/Storms	Low	Low	Low
		Landslides	Nil	Nil	Nil
		Bio-Disasters	Fairly High	Medium	Fairly High
		Fire	Fairly High	Medium	Fairly High
		Riots	Medium	Medium	Medium
		Chemical & Industrial Hazards	Low	Low	Low
		Building Collapse	Low	Medium	Low
		Road/Railway/Water/Air Accidents	Low	Medium	Low
		Terrorism	Low	Medium	Low
		Communal Riots & Stampedes	Fairly High	Medium	Fairly High

6. Summary of Risk Analysis of Pune Municipal Councils

Pune lies in seismic zone no III the chances of an earthquake affecting this area are fairly high. The intensity of an earthquake could be as high as 7.0 on the Richter scale. The risk of earthquake is fairly high in Bhore, Daund, Lonavala, Rajgurunagar, Daund, Indapur and Junnar.

The flood waters of the rivers and overflow of Dam enters the adjoining low lying areas of the cities. Lonavala has Bushi dam and other water bodies like lakes. The risk of floods and flashfloods is fairly high in Lonavala and Indapur.

Bad construction practices on the hill slopes loosen the hilly terrain giving rise to threat of landslides. The risk of landslides is fairly high in Lonavala.

There is a susceptibility of epidemics of contagious diseases, air borne and water borne due to various reasons. The main reason is lack of hygiene and inappropriate solid waste management collection and disposal. The risk due to biological hazards is high in Jejuri and Saswad. The risk due to biological hazards is fairly high in Alandi, Baramati, Bhore, Junnar, Rajgurunagar, Daund and Indapur.

The risk due to fire is high in Lonavala. The risk to fire is fairly high in Talegaon, Shirur, Bhore, Rajgurunagar, Daund and Indapur. The risk due to chemical and industrial hazards is fairly high in Talegaon, due to proximity to industrial area.

The threat of building collapse is to old and dilapidated buildings. The risk due to building collapse is fairly high in Bhore and Daund.

The proximity to National Highway NH4, the negligent driving of vehicles and pedestrian traffic increases the risk of road accidents. The risk of road accidents is fairly high in Jejuri, Saswad, Baramati, Bhore, Junnar, Lonavala, Rajgurunagar and Daund.

The reason for outbreaks of riots can be communal or political. The cities with mixed population can be susceptible to communal riots. The risk of riots and communal riots is fairly high in Alandi, Rajgurunagar and Indapur.

The places with political or religious importance and high congregation of people are susceptible to terrorist attacks. The risk of terrorism is fairly high in Talegaon and Lonavla.

The occurrences of stampedes is high in programmes, rallies, Jatra, Vari, Palkhi, Ganpati celebrations and other festive celebrations. The susceptibility to stampedes always exists in areas of high congregation of people. The risk of stampedes is fairly high in Alandi, Lonavla, Rajgurunagar and Indapur.

7. Prevention, Preparedness and Mitigation Measures

Prevention

- Allot different Safe Areas and assembly Points where the public can reach in emergency after vacating their houses or places of work during an emergency.
- Open areas for earthquake
- For floods, the safe places have to be outside the 'Red Line' and in buildings that are strong and spacious
- In case of bomb blasts or terrorist attacks, the safe places should be strong houses, at least 500 metre away
- Keep rescue and relief inventory ready for the population that may get affected by any hazard.
- Identify and prepare the list of volunteers.
- Revive the siren system instituted by the Civil Defence indicating different notes for different emergencies and practice the same periodically.
- Work out the evacuation routes and routes/ channels for the movement of the response forces.
- Instruct the public not to crowd around any place of emergency.

Preparedness

- Risk assessment and Vulnerability Mapping
- Understanding the increasing trend of disaster in Pune
- Protecting the critical infrastructure
- Ensuring Environmentally Sustainable development
- Climate Change Adaptation
- Improving Awareness in the community

- Placing information boards' at all public places regarding prevention, mitigation and response during Fires, Earthquakes, Floods and Terrorist Activities/ Security issues.
- The awareness could also be upgraded by holding exhibitions where a clay model of the city could be prepared and the evacuation plans and actions could be explained for major disasters and hazards on different such models.
- Ask the education institutions, corporate offices, industries and even public sector undertakings and the government to prepare their own DM Plans with stress on preventive and mitigation measures, evacuation plans and preparedness for response.
- The Ganpatimandals are the important stakeholder, hence coordinating with the Ganpatimandals for their preparedness measures.
- All the Ganpatimandals, Vari organisers and other stakeholders shall share their celebration calendar with the PMC.
- Make conduct of mock drill by the inmates of every organisation compulsory.
- An early warning system for floods should be established between the irrigation Dept. And the Collector's EOC as well as the EOC of the PMC.
- Manned security system and CCTV camera system shall be integrated for surveillance system.
- Communication and sharing of upto date information state of art IT infrastructure remain at the heart of effective implementation of disaster management strategy.
- The establishment of emergency operations centers, equipping them with contemporary technologies and communication facilities and their periodic upgradation, will be accorded priority.
- DM plans for hospitals will include developing and training of medical teams and paramedics, capacity building, trauma, psycho-social care, mass casualty management and triage.
- Upgrades of bed capacities and overall facilities in all government and private hospitals.
- Arrangements to attach private practitioners to various hospitals during emergencies.
- Identification of places where adhoc hospitals are established to cater to mass casualties.

- There is a need to immediately upgrade the FES and also possess smaller vehicle based Fire Tenders to negotiate the narrow lanes in congested areas and slums, as an immediate measure.
- Preparedness in Terms of Liaison with Other Co-opting agencies

Gap

- The capacity of Fire and Emergency services are inadequate in PMC.\
- FES requires an upgraded control room connected to the EOC of the PMC and the Police Control Room.
- Home Guards' capacity needs to be improved through training.
- Both the organisations need to be trained to operate in conjunction with the FES and the police.
- One team per ward should be kept ready as part of the Task Force 24 X 7.
- From the community, response teams need to be created to operate in conjunction with the FES and the Civil Defence/ Home Guards. The teams must comprise of volunteers of Ganesh Mandals/ DurgaPoojaMandals, NSS and NCC volunteers.

Mitigation Measures

1. Earthquakes

- Identify and empanel structural engineers to help the PMC's city engineer to study and publicise the Earthquake resistant structural norms
- Survey should be undertaken through independent agencies to identify specific structures
- Issue notices to the owners and the occupants of the structures and advise them to shift to safer locations or reconstruct the structures
- A drive should be undertaken to demolish unauthorized structures and no concessions should be given for granting the owners/ occupants for adjusting the construction norms.

- Spread awareness among the population regarding indications of an earthquake and actions to be taken in case of a quake.
- The overhead water storage tanks (ESRs) should be structurally strengthened to ensure that the EQ does not cause any damage and collapse to the structure.
- Sirens and Hooters should be fixed at all important locations.

2. Landslides

- Immediate restoration of slopes should be undertaken.
- Slums that area dangerously located should be shifted out as soon as possible.
- Where it is not possible to relocate the construction/population at the base, a retainer wall should be constructed.
- Suitable shrubs and trees should be planted methodically to ensure enhancement of soil holding capacity.
- Slopes should not be overloaded and a law should be immediately passed to that effect.

3. Floods

- PMC should proactively get information about rains from concerned department like meteorological department for weather, irrigation department for level of water in dams etc.
- All the water channels should be cleared before monsoon to avoid logging of water and creating flash flood situation.
- Media like TV, radio, internet, social media and mobile should be used effectively to send messages and information 72 hours prior to the actual hazard.
- All the people residing in the flood line zone should be shifted to safer places.

- The ESF, EOC and task forces, first aid team should be ready with all the equipments and resources and all the concerned departments shall be informed to be in ready status.
- The locations identified for sheltering victims of floods should be equipped with all the necessary facilities for providing food, shelter, clothing and medicines.
- The health department should take care of all the probable epidemics and carry out vaccination programs if necessary.
- The police department shall help in shifting the victims to safer locations and maintaining law and order situation shall be their first priority.
- Anti-flood wall is required where it is required.

4. Fire

Fire safety audits should be planned at important places and buildings.

5. Biological Hazards

- Control the spread of contagious diseases.
- Vaccination programs should be done frequently
- Check should be there on drinking water facilities.
- Keep check on all unauthorised vendors of food items.
- Carry out checks of kitchens of all restaurants and hotels.
- Solid waste management should be handled more sensitively.
- Create more capacity for waste disposal.
- Undertake cleaning of river channels and do not allow the sewage to flow into river.
- There is a need to vigorously carry out cleaning of the slums and undertake fumigation and disinfectant sprays.

6. Anti-Terrorism Measures

- Mock drills should be conducted in schools, colleges, offices, malls and other such type of gathering places.
- Fix up CCTVs at all bus stands, railway stations and public offices as well as cinema theatres and Malls.
- Detail more guards for protecting water reservoirs and filtration plants.
- Establish chemical check laboratories at each filtration plant.

7. Partnership for mitigation and preparedness

- Community based disaster preparedness
- Stakeholders Participation
- Corporate Social Responsibility (CSR) and Public Private Partnership (PPP)
- Media Partnership

8. Response, Recovery and Rehabilitation Measures

- 1 Response Mechanism
- 2 First and Other Key Responders
- 3 Search and Rescue team
- 4 First Aid Team
- 5 Armed forces and paramilitary Team
- 6 Local NGO's NCC and NSS team
- 7 Establishing a Public Grievance Bench
- 8 Temporary shelter management
- 9 Establishing Law and Order
- 10 Managing dead bodies of human beings and animals
- 11 Managing the Aid
- 12 Information and Media Management
- 13 Incident Command System (ICS)
- 14 Response Mechanism during active Disaster Phase and Mutual Aid Scheme
- 15 Response Mechanism in Conjunction with Pune District Headquarters
- 16 Response Mechanism in Conjunction with Satara District
- 17 Response Mechanism in Conjunction with the PCMC
- 18 Response Mechanism in Conjunction with the Cantonment Board

9. Recovery Measures, Rehabilitation and Reconstruction

If a disaster occurs, response and relief have to take place immediately. Rescue of affected people, distribution of basic supplies such as food water, clothing, shelter and medical care become urgent need of the hour. Delays will occur if government departments and municipalities have no clear plans to manage such events. It is therefore important to have plans in place.

The recovery process involves Relief and Rehabilitation. A good relief helps recovery process and rehabilitation brings the society back to complete normalcy. For better relief, a methodical relief management process is essential. Rehabilitation necessitates offering permanent alternate shelters and restoration of means of livelihood.

1. Relief Function

I. Immediate relief.

PMC should have a complete strategy on relief system else the whole effort shall be chaotic and people would be direction less. Relief entails offering immediate medical aid, provision of food and water and essential commodities to revive the victims from initial shock and regenerate the physical normalcy in life processes. The victims are also temporarily retained at holding camps/ temporary relief camps and are given immediate financial compensation. The immediate relief is conducted on the heels of Rescue and Evacuation functions.

The following are suggested to the PMC's ESF and Response organisations:-

- (a) Task Forces will evacuate the victims either to pre-allocated hospitals if a victim requires medical attention beyond first aid. Holding the victim at the site of incident for a longer time is counterproductive. Thus, each Task Force must have at least one ambulance at the time of response. Further modes of evacuation should be made available as soon as possible. The PMC will thus keep at least 3 to 4 ambulance vehicles earmarked to react in each division and these must be ordered by the EOC immediately. The FES of PMC also has some troop carrying vehicles that can be used initially for the carriage of injured victims

(later, these could be used for the disposal of the dead). It is important to ensure that the Task Force personnel are well trained in First Aid so that the victims could be stabilized at the site itself.

(b) The other victims who do not require medical attention should be immediately evacuated to a holding area, away from the incident site and where they should be given water, food and hot beverages for bringing them out of shock. Relief camps should be established as soon as possible where the victims should be sheltered and their food, water, sanitation and requirements of essential commodities like clothes and other essential items of toiletries should be taken care of. These relief camps should be pre-planned and organised. Each relief camp must have the following organisation:-

The camp Commandant will ensure that a record of all the distribution of commodities is maintained. The ward officer will ensure that cooked food or cooking arrangements with rations are made available in adequate quantum (refer to Resource management Part for scaling). Water is supplied initially on a hard scale and as normalcy is restored, the same is increased. The drinking water should be purified with chorine tablets and distributed. The Administrative team will be responsible for recording the details of the inmates of the camp, provide essential commodities like clothing, bedding, plates and glasses and also essential items that the female inmates require and feeding bottles for the children. The administrative team should also be responsible for ensuring visits by the clinical psychologists and the medical team once a day. The administrative team also ensures that the inmates are kept busy in entertainment and some activities for better psychological recovery. It will also announce from time to time the facilities that the government offers.

The food and water management team should be responsible for preparation of food and its distribution and ensuring that the food is cooked in hygienic

condition and that there are neither shortages nor wastages. It should be ensured that water is stored in sufficient quantum and water for consumption is purified.

The sheltering team will be responsible to erect shelters and logical distribution of the family members in the shelter accommodation. It will also ensure creation of toilet blocks and that the toilets are hygienically clean.

The camp commandant will send daily “feeding strength” reports to the Divisional Office through the liaison officer. Any requirements should be projected through the liaison officer. It should be ensured that electricity is provided to the camp as soon as possible and even Tele communications should be restored within about 48 to 72 hours.

(c) **Damage and Need Assessment (DNA):** PMC will order the following DNA teams to operate in each ward. The team will have the following composition for assessing the damage and ascertaining the needs of the society. The assessment should be done within 24 hours of an incident and the team should also talk to the affected victims in the relief camps. Multiple teams will be formulated under a central control of nominated officers. The ward level teams will report their observations to the central team formed by the Municipal Commissioner. It is recommended that the central team may be comprised of a Dy MC and senior officers of the PMC. Formats for reporting of the DNA feedback will have to be formulated whereby, damages to infrastructure, property – private and public, loss of lives and injuries to humans and animals, material needs, psychological needs, medical help, requirement of essential commodities, need for repair and restoration of certain facilities and services and estimation of economic cost of the damage and compensation would be reflected. DNA is not a one-time activity. Needs will have to be estimated repeatedly for each phase of the response and relief, periodically as the needs do change and they have to be prioritised:-

- (i) Officer from city engineer's office for assessing structural damage or from the PWD.
- (ii) Officer from the concerned ward.
- (iii) Officials from Social Welfare department of the district.
- (ii) A lady constable from police or home guards.

(d) **Compensation:** Invariably, cash compensation is announced by the govt. to the next of kin of the dead people and those to the injured. Past experience suggests that this compensation is distributed with nearly complete lack of control and the compensation lands into wrong hands. To avoid this, ward officers, social workers and the corporators have to be present to identify the persons receiving the compensation. This process of distribution will take place in presence of an impartial witness from the public who should be a highly educated and respected person from the same locality. This person must sign as an independent witness and retain a copy of the proceedings and supply his residential address and identity proof with the official documents. Each recipient of the compensation will be photographed in presence of the official distributing the compensation and these photographs will be authenticated by the independent witness. Compensation to the minor children of the deceased will not be distributed in cash. Instead, the same will be invested in their names in a nationalized bank and the documents will be submitted to the govt. treasury. The investment will also be authenticated by a witness similar to the one mentioned above.

(e) **Aid by the NGOs:** Many NGOs approach the community directly to provide aid in kind. They should be disallowed because the distribution of the aid is likely to become imbalanced and essential items do not get distributed evenly. The PMC will put up instructions that any aid will be centrally received. A cell will be opened at the PMC and the aid giving agency will list out the items on a voucher

and the officer in charge of the aid will sign it. Two to three honourable member of the public (retired judges or a civil servants or educationists will be invited as members to attend the functioning of this cell. The items will be taken on ledger charge and immediately stored and sent to relief camps on need basis. The issues will also be recorded. Full accountability system will be exercised and the system will be transparent. Accounting ledgers of the stocks will be maintained. The stocks will be verified against the ledger and till the first one month the cell will function. The balance stock will be disposed off in accordance with the written directions of the district collector.

(f) **Animal Shelters:** Animal shelters will be established under the care of Animal Husbandry dept of the district. These shelters will be away from the population centres and outside the city. Fodder and medical attention will be catered for. Identification of the animals poses a problem for handing over the animals to their owners later. A special system like tagging shall be worked out for identification of animals. The animals will be photographed while handing over and the handing over will be on a document where the photograph will be affixed.

A) **Rehabilitation:** Rehabilitation is a lengthy process involving a complex system and many stakeholders. Rehabilitation involves different aspects like shelter, livelihoods, education, health and infrastructure. This is a long drawn function which is quite intrinsic. This issue is basically within the realm of the district collector. However, partly, as far as alternative accommodation for rehabilitation is concerned the PMC may have to decide location(s) for construction of alternative houses, where required. Land acquisition, identification of location and financial impacts have to be considered while deciding upon the location and size of the houses offered. Another sensitive issue is about finding means of livelihood for those who have lost it due to the incident. This again is within the realm of the district administration.

B) Reconstruction and Recovery

The approach to the reconstruction process has to be comprehensive

Reconstruction of the civic facilities will be an important area for immediate restoration.

This will have to be immediately done by the PWD, Sewage, Water and Electricity Dept of the PMC. A team should be formed as part of the ESF functions under one senior officer from the PMC to immediately restore the services if the city has to return to normalcy soonest. Teams of contract labours may have to be hired and employed. It is estimated that each ward will require one team of each type for water, sewage and power restoration. These teams will work under the guidance of the central team, but the control over execution will be that of respective ward officers.