Planning for optimal sanitation in Amravati city, Maharashtra

A DISSERTATION

Submitted in partial fulfillment of the

Requirements for the award of the degree

Of

MASTER OF URBAN AND RURAL PLANNING

By

DEEPLAXMI NULKAR

12511007

DEPARTMENT OF ARCHITECTURE AND PLANNING

INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE

ROORKEE-247667 (INDIA)

JUNE, 2014

CERTIFICATE

Certified that report entitled **"Planning for optimal sanitation in Amravati city, Maharashtra"** which has been submitted by **Deeplaxmi Nulkar**, for partial fulfillment of the requirement for the award of the degree of **Master of Urban and Rural Planning**, in Department of Architecture and Planning, Indian Institute of Technology- Roorkee, is the student's own work under my supervision and guidance. The matter embodied in this dissertation has not been submitted by him for the award of any other degree of this or any other institute.

Date:

Place: Roorkee

Prof.Dr.V.Devadas

Professor

Department of Architecture and Planning

Indian Institute of Technology- Roorkee

Roorkee, Uttrakhand state, India

CANDIDATE'S DECLARATION

I hereby declare that this report entitled **"Planning for optimal sanitation in Amravati city, Maharashtra"** which has been submitted for partial fulfillment of the requirement for the award of the degree of **Master of Urban and Rural Planning**, in Department of Architecture and Planning, Indian Institute of Technology- Roorkee, is an authentic record of my own work carried out during the period from July 2013 to June 2014, under supervision and guidance of **PROF.DR.V.DEVADAS** , Department of Architecture and Planning, Indian Institute of Technology, Roorkee, India.

The matter embodied in this dissertation has not been submitted by me for the award of any other degree of this or any other institute.

Date:

Place: Roorkee (**Deeplaxmi Nulkar)**

This is to certify that the above statement made by the candidate is correct to the best of my knowledge and belief.

Prof.Dr.V.Devadas

Professor

Department of Architecture and Planning

Indian Institute of Technology- Roorkee

Roorkee, Uttrakhand state, India

ACKNOWLEDGEMENT

I owe my gratitude to all those people who have made this dissertation possible and because of whom my experience here at IIT Roorkee has been one that I will cherish forever.

I am extremely grateful to my guide Prof. Dr. V. Devadas, for his suggestions, advices and constant motivation at every stage of this research work

I would also like to thank various officials from Amravati Municipal Corporation (AMC) and other organizations for providing me with required information.

The two years at IIT Roorkee would have been a drag without Ankita, Neelakshi, Nitya, Safoora, Vidhu and all my friends here I will forever cherish the time spent with you which has been rewarding, both personally and academically. I am thankful to Aditya for all the long distance motivation, support and encouragement.

I thank my parents and my family for emotional support and encouragement at every step. Lastly, I thank the almighty for the above and more.

CONTENTS

List of figures

List of Tables

ABBREVIATIONS

AMC: Amravati Municipal Corporation

BPL: Below Poverty Line

DP: Development Plan

DPR: Detail Project Report

ESR: Elevated Service Reservoir / Environmental Status Report

IISER: Indian Institute of Sciences Education and Research

ILCS: Integrated Low Cost Sanitation Scheme

JNNURM: Jawaharlal Nehru National Urban Renewal Mission

LPCD: Litter Per Capita Per Day

MSW: Municipal Solid Waste

M&E: Monitoring and Evaluation

MT: Metric Tonnes

MTD: Metric Tonnes per Day

NUSP : National urban sanitation policy

ODF: Open Defecation Free

O&M: Operation and Maintenance

PPP: Public Private Partnership

SLSC: State Level Sanctioning Committee

SWM: Solid Waste Management

TPD: Tonnes per Day

ULB: Urban Local Body

WTP: Water Treatment Plant

CHAPTER 1 INTRODUCTION

CHAPTER 1: INTRODUCTION

1.1- BACKGROUND

Sanitation brings the greatest return for investment of development. For every single rupee spent on sanitation approximately 9 times is saved in education, health and economic development. Regardless of the entrenched truth, this sector has been ignored for most of the Indian post-Independence history. A large number of Indians are subjected to grave sick wellbeing, increasing dangers to security, lower expenditure on education and nutrition, lower income and reduced productivity resulting into a deep cycle of poverty – just because of need for basic sanitation facility.

The situation intensifies in urban India. Increasing slum population and absence of satisfactory sanitation force more than 50 million people to defecate in the open each day. The poor suffer the most due to lack of sanitation in the form of ill children, uneducated girl child and unproductive people. All together this makes these people even more vulnerable.

The need for improved urban sanitation in India is increasing. Rising densities of slums increasing levels of urbanization and historical lack of attention to urban sanitation only make this need more urgent.

This report highlights that policy developments which focus on urban sanitation can go a long way. And provide access to improved sanitation and ensuring healthy, prosperous city.

*Sanitation is **access** to, and use of, excreta and wastewater facilities and services that ensure **privacy** and dignity, ensuring a clean and healthy living environment for all. Facilities and services should include the collection, transport, treatment and **disposal** of human excreta, domestic wastewater and solid waste, and associated **hygiene** promotion.*

*(Source:*UN Habitat & Water Aid)

1.2- STUDY AREA

Amravati city of Maharashtra state has been selected for study. Amravati is an old town founded in 1097 AD. It is located between 20.30deg. to 21.50deg N and 76.35deg to 78.27deg E. Amravati one of the major towns of the state It is part of Deccan Plato and has an altitude of 343 m above sea level. As per census India, population of Amravati in 2011 is 646,801. It is the gateway to the hill station Chikhaldara and Melghat tiger resort. The city is famous for its educational institutes

1.3- AIM

To evolve a set of policy planning guidelines for optimal sanitation in Amravati city, Maharashtra

1.4- OBJECTIVES

- To study the present conditions of sanitation systems and its impact on other subsystems in Amravati city.
- To identify the control parameters, which decide the function of the system.
- To forecast the demand and supply of infrastructure for 2020.
- To evolve a set guidelines for complete sanitation Amravati city.

1.5- SCOPE

The project will suggest the planning policies guidelines and technological recommendations for the sanitation of the city. The author hopes that if the proposed recommendations are implemented in the system optimal sanitation could be achieved which will lead to overall development of the city.

1.6- LIMITATIONS

The city is facing problems like sanitation, slums, traffic etc but the thesis will be focusing on the issues of sanitation only.

1.7- RESEARCH METHODOLOGY

System and subsystem wise study will be done for thorough understanding. Following research methodology would be applied for evolving planning policy guidelines.

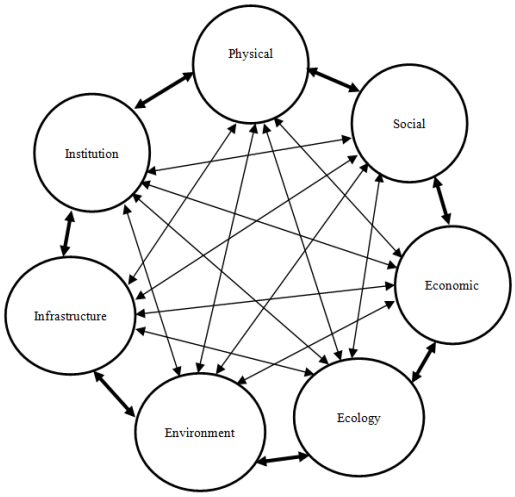


Figure 1 Systems and subsystems diagram

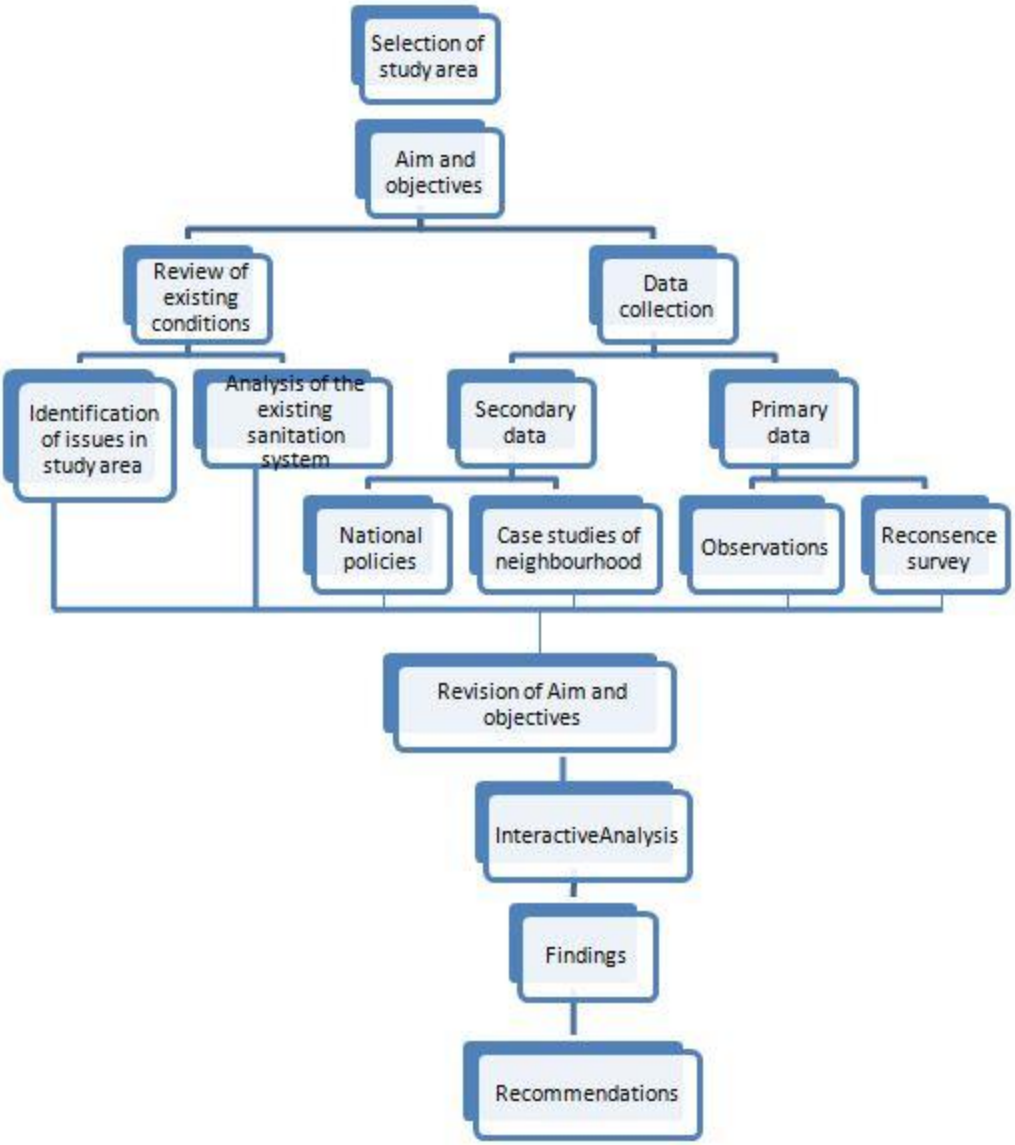


Figure 2- Research methodology

- Data: It would involve data collection from both secondary as well as primary sources.
- Analysis: literature studies, primary household surveys and statistical analysis would be analyzed thoroughly.
- Results & Discussion: the results observed based on the above analysis would be discussed thoroughly to arrive at findings.
- Findings: Evolving inferences based on the studies and analysis.

- Evolving Policies: Evolving a set of Policy Planning guidelines for sustainable sanitation in the study area.

- Recommendations & Conclusions: Based on the above sequence of steps, recommendations and conclusions shall be drawn accordingly.

1.8- DATA COLLECTION

a) Secondary data collection

The following secondary data was collected:

- Existing studies, reports, and proposals
- City sanitation plan
- Proposed and on-going projects
- Existing sanitation infrastructure
- Sewage network map
- City details
- Total population as per census 2011 and population trend
- Existing and future distribution of land-use

b) **Primary data collection**

The following primary surveys are conducted at various locations in the city to access the sanitation scenario:

- Reconnaissance Surveys
- User opinion surveys

CHAPTER 2 OVERVIEW OF AMRAVATI CITY

CHAPTER 2: OVERVIEW OF AMRAVATI CITY–

2.1- LOCATION

Amravati district of Maharashtra state lies between 20.30deg. to 21.50deg North latitude and 76.35deg to 78.27deg East longitude. The district is bounded on the North of Madhya Pradesh on the East by Nagpur and Wardha districts and on the South and South West by Yavatmal, Akola and Buldhana district of Maharashtra state. Amravati city is the **seventh** most populous metropolitan area in Maharashtra Amravati is also the headquarters of the Amravati "Amravati Division" which is one of the six divisions of the state of Maharashtra.

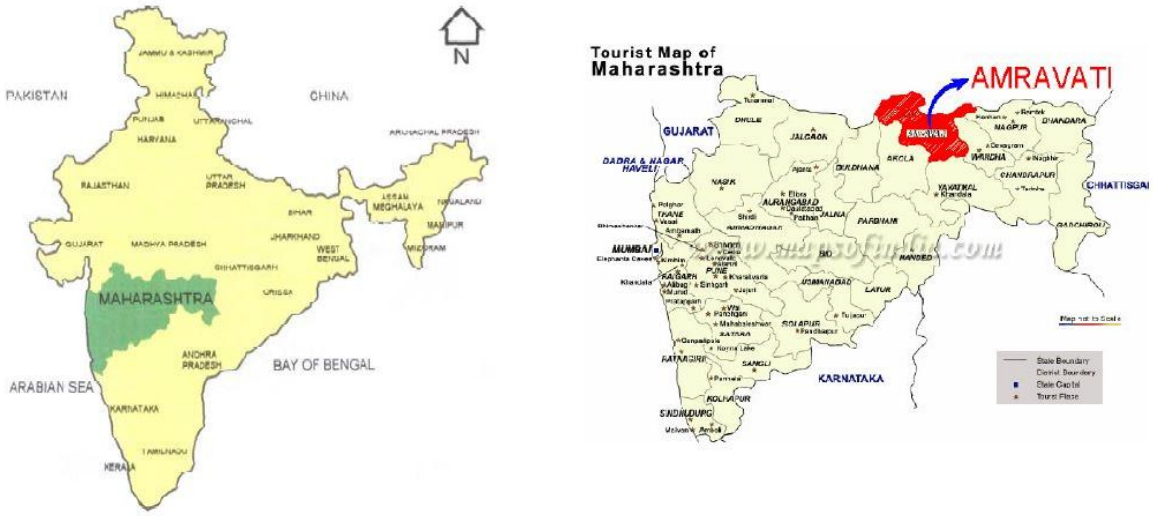


Figure 3-Location of Amravati district

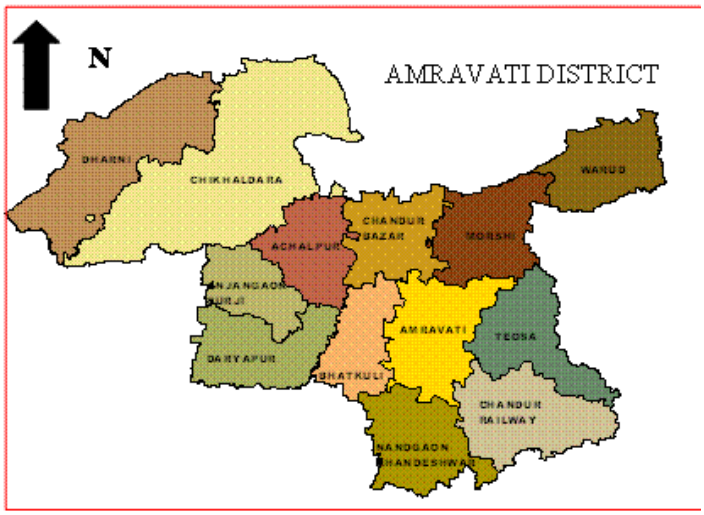


Figure 4-Amravati district

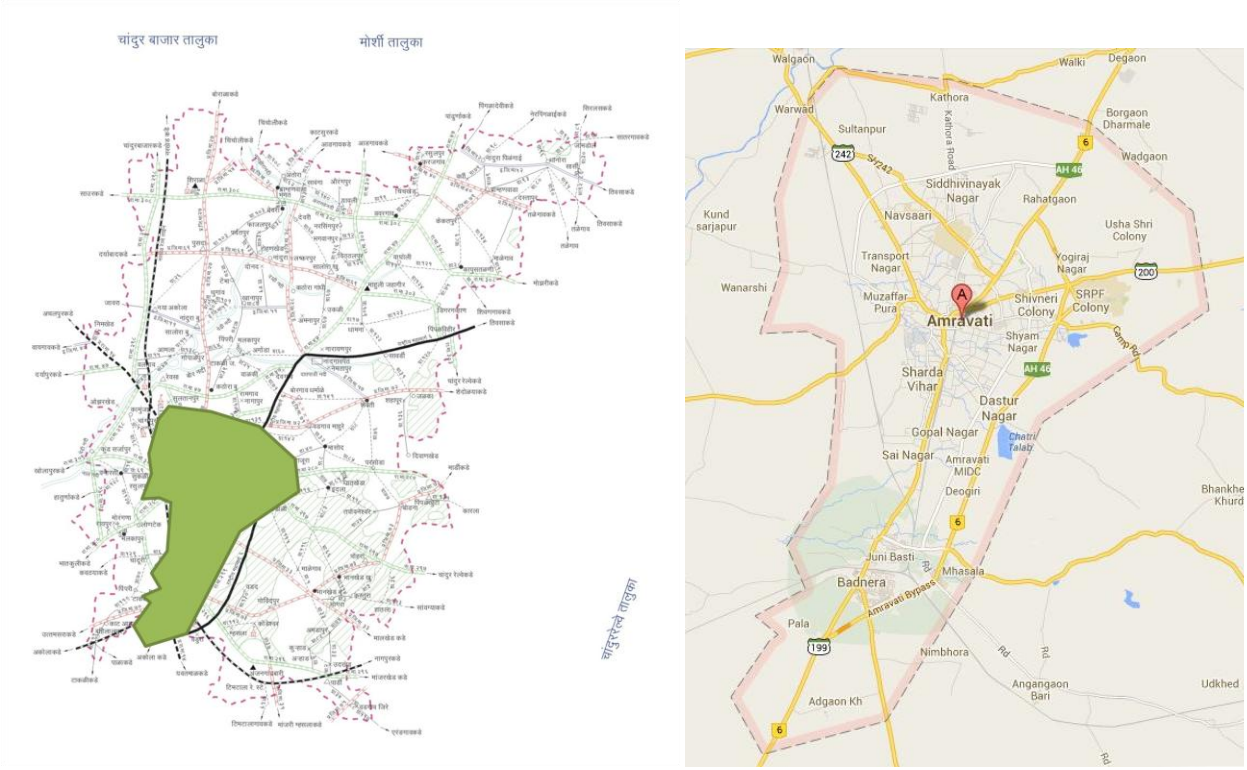


Figure 5- Amravati city

2.2- REGIONAL SETTING

The average altitude is 340.76m above MSL. The total area of the Amravati Municipal Corporation (AMC) is about 121.56 Sq. Km. The city is located on the National Highway NH-6 leading to Mumbai in the west and Kolkata in the east. Amravati has good road, rail connectivity with almost all important cities in India.

2.3- CLIMATE & RAINFALL

Climatically the district is hot and humid. The maximum temperature observed – 47.9deg.C.and the minimum temperature – 9 deg C. Amravati district receives rainfall from south westerly monsoons. Average rainfall is 874 mm

Climate data for Amravati [hide]													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	29 (84)	32 (90)	36 (97)	40 (104)	42 (108)	37 (99)	31 (88)	30 (86)	31 (88)	33 (91)	30 (86)	28 (82)	33.3 (91.9)
Average low °C (°F)	15 (59)	17 (63)	21 (70)	25 (77)	27 (81)	25 (77)	23 (73)	23 (73)	22 (72)	20 (68)	17 (63)	15 (59)	20.8 (69.6)
Precipitation mm (inches)	13 (0.51)	16 (0.63)	9 (0.35)	8 (0.31)	13 (0.51)	155 (6.1)	248 (9.76)	173 (6.81)	165 (6.5)	44 (1.73)	21 (0.83)	9 (0.35)	874 (34.39)
Source: Government of Maharashtra													

Figure 6-Climate and rainfall

2.4- DEMOGRAPHY

As per 2011 Census Amravati city had a population of 646,801. Males constitute 52% of the population and females 48%. Children under 6 years of age make up to 6% of total population.

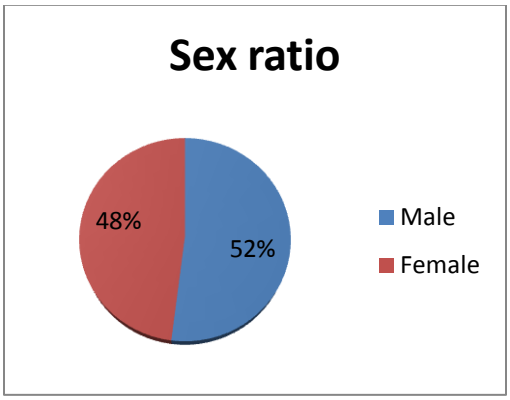


Figure 7 - Sex ratio

Sex Ratio -

The breakup of population into male and female has got a great bearing on the social conditions prevailing in the city as well as district as a whole. The data on the sex composition as per Census 2011 for the city is 957.females per 1000 male population

Literacy –

A study of literacy indicates the potential of the city for absorbing the developmental efforts. The literacy ratio of Amravati is 93.03% which is much higher than the national average of59.5%.

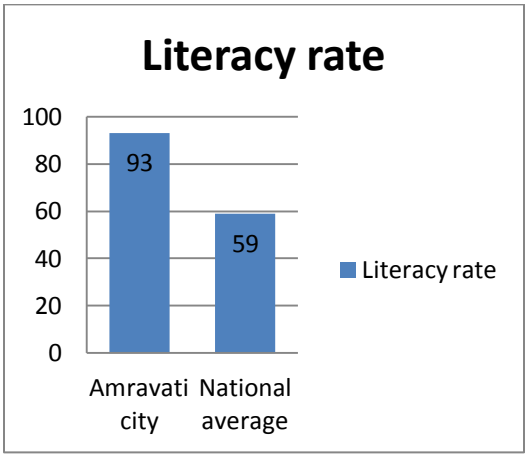


Figure 8-Literacy rate

Amravati City	Total	Male	Female
Population	**646,801**	330,544	316,257
Literates	**543,568**	284,490	259,078
Children (0-6)	**62,497**	32,713	29,784
Average Literacy (%)	**93.03**	95.52	90.44
Sexratio	**957**		
Child Sexratio	**910**		

Figure 9-Demographics

2.5- EDUCATION

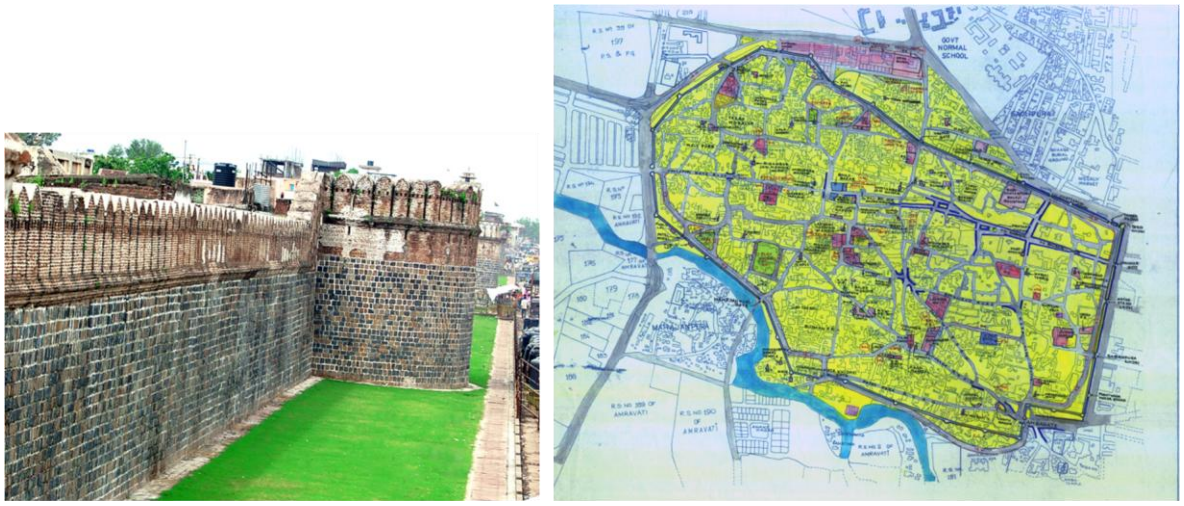
Amravati has emerged as a major educational center in Central India offering many majors including medical and engineering courses. Amravati is well known for the famous health Education Institution Hanuman VyayamPrasarak Mandal (popularly known as HVPM). Amravati also serves as an educational hub for central India. Excellent literacy rate of 93% is result of the available educational facilities

2.6- HERITAGE STRUCTURES

In this ancient town a large no. of monuments which are even now in use and which are more than 500 years old exist. The walled city of Amravati was built around 17th century

The heritage structures that can be readily identified are listed below:

- Ambadevi Temple.
- Academic High –school
- Central Jail
- VMV College.
- Fort wall



Walled Old Amravati town

.

Figure 10- Heritage buildings of the city

2.7- HOSPITALS

There are 16 Municipal Corporation Dispensaries and 12 Urban Health Post (UHP) existing in the city. In addition to these there are 161 private hospitals and 4Government hospitals in the city

2.8- MARKETS

There are 30 markets existing in the city. The up gradation of 3 major markets is being planned.

2.9- EXISTING SLUMS

Total 123 slums are there in the city. 101 are notified slums and 22 are un-notified slums. Total population of slums is 2,16,000 which is 29 % of the total population.

List of slums

2.10- LAND USE

The existing land use data in Amravati Municipal Corporation area has been categorized under major land use zone such as residential, industrial, commercial, recreational, transport and communication, public and semi-public, public utility services and agricultural lands.

The total geographical area within the limits of Municipal Corporation of Amravati is 12,165 hectares i.e. 121.65 sq.km. Out of which only 35.487 is developed area.

The area mainly covers the residential development under Gaothan old town, newly developed slums and residential development, which is coming up around the city.

The existing land use pattern as given in the development plan of Amravati is as given in table below

Sr. No	Land Use	Area (Ha)	Percentage with Developed area	Percentage with Total Area
1.	Residential	1892	43.80	15.55
2.	Industrial	348	8.05	2.86
3.	Commercial	59	1.36	0.48
4.	Public / Semi Public	1036	23.98	8.51
5.	Public Utility	60	1.38	0.48
6.	Recreational Facilities	127	2.95	1.04
7.	Transport and Communication	793	18.48	6.55
Total Developed area		*4320*	*100.00*	*35.48*
8.	Water Bodies	331	-	2.72
9.	Forest Land	1167	-	9.59
10.	Agricultural / Bagayat Land	4655	-	38.30
11.	Vacant Land	1692	-	13.91
	Total area	**12165**	-	**100.00**

Table 1-Existing land use pattern (source-CSP)

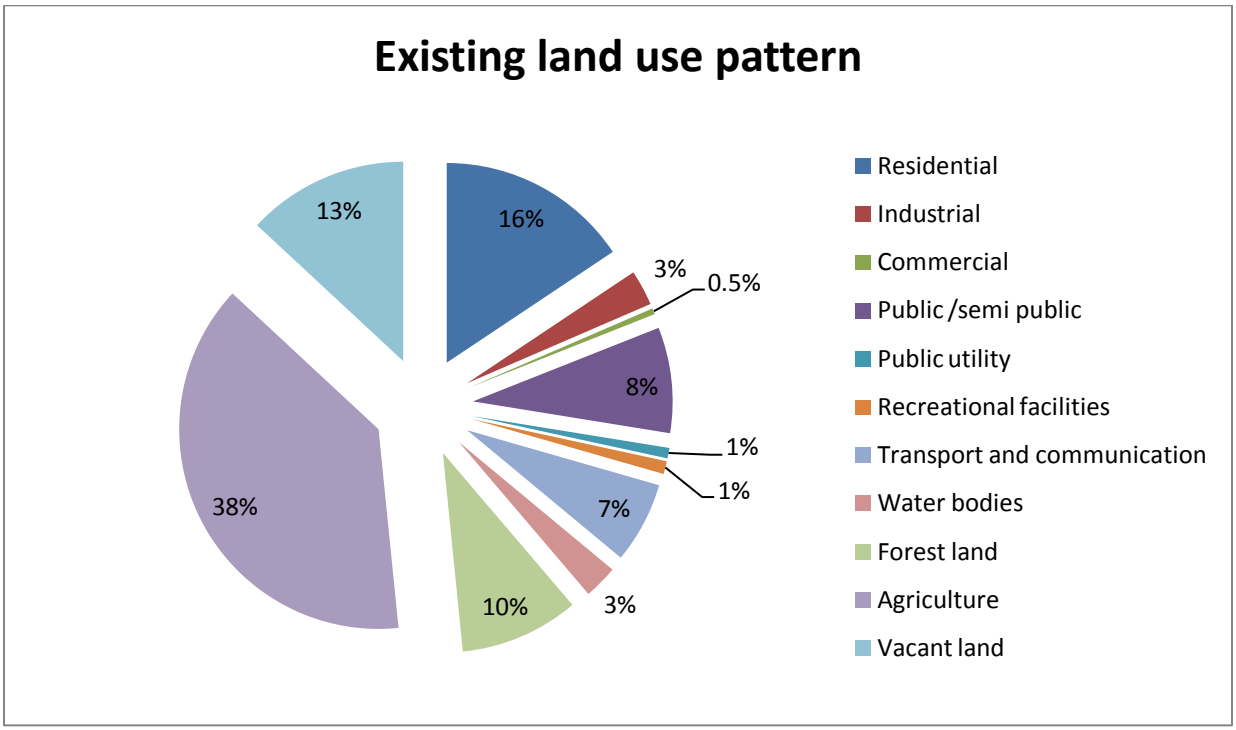


Figure 11-Existing land use pattern

Sr. No	Land Use	Area (hectare)	Percentage with Developed Area	Percentage with Total Area
1	Residential	5508	55.42	45.28
2	Industrial	502	5.05	4.13
3	Commercial	107	1.07	0.88
4	Public/ Semi Public	1,185	11.92	9.74
5	Public Utility	127	1.28	1.04
6	Recreational facilities Regional Park	238 1416	2.40 14.25	1.96 11.64
7	Transport and Communication	855	8.60	7.03
Total developed area		**9938**	**100**	**81.70**
8	Water bodies	331	---	2.72
9	Forest Land	70	---	0.57
10	No Development Zone	1826	----	15.00
	Total area	**12,165**	**-----**	**100.00**

Table 2-Proposed land use pattern(Source-CSP)

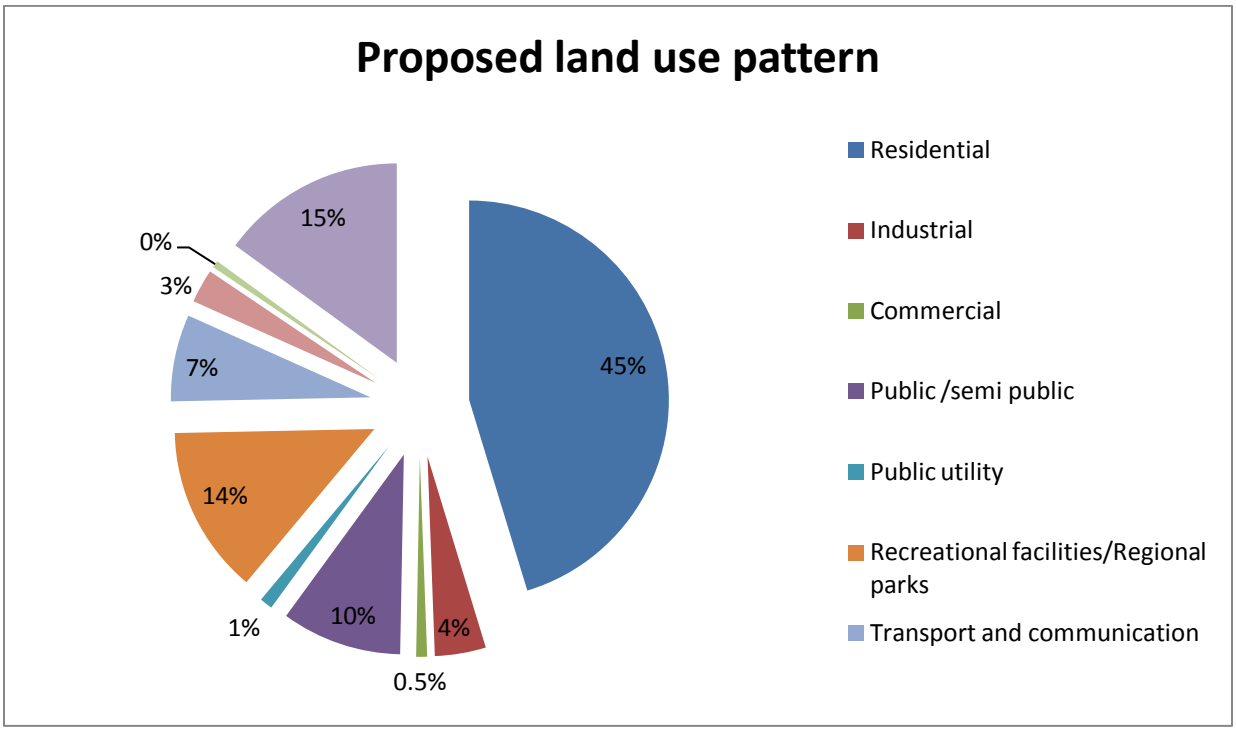


Figure 12-Proposed land use pattern

2.11- MUNICIPAL SERVICES

Amravati Municipal Corporation

Amravati Municipal Corporation was established on 15th August 1983.The Corporation is headed by a Mayor who is assisted by the Deputy Mayor. They carry out the work through various committees such as Standing Committee, Law Committee, Education Committee, Women and Child Welfare Committee, City Development Committee and Four Zonal Committees for the four zones. The AMC comprises of area of Amravati and Badnera along with eighteen revenue villages namely Navsari, Tarkheda, Shegaon , Rahatgaon, Mhasala, Wadali, Benoda, Jewad, Vadad, Nimbhora(K), Saturna, Akoli, Waruda, Kasbe, Badnera Mahajanpura, Gambhirpura and Amravati Peth.

The total area of the city is 270 Sq. Km of which 181 Sq Km falls under municipal limits and about 89 Sq Km falls out off the municipal limits.

Map of wards and zones-

The city is divided into 81 wards grouped in 4 zones.

Zonal Offices

1) Zone No 1 - Rampuri Camp

2) Zone No 2 - Main office

3) Zone No 3 - Hamalpura

4) Zone No 4 - Badnera.

Figure 13- Amravati Municipal Corporation (AMC)

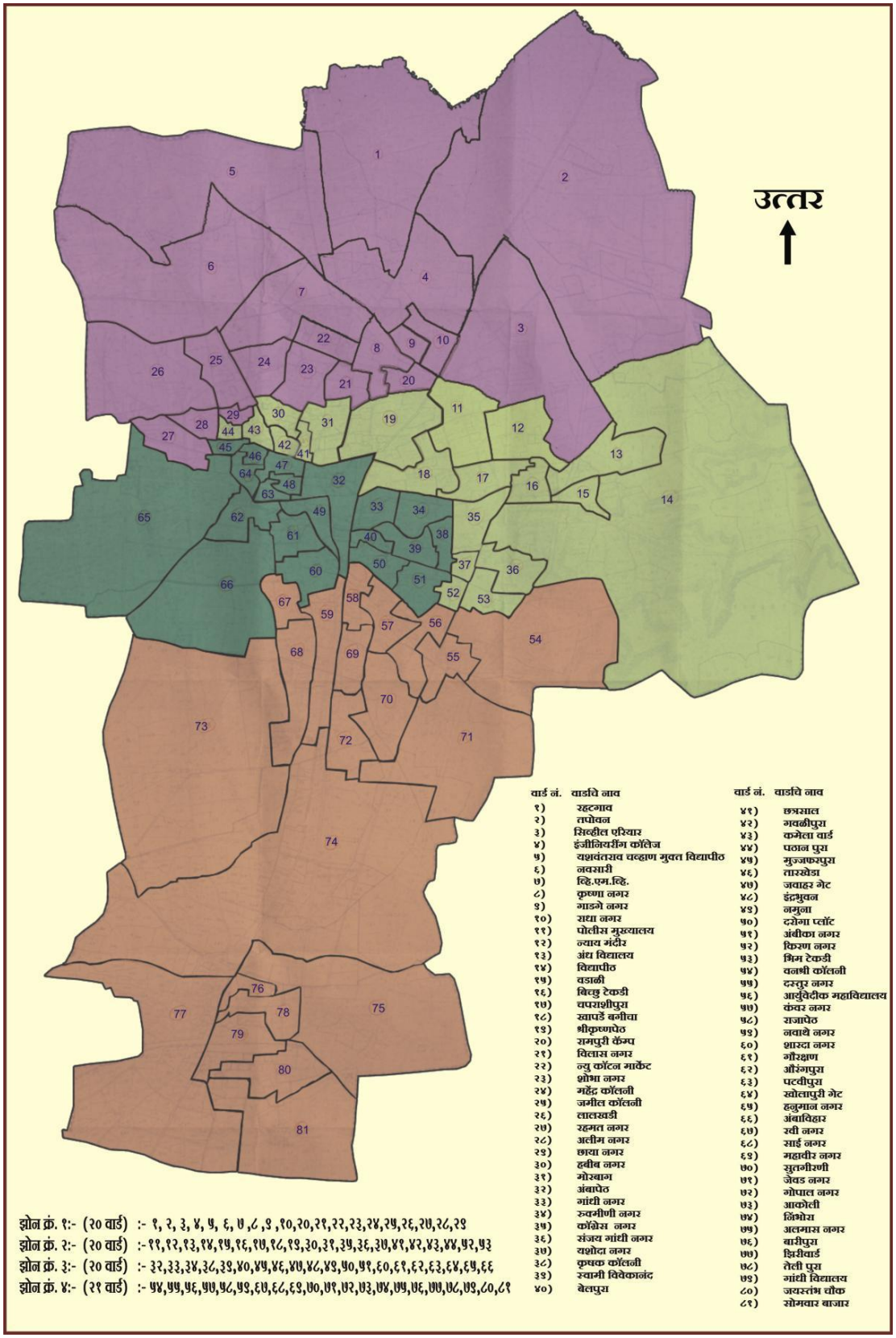


Figure 14- Ward wise map of Amravati city (Source- CDP)

2.12- ISSUES OF AMRAVATI CITY

IDENTIFIED THROUGH SOCIAL MAPPING

- Inadequate basic infrastructure due to uncontrolled slum development
- Inadequate and damaged storm water drains
- Inadequate public toilets
- Un-hygienic conditions and lack of sanitation
- Damaged roads

Identified through Government reports

The report of city sanitation rating presented by **National Urban sanitation policy (NUSP)** puts Amravati city in black category suggesting the **Need considerable improvement**

Amravati scored only 44.25 points on the scale of 100

45	Agartala	TRIPURA	**45.29**	19.200	16.990	9.100
46	Greater Mumbai	MAHARASHTRA	**45.076**	14.250	23.593	7.233
47	Chikmagalur	KARNATAKA	**45.02**	14.920	19.950	10.150
48	Kottayam	KERALA	**45**	26.000	13.400	5.600
49	Bokaro Steel City	JHARKHAND	**44.85**	20.000	15.050	9.800
50	Amravati	MAHARASHTRA	**44.25**	15.000	16.850	12.400
51	South Dumdum	WEST BENGAL	**44.24**	18.740	18.850	6.650
52	Meerut	UTTAR PRADESH	**44.15**	11.653	18.797	13.700
53	Nagercoil	TAMIL NADU	**43.91**	18.920	21.140	3.850
54	Barrackpur	WEST BENGAL	**43.85**	19.250	18.650	5.950

Figure 15-City ranking according to NUSP

Category	Description	Points
RED	Cities requires immediate remedial action	<33
BLACK	Needing considerable improvement	<34 ≤ 66
BLUE	Recovering but still diseased	<67 ≤ 90
GREEN	Healthy and clean city	<91 ≤ 100

Figure 16-City colour codes and their catagories

Figure 17- Poor sanitation in Amravati city

CHAPTER 3: GOVERNMENT POLICIES FOR SANITATION

CHAPTER 3: GOVERNMENT POLICIES FOR SANITATION

Sanitation has always been one of the important sectors for policy makers in India. This chapter discusses some of the important national sanitation schemes. Following is the timeline for sanitation related schemes in India.

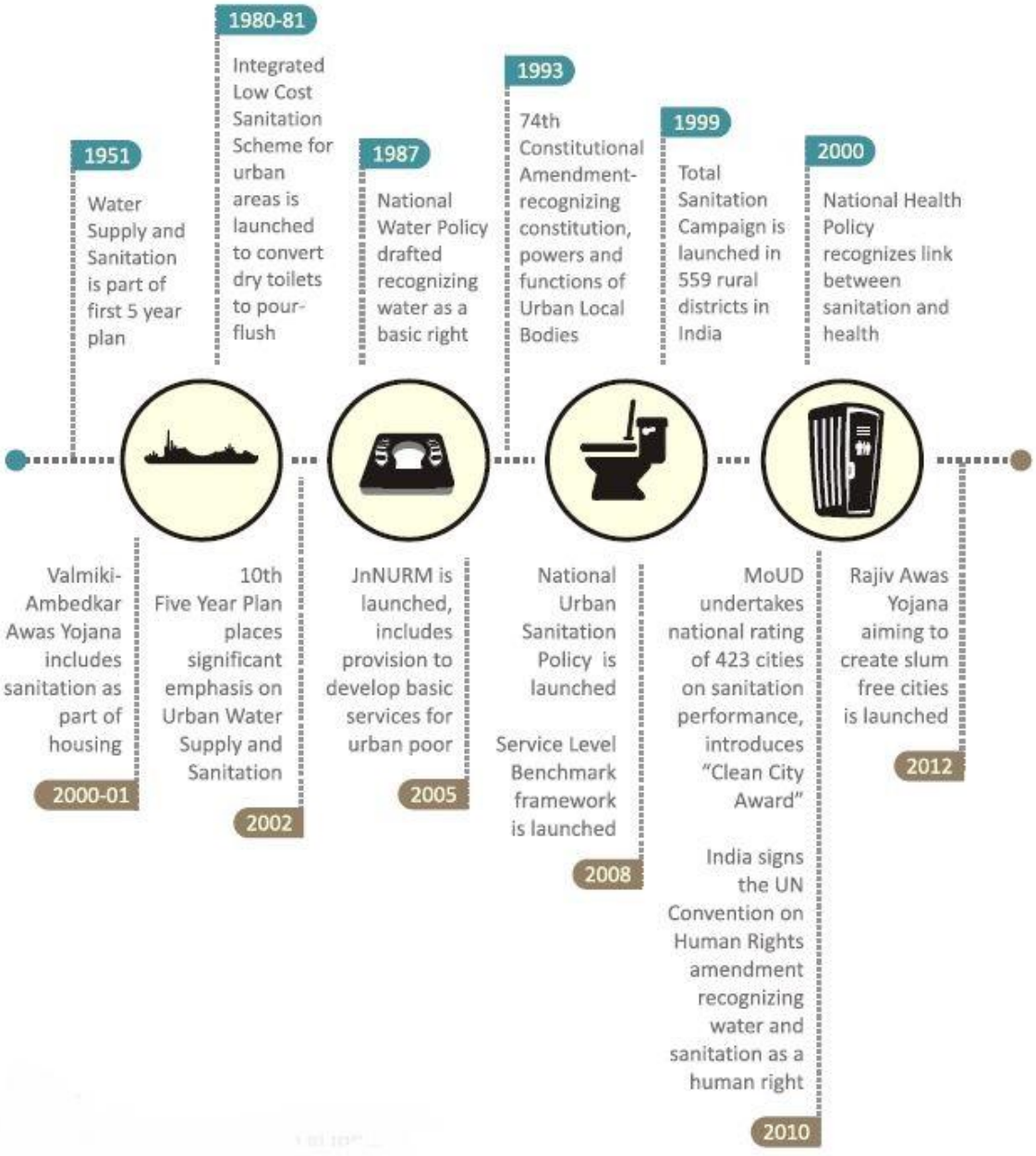


Figure 18- Timeline of National sanitation schemes

3.1- NATIONAL AWARD SCHEME FOR SANITATION FOR INDIAN CITIES

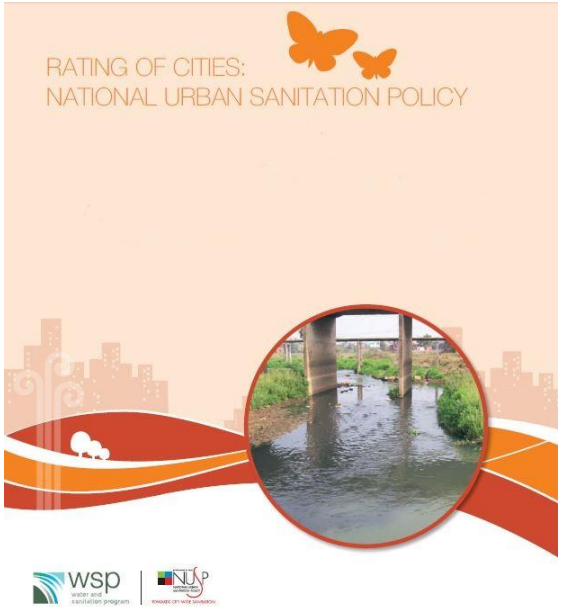


Figure 19- National award scheme for sanitation for Indian cities

Goal

The Government of India planned to institute an annual award scheme for cities to promote sanitation in urban sectors of the country and to identify excellent performance in this area. The awards are based on the basis that improved environmental standards and public health are the two results that cities must ensure for urban citizens. To do so, governments in urban areas will require to plan and implement city-wide sanitation plans, thus design a processes that helps to reach outputs to safe collection, disposal and treatment(including conveyance, treatment, and/ or re-use without adverse impacts on the environment in and around the cities). It should be noted that the awards will not recognize mere inputs, hardware or expenditure incurred in urban sanitation but assess how these lead to achievements of intermediate milestones toward the final result of 100 % safe disposal of wastes from the city on a sustainable basis. Cities will need to raise the awareness of city stakeholders (households, establishments, industries, municipal functionaries, media, etc.) since improved sanitation can ensure improved public health and environmental outcomes only if considerable changes in behavior and practice take place across the spectrum of society.

A completely Sanitized City will be one that has accomplished the yields or developments determined in the National Urban Sanitation approach, the notable peculiarities of which are as takes after:

- Cities must be open defecation free
- Must eliminate the practice of manual scavenging and provide adequate personnel protection equipment that addresses the safety of sanitation workers.
- Municipal wastewater and storm water drainage must be safely managed
- Recycle and reuse of treated wastewater for non potable applications should be implemented wherever possible.
- Solid Waste collected and disposed off fully and safely

- Services to the Poor and Systems for Sustaining Results
- Improved Public Health Outcomes and Environmental Standards

Baseline, Eligibility and Selection Procedure

a) Baseline and Planning: First, each of the cities will conduct a survey (based on secondary and primary data sources) and establish a comprehensive baseline with respect to (liquid and solid) waste generation, collection and disposal in the city. This will enable them to place themselves through objective self-assessment, in the relevant sanitary category (see below). This will form the basis for a City Sanitation Campaign to mobilize all stakeholders, and raise awareness about and priority to 100% sanitation. Based on the baseline, the city will draw up and implement with support from the State Government and Govt. of India, a comprehensive City Sanitation Plan to address the situation in order to reach the goal of becoming 100% sanitized.

b) Implementation: The city will implement its City Sanitation Plan in a strategic manner, clearly prioritizing areas that need urgent attention, and implementing long-term plans in parallel. Again, emphasis will be on mobilizing all city stakeholders and raising the importance of behaviour change, practices and installations for safe and sanitary disposal of all wastes of the city on a sustainable basis.

c) Achievement of milestones: The cities/urban areas that have achieved the sanitation outputs and outcomes described above and have systems and procedures in place to sustain these, will apply to their State Governments (State Urban Development / Municipal Administration Department), for recognition and nomination for the national award.

d) State-level Verification and Awards: The state government will be fully responsible for supporting and supervising their cities to implementing the above steps, and in this regard, may consider instituting a State-level award scheme to promote competition amongst the urban areas within the state. State Governments will also need to launch state level awareness campaigns.

e) National Cities' Sanitation Rating: The MOUD, Govt. of India, will commission independent agencies to carry out surveys of all Class I cities (and other cities included under JNNURM) and publish the results nationally as the basis for recognizing performance. In addition, Govt. of India may also request states for recommending cities showing commendable performance, that will be followed by a due verification process.

f) Criteria for Awards: The National Urban Sanitation Advisory Group, constituted by the MoUD, will be responsible for setting out and revising criteria for the national award. This Committee will also be the final authority in deciding annual awards to applicant cities.

g) Type of Awards: the award scheme will recognize the achievement of cities at the national level. However, no monetary incentive or reward is envisaged for the award. The award may however include, for city and state representatives, sponsorship to participate in national events, trainings, and exchange and learning visits to other locations.

Rating and Categorization of Cities

The rating of cities in regard to their performance in sanitation improvements will be based on set of objective indicators of outputs, processes and outcomes, as presented in Table.

No	Indicators	Points*
1	**Ouput-related**	**50**
A	No open defecation sub-total	16
i.	Access and use of toilets by urban poor and other un-served households (including slums) - individual and community sanitation facilities	4
ii.	Access and use of toilets for floating and institutional populations - adequate public sanitation facilities	4
iii.	No open defecation visible	4
iv.	Eliminate Manual Scavenging and provide personnel protection equipment to sanitary workers	4
B	Proportion of total human excreta generation that is safely collected (6 points for 100%)	6
C	Proportion of total black waste water generation that is treated and safely disposed off (6 points for 100%)	6
D	Proportion of total grey waste water generation that is treated and safely disposed off(3 points for 100%)	3
E	Proportion of treated waterwater that is recycled and reused for non potable applications	3
E	Proportion of total storm-water and drainage that is efficiently and safely managed (3 points for 100%)	3
F	Proportion of total solid waste generation that is regularly collected (4 points for 100%)	4
G	Proportion of total solid waste generation that is treated and safely disposed off (4 points for 100%)	4
H	City wastes cause no adverse impacts on surrounding areas outside city limits (5 points for 100%)	5
2	**Process-related****	**30**
A	M&E systems are in place to track incidences of open defecation	4
B	All sewerage systems in the city are working properly and there is no ex-filtration (Not applicable for cities without sewerage systems)	5
C	Septage/sludge is regularly cleaned, safely transported and disposed after treatment, from on-site systems in the city (MAXIMUM 10 marks for cities without sewerage systems)	5
D	Underground and Surface drainage systems are functioning and are well-maintained	4
E	Solid waste management (collection and treatment) systems are efficient (and are in conformity with the MSW Rules, 2003)	5
F	There is clear institutional responsibility assigned; and there are documented operational systems in practice for b)/c) to e) above	4
G	Sanctions for deviance on part of polluters and institutions is clearly laid out and followed in practice	3
3	**Outcome-related**	**20**
A	Improved quality of drinking water in city compared to baseline	7
B	Improved water quality in water bodies in and around city compared to baseline	7
C	Reduction in water-borne disease incidence amongst city population compared to baseline	6

Table 3-Rating and categorization of cities (Source NUSP)

Category	Description	Points
RED	Cities requires immediate remedial action	<33
BLACK	Needing considerable improvement	<34 ≤ 66
BLUE	Recovering but still diseased	<67 ≤ 90
GREEN	Healthy and clean city	<91 ≤ 100

On the basis of plans prepared and implemented, cities will be able to measure the results of their actions, and be able to clearly chart out their improvements over time compared to their baseline situation.

■ On achievement of remarkable results, i.e. coming into the Green category (Healthy and Clean City), cities will typically become eligible for the national award. Other cities showing remarkable incremental performance or selective achievements may also be given special or honorary awards. Cities in different size-classes may also be considered for category-wise awards.

■ Based on results of the Rating survey and selection of awardees, cities will be invited to participate in a National Urban Sanitation Award ceremony.

Special and Honorary Awards

In order to mobilize cities to participate in the competition, two strategies will be followed:-

■ Institution of award schemes as a part of State Strategies

■ Institution of special and honorary awards to cities showing spectacular performance in selective dimensions or substantial increments

Special Awards: will be given to recognize special achievements, especially in the initial stages, since achievement of 100% sanitation may be difficult especially in the initial stages. For instance, a city may demonstrate remarkable performance in the area of stopping open defecation although 100 percent treatment may be constrained because of lack of time and resources within a given year. In such cases of selective performance, awards will be instituted – in the initial years; these awards will be to accord recognition to:

■ Stopping Open Defecation

■ Remarkable performance in awareness generation

■ Institutional assignment and implementation of operational procedures

- Mobilization of community organizations or non-government agencies in sanitation campaigns

Honorary Awards for Exemplary Performance: It may be difficult for many urban areas to immediately show all-round performance in sanitation. Therefore, cities showing maximum overall improvements in a given year, compared to their baseline situation, may also be given an award with a view to recognition of incremental efforts made. If State strategies incorporate award schemes, many of the above category of performers will be pre-selected from states, and sent up for the national competition.

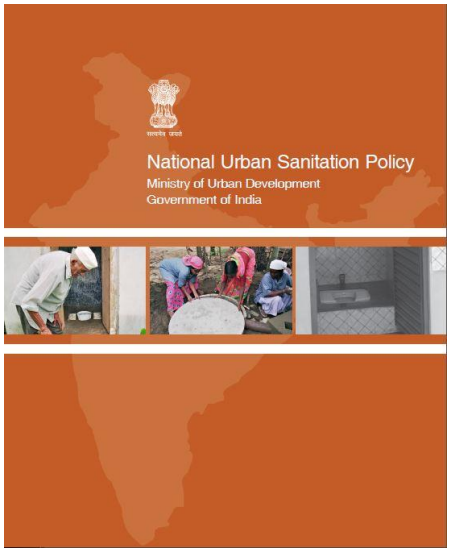
Funding

a) The Ministry of Urban Development, Govt. of India, will fund the national rating surveys, and bear the expenses for organizing the annual national Award Presentation Ceremony.

b) Cities will utilize funds that they are eligible for, following guidelines, under the Govt. of India-assisted (JNNURM, UIDSSMT, VAMBAY etc.). State Government schemes may also supplement funds for the purpose to their cities.

c) The Government of India will support the cities and State Governments' efforts by i) launching a national communication campaign for awareness generation; ii) providing technical assistance and guidance (Guidance Notes, training and capacity building, etc.) for cities; iii) Providing funding support from Govt. of India-assisted schemes, where provided for; and iv) Funding the national rating of cities' surveys on the premise of the above evaluating plan, urban areas will be set in distinctive classifications as exhibited in Table. National rating review information will use these classifications for production of results.

3.2 NATIONAL URBAN SANITATION POLICY (NUSP)



Vision

The vision for Urban Sanitation in India is:

All Indian cities and towns become totally sanitized, healthy and liveable and ensure and sustain good public health and environmental outcomes for all their citizens with a special focus on hygienic and affordable sanitation facilities for the urban poor and women.

Key Sanitation Policy Issues

So as to accomplish the above Vision, after key arrangement issues must be tended to:

■ Poor Awareness: Sanitation has been agreed low necessity and there is poor mindfulness about its innate linkages with open wellbeing.

■ Social and Occupational parts of Sanitation: Despite the proper legitimate skeleton, advance towards the disposal of manual searching has indicated restricted achievement; practically no consideration has been paid towards the word related risk confronted by sanitation laborers every day.

■ Fragmented Institutional Roles and Responsibilities: There are significant crevices and covers in institutional parts and obligations at the national, state, and city levels.

■ Lack of an Integrated expansive Approach: Sanitation speculations are as of now arranged in a piece-dinner way and don't consider the full cycle of safe control, medicine and safe transfer.

■ Limited Technology Choices: Technologies have been focused on restricted alternatives that have not been savvy, and supportability of speculations has been being referred to.

■ Reaching the Un-served and Poor: Urban poor groups also different inhabitants of casual settlements have been obliged by absence of residency, space or budgetary obligations, in getting competitive access to safe sanitation. In this setting, the issues of whether administrations to poor people ought to be individualized and whether group administrations ought to be given in non-told slums ought to be tended to. However procurement of individual

toilets ought to be prioritized. In connection to "Pay and Use" toilets, the issue of subsidies coincidentally arriving at the non-poor ought to be tended to by distinguishing diverse classifications of urban poor.

■ Lack of Demand Responsiveness: Sanitation has been given by open orgs in a supply-driven way, with little respect for requests and inclination of families as clients of sanitation administrations.

The general objective of NUSP arrangement is to convert Urban India into group driven, completely cleaned, solid and decent urban areas and towns. With particular objecIn order to achieve the above Vision, following key policy issues must be addressed:

A.. Awareness Generation and Behavior Change

B.. Open Defecation Free Cities

C.. Integrated City-Wide Sanitation

D..Sanitary and Safe Disposal

E..Proper Operation & Maintenance of all Sanitary Installations

Figure 20- Totally sanitized city

A totally sanitized city

Eliminates the practice of manual scavenging and provides adequate personnel protection equipment for ensuring safety of sanitation workers. Safely collects, treats, and disposes all wastewater. Implements, wherever possible, the recycling and or reuse of treated wastewater for no potable purposes. Safely collects, treats and disposes all solid waste. Provides sustainable sanitation services for poor people

3.3- JNNURM

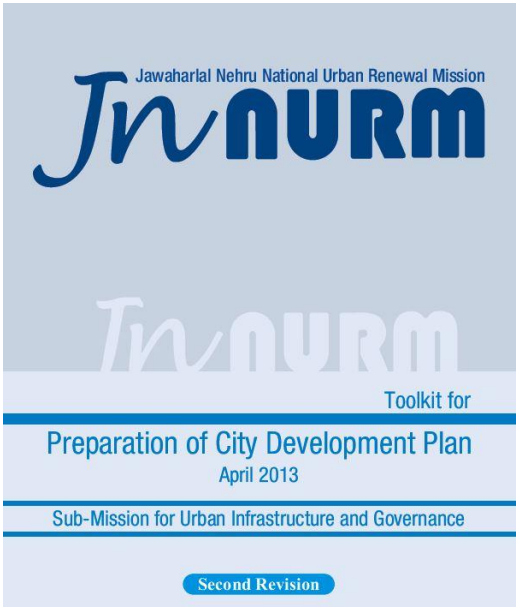


Figure 21- JNNURM Toolkit

CDP toolkit published by JNNURM provides guidelines for developing sanitation policy for cities gives outline for sanitation purposes.

Vision

To attain environment friendly citywide coverage of sewerage and sanitation system

- To achieve universal coverage in the City and improve service levels
- To develop environmentally safe Collection, Treatment and Disposal system
- To provision of safe and hygienic
- Sanitation Facilities to major Tourist/Pilgrim locations, Slum Areas and other city-wide locations
- To prevent flow of sewage and sullage into natural drains and water bodies

3.4- INITIATIVE BY MAHARASHTRA STATE

Maharashtra State is taking initiative to improve the sanitation and water supply services in the state through various schemes. In Maharashtra, the Ministry of Water Supply and Sanitation along with the department of Water Supply and Sanitation was created in 1996 to exclusively concentrate on the poor coverage and access to these essential services in both urban and rural areas. The Ministry is headed by the Minister of Water Supply and Sanitation and is supported by the State Minister for Water Supply and Sanitation. The Secretary heads the Water Supply and Sanitation Department (WSSD). The WSSD is supported by two technical wings viz: Maharashtra Jeevan Pradhikaran (MJP) and Groundwater and Survey Development Agency (GSDA).

Maharashtra is developing a state sanitation strategy in lines with the National Policy on Urban Sanitation. A key milestone to ensure success is the Sant Gadge Baba rural Sanitation Campaign. It encourages cities to prevent open defecation, safely manage waste water, etc. It

forges a spirit of competition among the Urban Local Bodies through performance evaluation and rewards.

The state has also launched “SwarnaJayanti Sujal and Nirmal Maharashtra 2010 Abhiyan**”.** The aim is to prioritize sanitation and develop individual strategies suiting local context.

SWARNA JAYANTI SUJAL & NIRMAL MAHARASHTRA 2010 ABHIYAN

This campaign aims at continuous improvement and strengthening of urban water supply and sewerage sectors. In the first phase, Eighty Two cities would be provided monetary assistance for carrying out new infrastructure development and improvement works in these two sectors.

CHAPTER 4: SANITATION STATUS ANALYSIS

CHAPTER 4: SANITATION STATUS ANALYSIS

4.1- TOILET FACILITIES

Availability of toilets is an important indicator of sanitation. Amravati Municipal Corporation had undertaken the task of providing public / community toilet facility to the urban poor in previous years. This led to reduction in open defecation to a large extent. In spite of these efforts the practice of open defecation is common in slum area of the city. Open defecation has a serious impact on health people.

Some of the reasons for open defecation are

- Lower socio-economic strata population is unable to build toilets at individual level
- In slums there is lack of space to construct toilets
- Children usually defecate in open and later on it becomes habitual
- Poorly maintained community toilets
- Floating population who is not aware of availability of the facilities
- Women, children and physically handicapped people are not provided with any special facility.

Figure 22- Poorly maintained public toilets

Status of toilets

- The city has around 4.45% Households defecating in open because they are unserved through Individual or community toilets facility
- Toilet facility is not available for major public places like State transport bus stand, Joshi market, Cotton market etc

- Out of 132315 households in the city, 1710 households do not have individual toilet facility. 12710 households use a community toilet facility.
- There are 25 sulabh toilets within the city distributed in 4 zones.
- Still a population of 16700 souls is without any kind of toilet facility and thus they have to resort to open defecation.

Zone No.	Population 2001	Population 2011	Number of HHs 2011	Household with Individual Toilets	Household using Community Toilets	Un served Households	Un served HHs	Un served Population
1	137676	161838	32368	28267	7	2600	1501	7505
2	137187	161263	32253	30640	4	1200	413	2063
3	133625	157076	31415	28274	11	3099	43	213
4	141022	165771	33154	26523	16	5811	820	4099
Total	**549510**	**645948**	**13020**	**113704**	**38**	**12710**	**2777**	**13880**
Source : data collected by Sanitary Inspector at AMC								

Table 4- Zone wise availability of toilets

Open defecation

India is called as the world's open defecation capital .Out of 1.1billion people who defecate in open 56 % are from India.

Open defecation leads to serious health hazards in the surrounding area. It is one of the most serious issues of sanitation programme.

- Quality of surrounding environment becomes very poor
- Open grounds and playgrounds cannot be used for their primary purposes
- High risk of spread of diseases
- Contamination of water sources

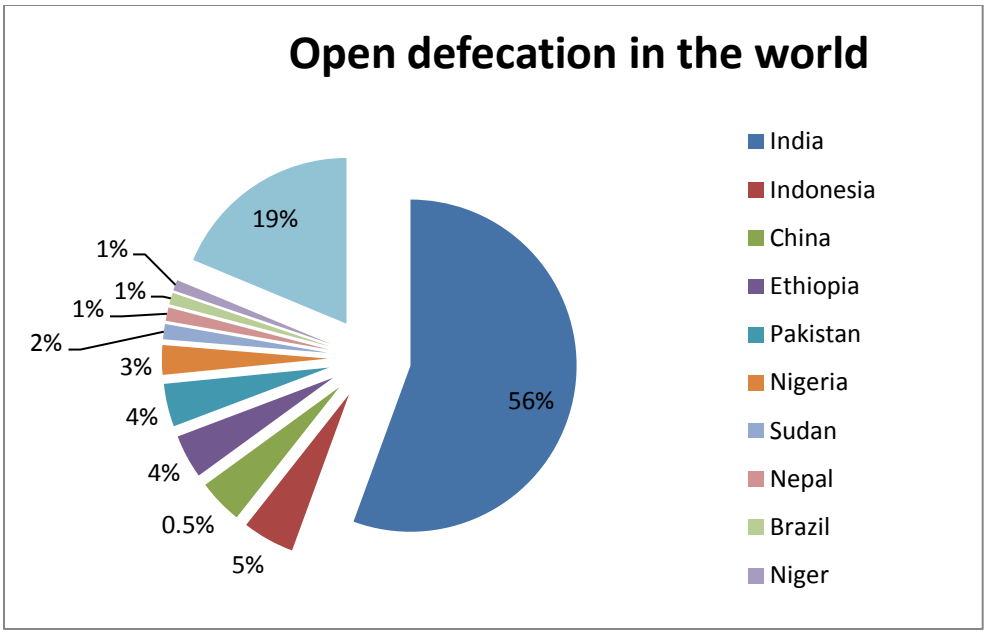


Figure 23- Open defecation in world

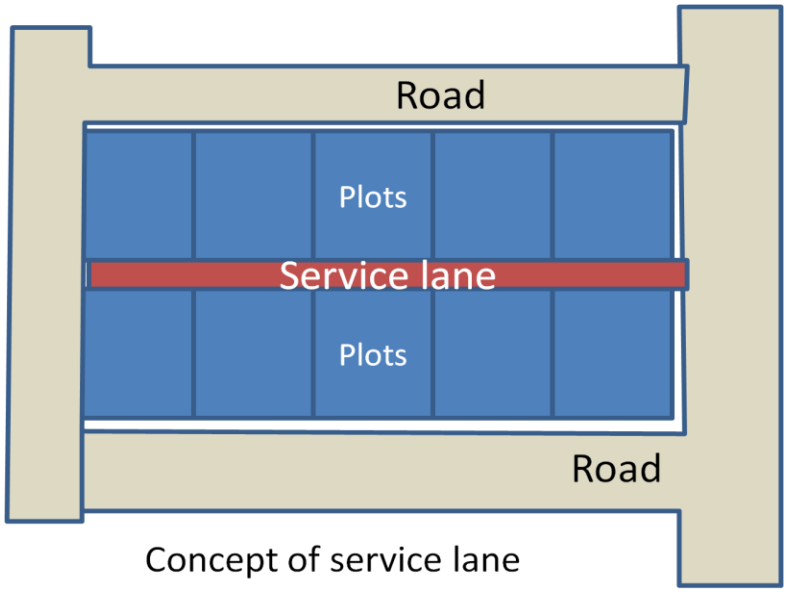
Zone No.	No. of Places	Names of Places
1	6	1) Crematory Area, Vilas Nagar 2) Open Ground, Jay Siyaram Nagar 3) Open Ground, Azad Nagar 4) Near Nallah, Mahendra Colony 5) Crematory Ground, Navsari 6) Shegaon Road, Rahatgaon
2	6	1) Near Nallah, Sanjivani Colony 2) Crematory Ground, Wadarpura 3) Hindu Crematory, Frazerpura 4) Maila Galli, Benoda 5) Ashok Nagar Ground 6) Bajrang Hill Ground, Smashanganj
3	10	1) Public Septic Toilet Ground, Near Mahajanpuri Gate 2) From Kholapuri Gate to Kandalkar Plot on Road 3) Gandhi Ashram Ground 4)Open space in front of Sulabh Shouchalaya Hamalpura, 5) Service Line, behind Dr. Bonde Hospital, Dande Plot, 6) Service Line of Nandipura, Sabnis Plot 7) Service Line behind Gopal Talkies, Rajapeth 8) Open Ground, Daroga Plot 9) Open Ground, Kalyan Nagar 10) On the bank of big Nallah, Near Crematory, Gadgadeshwar Road, Amba Vihar
4	10	1) Jewad Nagar Ground 2) Hill behind Mahadev Khori 3) Sutgirani Kailas Nagar Ground, Choure Nagar 4) Slum, Choure Nagar 5) Chaman Nagar Ground 6) Sawata Ground, Juni Wasti 7) Baripura Ground, Juni Wasti 8) Nawin Wasti, Hamalpura Road 9) Laddha Plot, Yawatmal Road, Nawin Vasti 10) Wadura Gaon, Nawin Vasti.

Table 5-Sites identified with open defecation

4.2- SEWAGE SYSTEM

Existing System

- Septic Tanks are generally used by the local people and all the storm water , waste water and sewage flows to the open drains
- No covered drains or underground drains observed
- Frequent clogging of drains
- Drains are connected to rivulet (Nallah) resulting into contamination and poor environmental conditions of the surroundings
- Valuable city land is wasted due to the service lane concept



Concept of service lane

- Service lanes are usually 2-3 m wide strip of land which passes through backside of plot layouts
- Open drains flow through these service lanes
- Many times solid waste is also thrown in these service lanes making them very filthy
- Stray dogs and pigs are generally observed in large number in these service lanes

Figure 24- Condition of service lanes in the city

Natural drains or Rivulets in the city

Though the city has a strong network of rivulets but the level of contamination increases the risk of water clogging

Figure 25- Poor condition of rivulets in the city

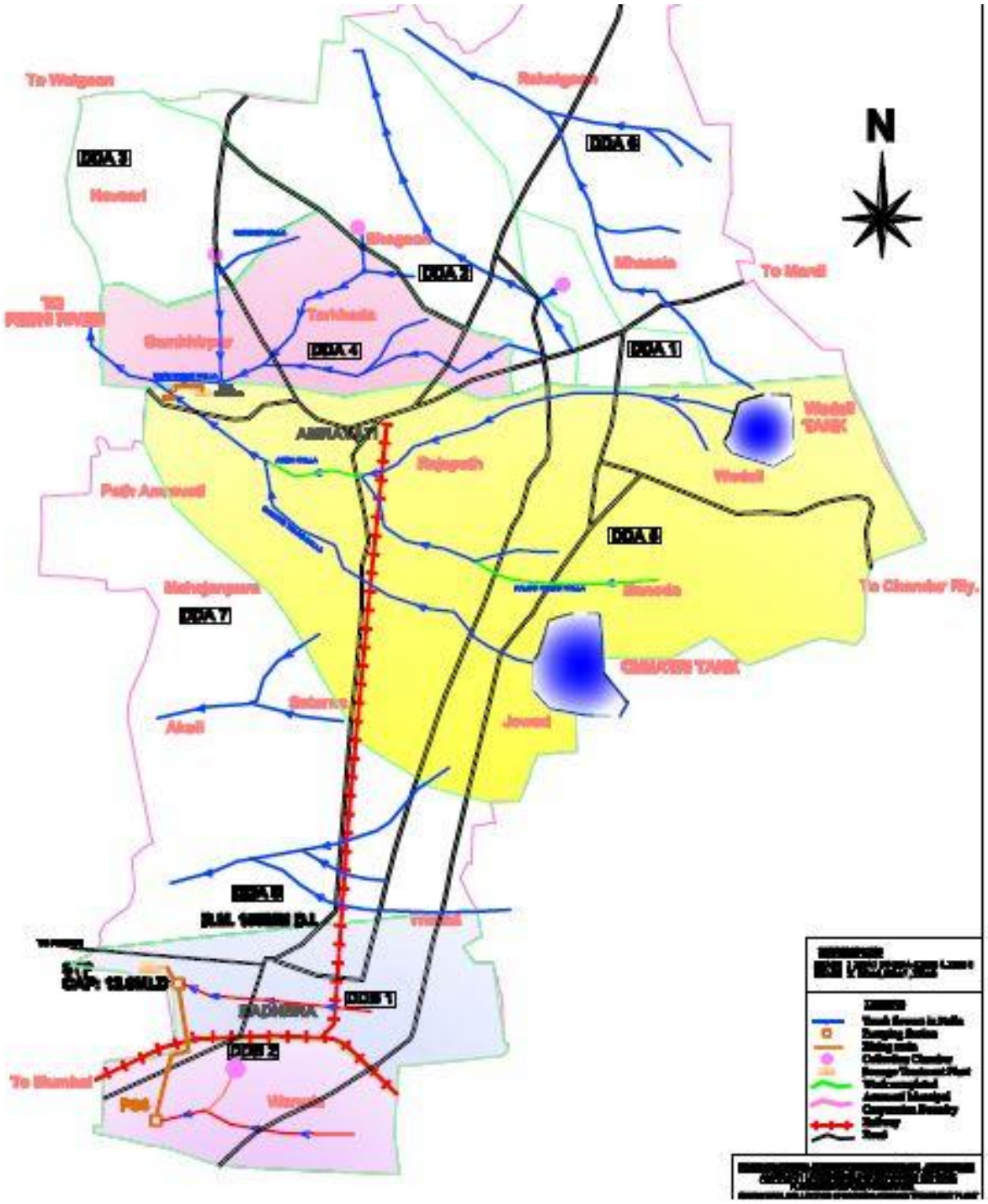


Figure 26- Natural drainage pattern of the city(Source- Water supply department)

4.3- SOLID WASTE MANAGEMENT

Existing System

- Solid waste generated in households is collected by Swachhata Doots, These are the rickshaws with garbage collectors for door to door garbage collection. But the frequency of the garbage collectors is very low
- So the solid waste generally ends up in nearby dumpsters or service lanes
- The waste is currently dumped at the landfill site and no treatment is done

Figure 27-Door to door garbage collection

CHAPTER 5: SUCCESS STORIES OF NEIGHBOURHOOD

CHAPTER 5: SUCCESS STORIES OF NEIGHBOURHOOD

5.1 GADGEBABA GAM SWACHHATA ABHIYAN

Figure 28- Gadgebaba gram swachhata abhiyan poster

Sant Gadge Baba Gram Swachata Abhiyan was introduced in Maharashtra to raise awareness about the necessity for cleanliness among villagers. This idea was prompted because of the result of the survey done on the level of use of sanitation facilities provided by the government. The survey exposed that during1997 and 2000, of the 16,61,000 toilets which were built in Maharashtra costing Rs.456 crores, only 57 % were in use.

There were two major reasons for this. One being the lack of integrated approach to sanitation and the other was a lack of community involvement.

- Government of Maharashtra introduced the programme.
- Cash awards and Nirmal Gram award are won by the cleanest village
- Development programmes are also made and new schemes are sanctioned for the villages performing well under Gadgebaba gram swachhata abhiyan
- Moto is " from cleanliness to prosperity"
- Awareness is created through different media

Scoring under Campaign		
S.N	**Components**	**Points**
1.	Drinking Water Management	20
2.	Waste Water Management	10
3.	Individual Toilets	25
4.	Solid Waste Disposal	10
5.	Environmental Sanitation (Village and House)	05
6.	Personal Hygiene	05
7.	Family Planning	10
8.	People's Participation	10
9.	Innovative Activity by Community	05
Total Points		**100**

Table 6 indicators of hygiene of village

Figure 29-Awareness through different media

Figure 30 Results of the programme

5.2- PROJECTS UNDERTAKEN BY NGO (THE UGLY INDIAN) IN BANGALORE

The Ugly Indians is a NGO working all through the India. Instead of having a particular group of members this organization connects the entire people who work for better sanitation in the cities.

Moto is "**Stop Talking, Start Doing.**"

"The problem of filth on our streets is a behavior and attitude problem which can be solved. This can be partially achieved without spending much money or changing systems. It needs coming up with ideas to change people's behavior and attitudes."

Some of the guidelines are:

1. No lectures, no moralizing, no activism, no self-righteous anger.
2. No confrontation, no arguments, no debates, no pamphlets, no advocacy.
3. Don't step on anyone's toes; don't take sides in any ideological debates.
4. Support existing systems and improve their effectiveness for the greater good.
5. Basically, get real. Treat everyone with sincerity, respect and dignity first, and the greater good will be an outcome.

A 'solution' is a real solution only if:

1. It sustains in the public street for at least 90 days.
2. With no supervision.
3. Is low-cost (ideally free) and easy to implement and replicate
4. Changes the behaviour and attitudes of all concerned
5. Creates minimal change in the daily actions of everyone concerned

(nobody should lose a job, lose a source of income, or get seriously inconvenienced – because it takes only one Ugly Indian to undo the good work of a hundred others).

Figure 31- Effect community involvement in sanitation

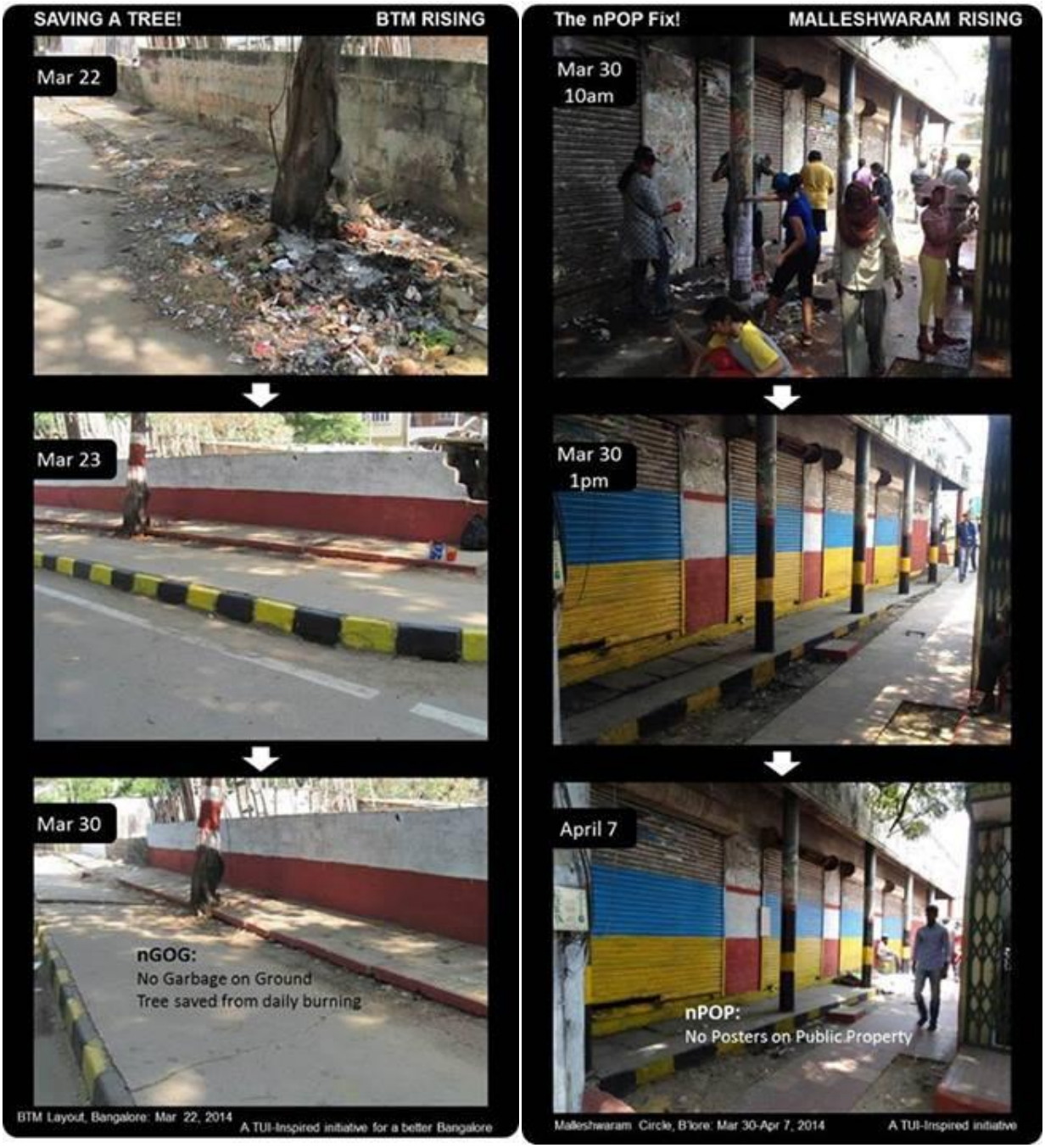


Figure 32 Effect of community involvement in sanitation

5.3- SUCCESSFUL CITY SANITATION PLAN NANDED, MAHARASHTRA

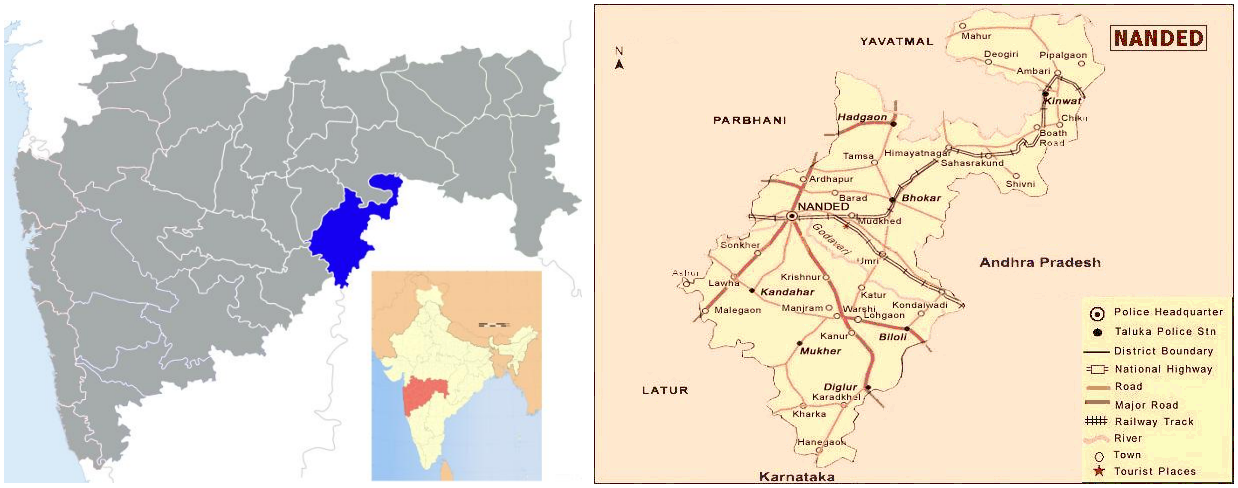


Figure 33 Map of Nanded Maharashtra

Nanded District is located in the southeastern part of Maharashtra, bordering Andhra Pradhesh. Nanded Waghala city with a municipal jurisdiction of about 51.76 sq km is the headquarters of the Nanded District in the Marathwada Region of Maharashtra state. It is the second largest urban center in the Marathwada region (population of 4, 30,733 as per 2001 Census)

Former Municipal Commissioner of Nanded Waghala Municipal Corporation Dr.Nipun Vinayak and his team used the opportunity by the NUSP (National Urban Sanitation Policy) which needs all cities to prepare City Sanitation Plan to resolve the sanitation challenge ahead

Need- Apart from being a town with 5lac population each year Nanded hosts about 3 million pilgrims. Hence sanitation plan was required to confront the problem of inadequate sanitation in the town

Approach and methodology- The Community Led Total Sanitation Approach

Key principles of the CLTS approach

• Establishing appropriate institutional frameworks: Giving local governments a central role in scaling up and sustainability.

• Using a holistic and all inclusive approach that focuses on communities and not households. Natural leaders are motivated, trained and supported to lead community mobilization in their area of influence.

• Low dependency on external subsidy: Leading to higher achievement utilizing limited government finances.

• Focus on elimination of open defecation: Leading to acceptance of locally available, accessible, affordable, innovative and customizable technologies

• Igniting behaviour change - sustainable, community monitored, focused on outcomes.
• Market development (development of sustainable supply chain as per community needs): Promoting the availability of sanitary materials and allowing private suppliers to respond to the demand.

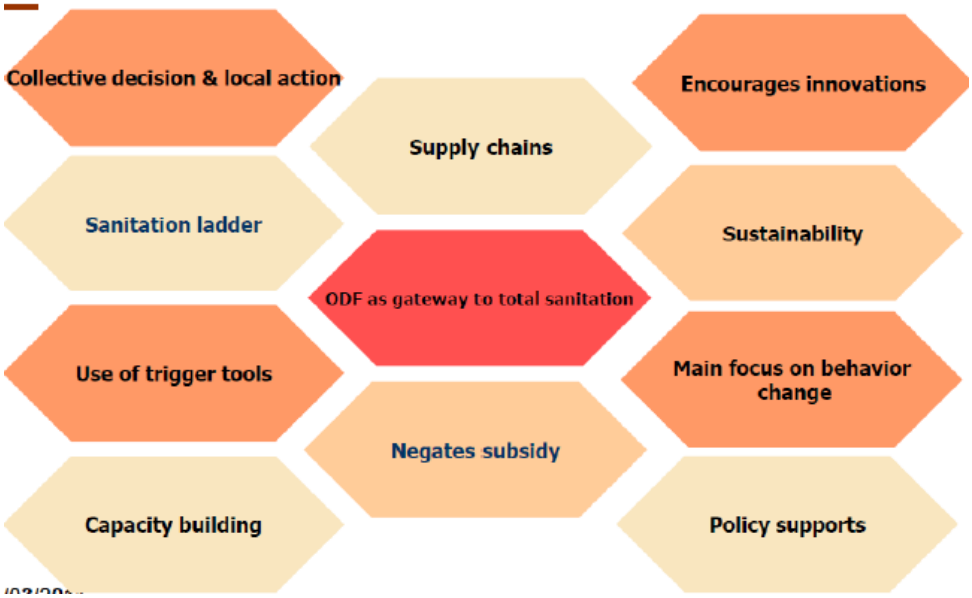


Figure 34- Hilights of CSP Nanded

CHAPTER 6: ANALYSIS OF THE SANITATION SYSTEM

CHAPTER 6: ANALYSIS OF THE SANITATION SYSTEM

6.1- SURVEY ANALYSIS

Household survey

Household survey was conducted to understand views of citizens towards sanitation of Amravati city. Sample size of 100 persons with mixed age group was selected.

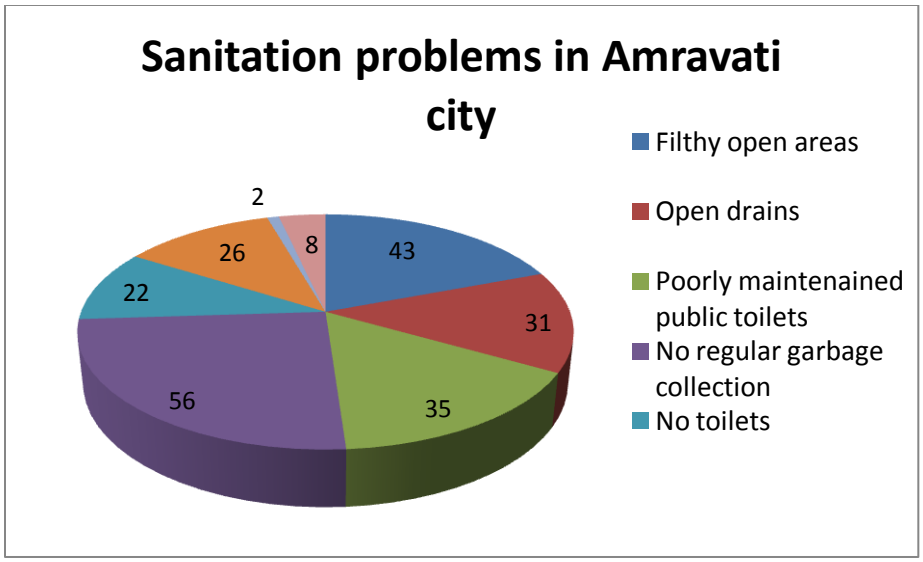
Male responses – 45

Female responses – 45

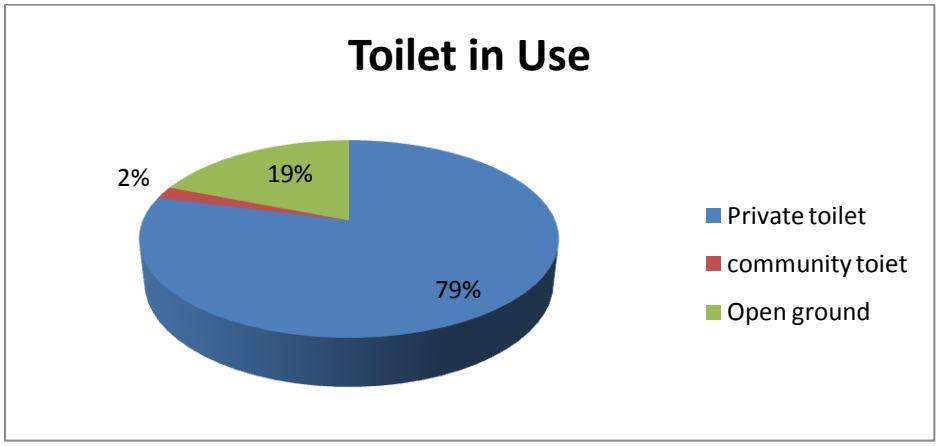
Children responses (age <12)- 10

Sample involved people from different economic background. The questionnaire was analyzed and following are the results of the survey.

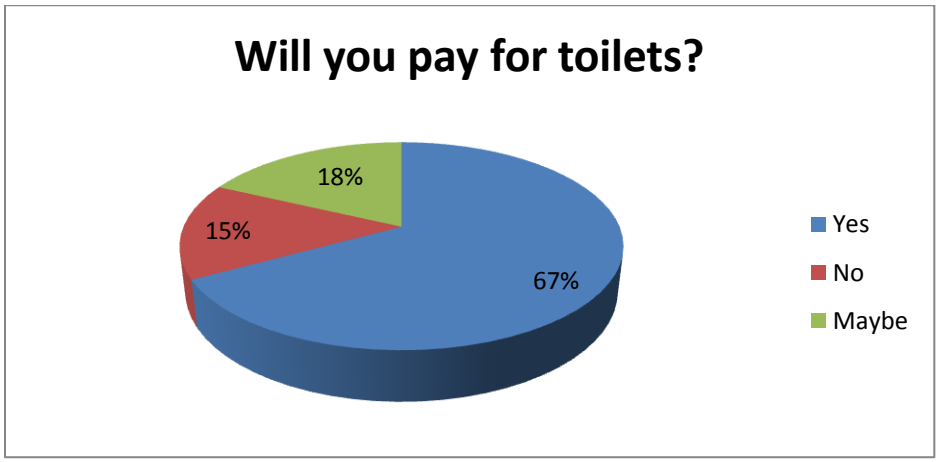
1. According to you what is the major problem in the city (Sanitation related)?



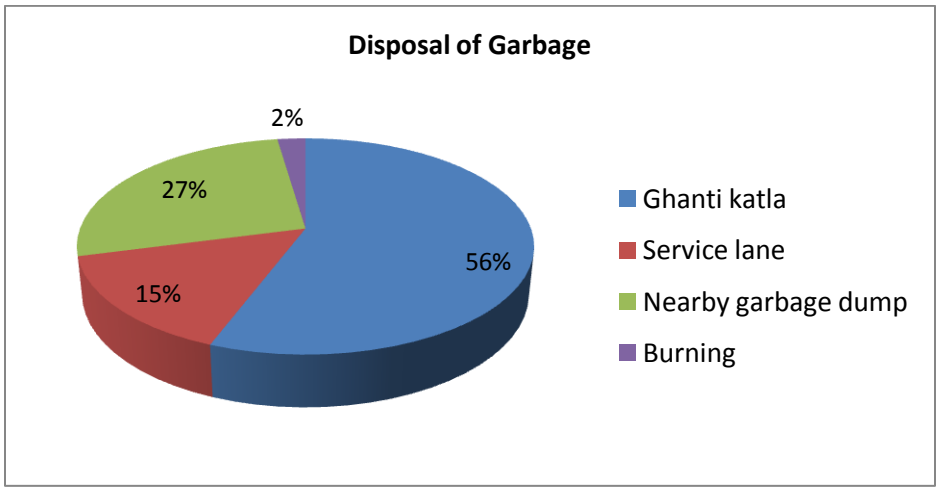
2. What kind of toilet facility do members of your household usually use?



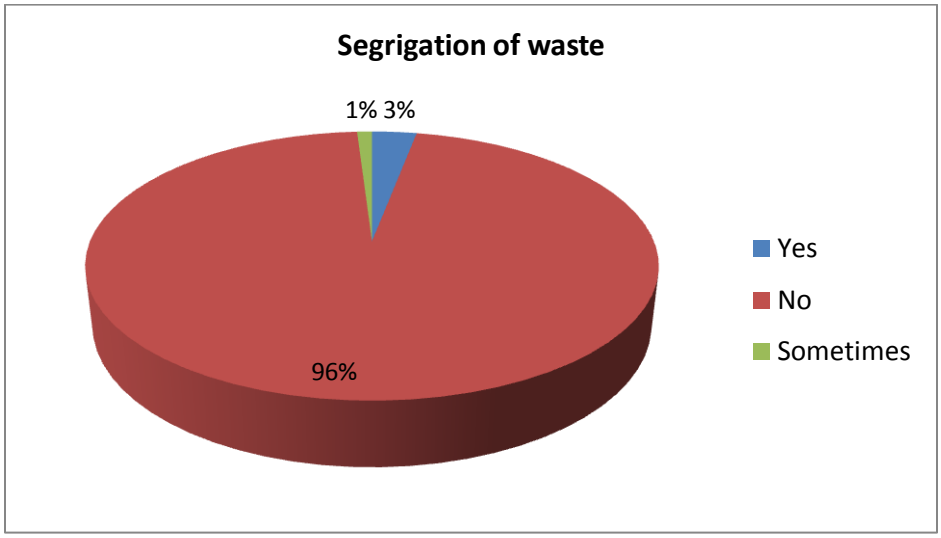
3. Will you pay for toilet if you are given toilet facility?



4. How do you dispose household garbage?



5. Do you segregate house hold waste?



6.2- SWOT ANALYSIS OF AMRAVATI CITY SANITATION SYSTEM

Strengths

- Efficient natural drainage pattern
- Ample water supply (135 lpcd)
- High literacy rate (93.03%)

Weakness

- No existing underground drainage system
- Age old service lane system
- No active solid waste treatment
- 28% population living in slums

Opportunities

- Lot of city area can be acquired if service lane system
- Cheap labour and low cost technologies available

Threats

- Scale of financial aid required is much more as the whole city needs the infrastructure
- If no measures are taken there is a risk of epidemics and health hazards

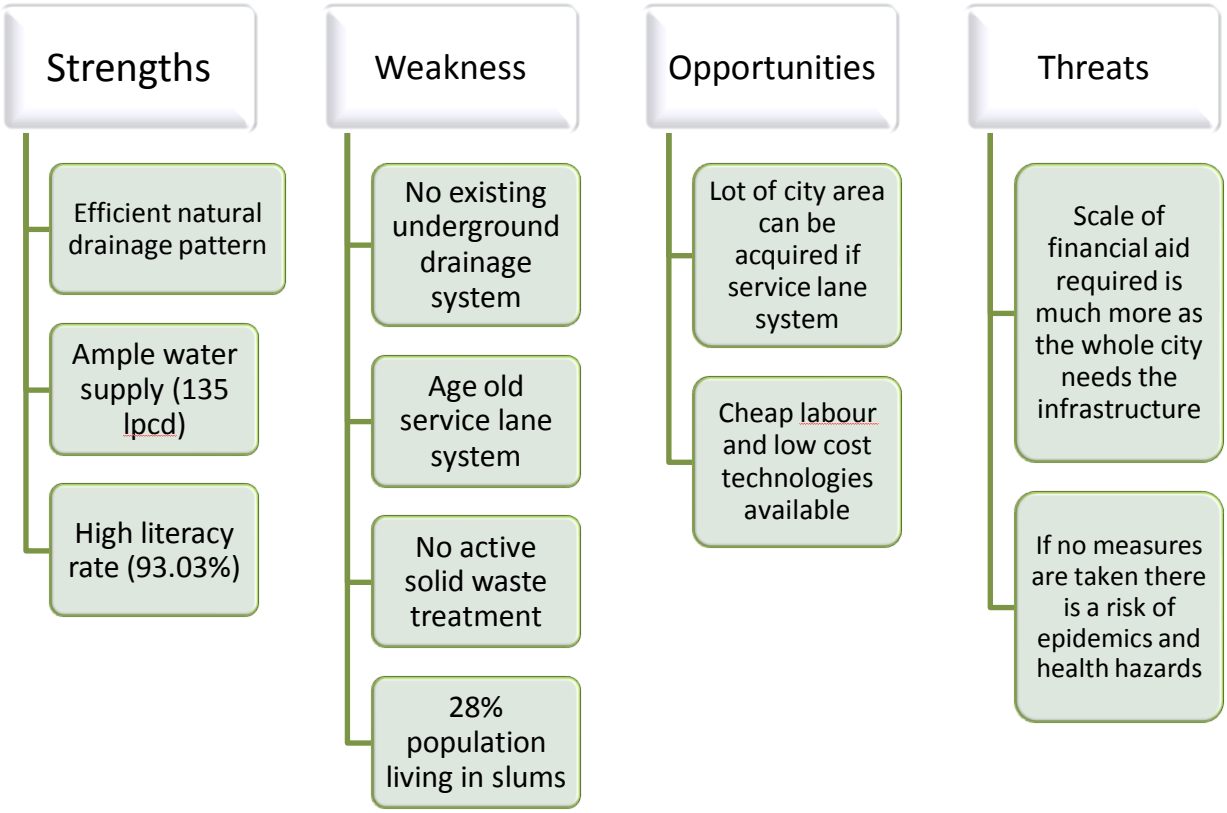


Table 7- SWOT analysis

6.3- INTERACTIVE ANALYSIS

Interactive analysis will explain the impact of the study area on different systems and subsystems. This analysis highlights the importance and need of the study.

Social

Poor sanitation will have bad impact on health and overall well being of the people. Any problem in the society first attacks the weaker section of the society hence economically weaker section, children, women, and elderly people, differently able are affected most by the issue of sanitation

Impact on children-
Children usually utilize spaces closer the settlement to defecate. Open drains right outside their own houses, close-by parks and play areas, open spaces contiguous streams and water sources, subsequently polluting their surroundings and drinking water sources. Generally, open spaces utilized for defecation are the main open playgrounds Regular and immediate contact with fecal matter and contaminated drinking water causes transmission of lethal illnesses, for example diarrhea, parasitic infections, and worm, diseases which are deadly, particularly for children. In India, more than 1,600 children of age less than five years die each day only

because of diarrhea caused by lack of sanitation. Even when diarrhea is not lethal, it makes children more susceptible to conditions such as 13 respiratory infections and critical under nutrition. The cost of treatment of diarrheal disease empties family finances, and restrains them from other development goals such as nutrition and education. According to the survey by UNICEF, reduced immunity in children is a result of sanitation-linked diseases this significantly hampers their overall development, with a long-lasting effect on growth and progress.

Impact on Women-

The struggle starts early in the morning for women. Unavailability of toilets in their homes, and embracement of openly defecating during the day they wait for night to fall and to find a location to defecate. Waiting long to relieve themselves causes contracting urinary tract infections, psychological stress and chronic constipation. Complexity of the problem intensifies during periods, pregnancy and postnatal recovery. Travelling long distances for accessing public facilities can make them vulnerable to sexual and physical assault. A United Nations survey says that it is common for girls in such conditions to get harassed, physically assaulted Lack of sanitation is harmful to women's health and their dignity additionaly it also impacts their education. Girls are hesitant to attend school, and parents are oppose to send them when there are no safe toilets. 40% of schools in India do not have a functional toilet. Girls are forced to miss schools during their menstrual cycle.The difficulty women face every day in their lives just because of lack of a simple toilet is unbelievable.

Economic

Reduction in land values is observed when there are garbage dumps or opens sewers nearby. Absence of sanitation techniques and practices leads to damage to the infrastructure which creates economic burden on the system

Sanitation and Productivity

Illness created by absence of sanitation force adults, particularly women, to take care of ill members of the family. This results in two things as they cannot do any productive work and they endanger their own wellbeing to completely understand their profitable potential. Lot of time is wasted while accessing the community toilet facilities which can be otherwise used for productive purposes.

Handling the issue of inadequate sanitation requires not only building infrastructure but also creating greater awareness about the issue, its extent and its real costs not only to poor people, but for societies as a whole

Ecological

When the waste water and sewage gets mixed with the rivulet water it endangers the life of fish and other animals in the rivulets. Stray animals die by eating plastic and other toxic materials from the garbage.

Environmental

Air pollution is caused by burning garbage .Water pollution is caused by mixing of sewage with rivulet water and due the the leachate underground water gets contaminated. Fecal material when gets mixed with water source can contaminate ground water resources

Infrastructure

Encroachment of garbage on roads reduces the active road width thus creating hindrance for the traffic. Many times the garbage bins are placed on the footpath which creates problems for the pedestrians .Solid waste mixing with sewage damages the sewage system.

Physical

Lot of valuable city land wasted in service lines system. In Amravati city this land is estimated to be 101 Ha. Open areas become unusable due to contamination.

6.4- MICRO LEVEL PROBLEMS IN AMRAVATI CITY

Following micro level problems can be said responsible for failure of sanitation systems

- **No toilet facility in major gathering points-** No toilet facility is provided at major public junctions like state transport, Joshi market, cotton market, Ambadevi temple etc. No special provision is there for additional toilets at temple complex during pilgrimage(September-October)

- **No special toilets for children and differently able**- In Amravati city even where community toilets are provided they are not universally designed. Children and differently able people face problems in using public toilets.

- **Absence of sanitary facilities in schools**- Sanitary facilities in schools are neglected even in private schools. Toilets are either not provided or not in condition to use. Separate toilets are not provided for girls and boys. There is not a single school in the city which had special toilet for differently able students Male students are observed reliving themselves in public while female students has to resist relieving themselves in school hours. Even in some schools where toilet facilities are available maintenance and water supply are not available. Hand washing stations and soap are still in the distant territory

- **Garbage bins are not designed ergonomically**- Frequency of garbage bins available citywide is very less. Even where they are provided they are difficult to use as most of them have opening at top hence people prefer to throw the garbage near the bin instead of putting it inside. This creates unhealthy environment around. The problem intensifies as stray dogs and pigs spread the garbage even more.

- **Segregation at source is not practiced**- Garbage collected at source is not segregated as per type of garbage. Biodegradable and non biodegradable waste is mixed together. This reduces the recycling ability of solid waste. This leads to unnecessary load on landfill site

- **Status and healthcare of sanitation workers is neglected**- People do not have a positive approach towards sanitation workers. skin and respiratory diseases are commonly observed in sanitation workers

- **Nuisance of stray dogs and pigs is observed-** It is Municipal Corporation's responsibility to keep a check on stray dogs and pigs. But number of stray animal in the city is very high. These animals are seen mostly in service lanes. These are very much responsible for spread of garbage and so the diseases

- **Lacks of awareness-** People are unaware about healthy sanitation practices. Even those people who can afford a toilet do not build one due to lack of awareness. Common practices of burning garbage, throwing waste in service lanes and littering are observed even in literate and richer localities

- **No underground sewerage network**- The city totally depends upon septic tanks system underground sewerage network is not present.

- **Penalties are not effective**-Penalties are not making any difference for sanitation system. As seen in the following tables the fines for different sanitation related problems have been doubled in past few years but it hardly created any difference in the sanitation practices. The collection of fine is not up to the mark as offences like littering are not fined. Critical offences like throwing construction waste on roads etc are charged for the penalties. The total amount collected as penalties was Rs 3lakh for year2011.

S.No	Description of offence	Penalty amount
1	Relieving oneself in public place	Rs 20/-
2	Throwing waste on roads	Rs 50/-
3	Spitting and spreading waste on govt offices, public places and religious places	Rs 25/-
4	Disposal of hotel waste in public places or on road	Rs 200/-
5	Vendors spreading waste on public places	Rs 50/-
6	Hawkers related to vegetable and fruits spreading waste in public places.	Rs 50/-
7	All commercial establishment dumping waste in gutters, roads and public places	Rs 200/-
8	Cow dung etc on roads and public places	Rs 150/-
9	Dumping of industrial waste in public places	Rs 300/ -
10	Hospital clinical waste dumping on road, public places and open places	Rs 300/-
11	Construction debris dumping on road, public places and open places	Rs 500/-

Figure 35- Penalty structure 2003

Sr	Description of offence	Penalty
1	Relieving oneself in public place	Rs 50/-
2	Throwing waste on roads	Rs 100/-
3	Spitting and spreading waste on govt. offices, public places and religious places	Rs 50/-
4	Disposal of hotel waste in public places or on road	Rs 400/-
5	Vendors spreading waste on public places	Rs 100/-
6	Hawkers related to vegetable and fruits spreading waste in public places.	Rs 400/-
7	All commercial establishment dumping waste in gutters, roads and public places	Rs 200/-
8	Cow dung etc on roads and public places	Rs 300/-
9	Dumping of industrial waste in public places	Rs 1000/-
10	Hospital clinical waste dumping on road, public places and open places	Rs 600/-
11	Construction debris dumping on road, public places and open places	Rs 1000/-

Figure 36- Penalty structure 2011

CHAPTER 7: TECHNOLOGICAL OPTIONS

CHAPTER 7: TECHNOLOGICAL OPTIONS

New technological solutions are required in the sanitation system.It is very important that these options should be selected after studying different factors like physical, institutional, environmental, financial, cultural and socioeconomical .

When the technological choice satisfies these criterias then only it can be selected as solution for the system.

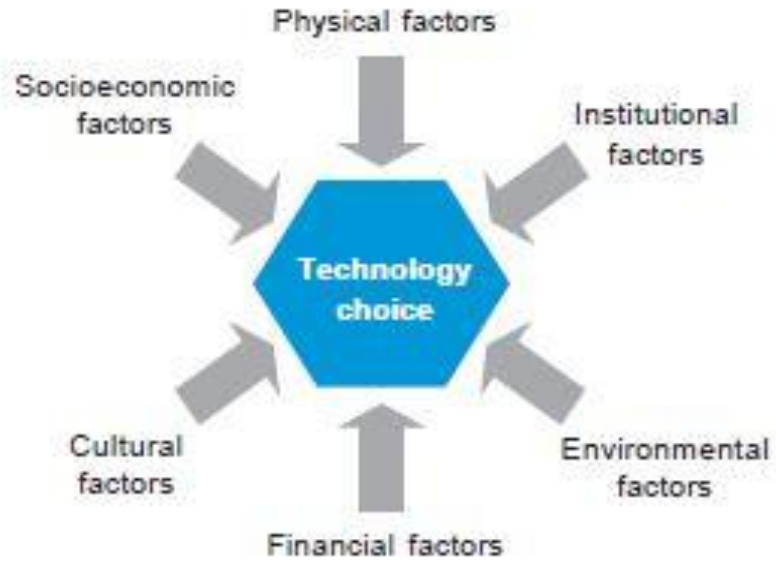


Figure 37 Factors affecting technological choices

7.1- CSV WARDHA TECHNIQUES

Center of Science for Villages (CSV) Wardha was set up in 1977. It acts as a technology transfer centre.CSV works to rescue traditional sciences through use of appropriate technology and beginning of innovative and practical scientific products that benefit both the environment and the people. It started working in 1995 as independent training center.

The two campuses of CSV in Wardha show a wide variety of alternate technologies both through models and practical application. At these locations, CSV provides training to artisans, micro-entrepreneurs , development practitioners etc on alternate technologies. Main areas of work are:

- Ecological Housing – mud and bamboo houses-low carbon building technologies
- Total sanitation – different solutions for home sanitation, sewerage management and school sanitation
- Solid Waste management – vermi-composting
- Water management - water recycling, rain water harvesting, low cost water filter
- Non conventional energy –, new bio-gas technology, improved cook stove

- Rural industries –paper technology, honey collection, pottery agricultural tools,
- Forest resource management
- Bio-technology

CSV also has a open sanitation park which demonstrates different of sanitation technologies. The campuses also display rainwater collection and recharge sets, technology for buildings is also showcased through their housing technology.

Sanitation model

CSV campus presents an ideal set of practices which aims at improving the living conditions of humans and conserving the environment as well. Which cover all the aspects of sanitation, like management of human waste, agricultural solid waste, animal waste and rainwater harvesting.

Household level

The general methodology favors singular toilets over the group toilets on account of the social hindrances associated with keeping up and cleaning another person waste. The accompanying reach of 10 sanitation alternatives was exhibited through sanitation-stop in the yard.

Latrine Pan

An option profound dish of 40 degree slant (as contrasted with accepted 20 degree) and a coated surface needs just about 2 liters of water for flushing. Likewise, the tried and true water seal is supplanted by a fold seal made with GI which additionally returns off stream and smell.

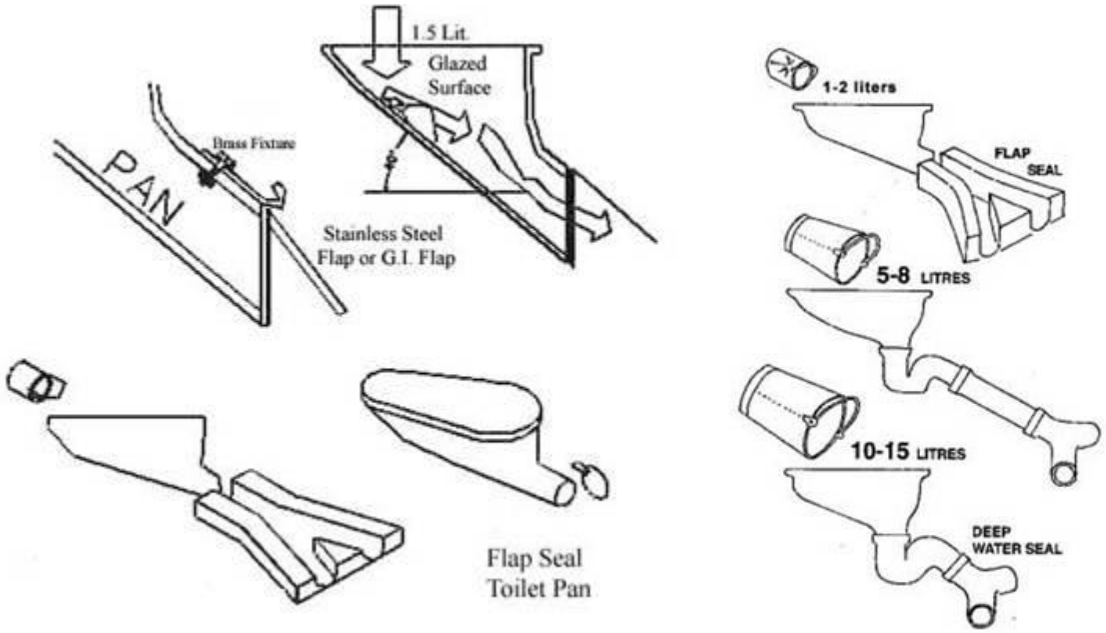


Figure 38- CSV toilet pan

School sanitation

CSV believes that Improved health and quality learning are not possible in schools as long as basic hygiene is lacking or sanitary facilities and water supply are missing. An unsafe school environment may damage their health especially girl children, who are more vulnerable to malnutrition in most of the cases leading to low enrolment and high dropout incidences.

They have a low cost alternative for toilets for children. These toilets are child friendly. Urinals are connected to soak pit and WCs are connected septic tank. This module can be modified to be used with underground sewerage system.

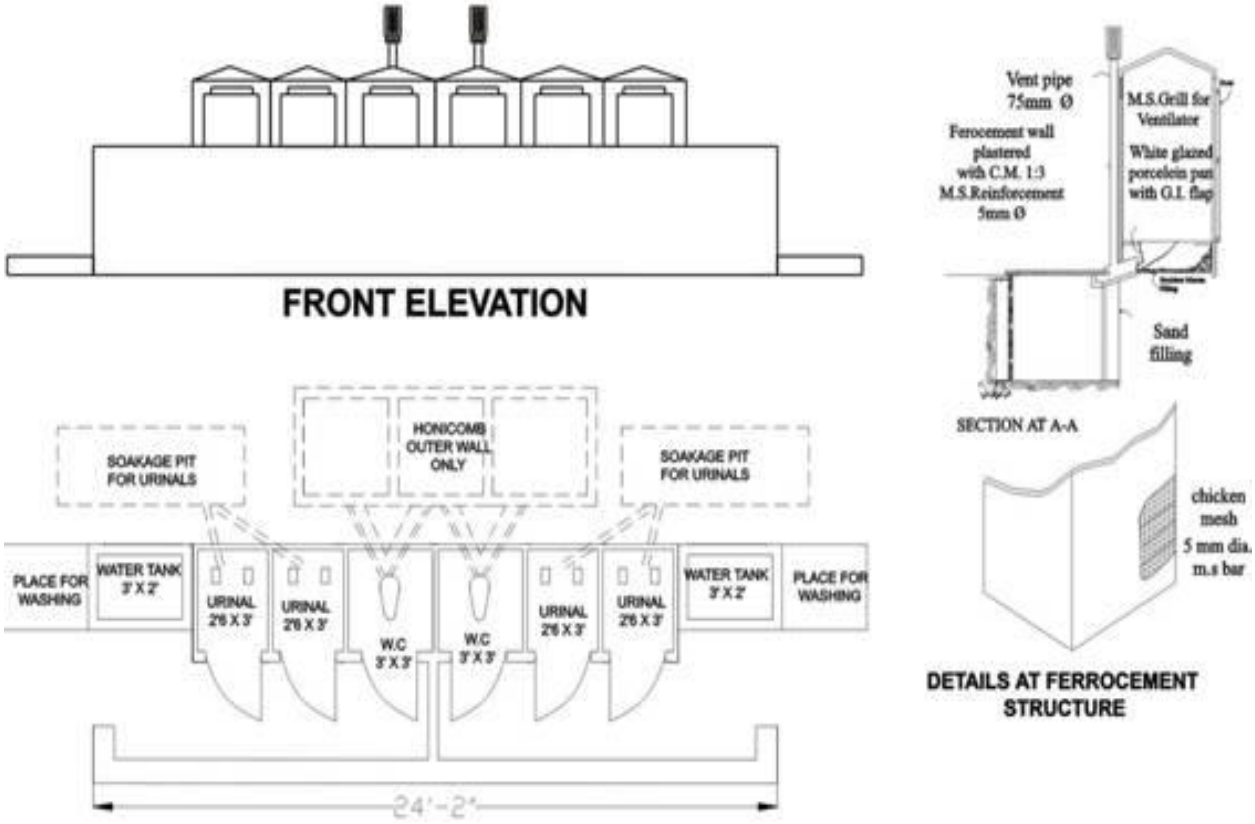


Figure 39 Low cost toilets for schools

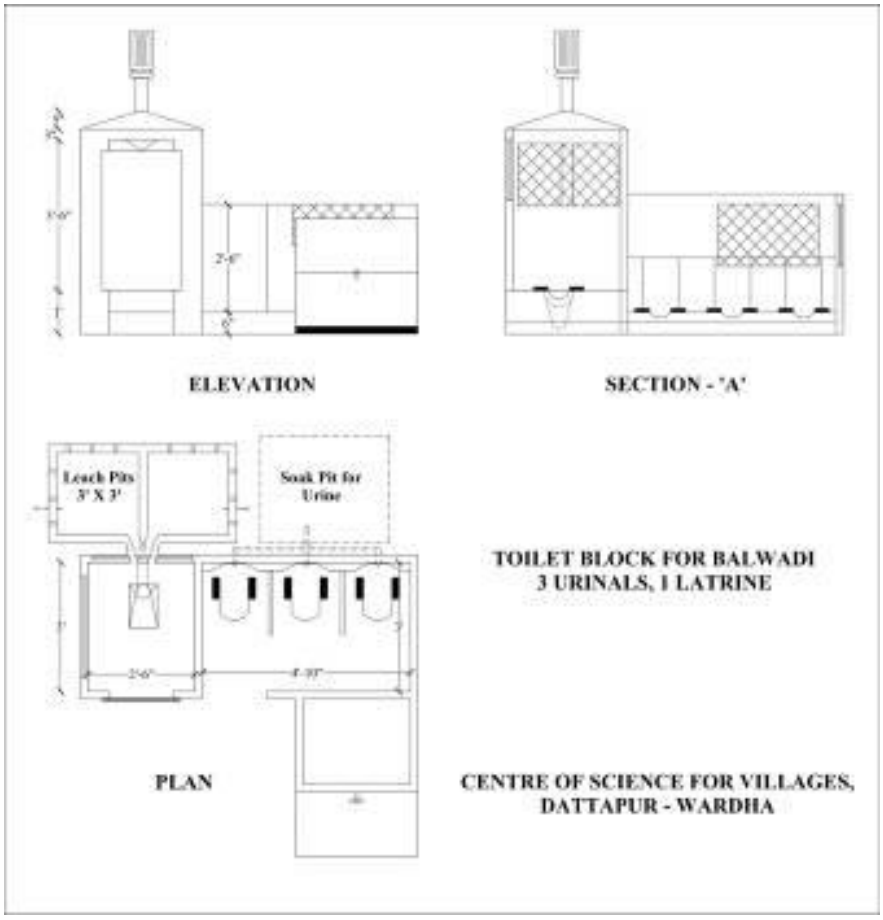


Figure 40 Low cost toilets for younger children

Figure 41 Low cost toilets for anganwadis

7.2- DELIGHT – INDIA'S NEW CONNECTED E-TOILETS

The latest in the row of toilet innovation is the E-Toilet by Eram Scientific Solutions. They have created the toilet called 'Delight'. Delight is an automatic public toilet with automated payment collection, door opening, flushing, floor cleaning and sterilization. The GPRS enabled system allows controlling the toilet remotely by administering collection monitoring and unit health status through web application and mobile phones. Delight is equipped with a Bio Membrane Reactor that helps recycle the water and reuse it for flushing and cleaning. Solar panels are available for alternate energy needs. In the areas where drainage tank facility is not available Delight can provide a Green Eco Friendly solution to manage the waste and its disposal like the Bio Membrane tank system and the Water recycling unit.

The toilet needs around 45sqft of built space and comes with a coin validator where the insertion of coins opens the door. Delight is first in the line of world class sanitation facility in India. Around 150 toilets have already been installed and another 300 are due to be installed.

Figure 42-ESS Values

The cost of e-toilet varies from Rs.350,000 to Rs.550,000 (inclusive of bio-membrane reactor's price). Bio-membrane reactor is a nano-technology-aided device that instantly recycles the used water and makes it ready for future use. The income generating model for these toilets is the advertisement panels attached outside and the collections everyday by the users.

Vision

Our vision is to be a pioneer in developing pro-earth solutions in multiple domains and technologies to ensure a better, safer and natural world around us."

Mission Statement

- Constantly innovating and applying Science and Technology to develop solutions against the pressing needs of the society.
- Applying unconventional methodologies and 'Out of the Box Thinking' and practices.

- Focus on developing solutions in alternate energy, clean technologies, and pro nature applications.
- Ensure the democratization of wealth and knowledge.
- Evolve itself as an abode of multi-disciplinary development enthusiasts.

Figure 43-Delight Toilets in Use

7.3- 3S SHRAMIK, PORTABLE SANITATION AND WASTE MANAGEMENT

Figure 44- Shramik toilets for schools

3S shramik specializes in providing quality alternative to portable toilet facilities primarily at pilgrimage and festival sites, construction sites etc. This inclusive business venture aims to set up portable sanitation facilities and waste management systems in the urban slums of India. Having successfully implemented a pilot programme in Delhi, Bangalore and Pune the company aims to expand its operations into other areas

Vision

A world where the basic human right to health and sanitation becomes a reality for all.

Mission

To supply and service portable restrooms from the most visited to the remotest areas of the globe. And to constantly improve on it.

values:

- Integrity: Our ethical principles are the backbone of our operations.
- Quality: Be the best at what we deliver.
- Commitment: We do what we do because we're passionate about it.
- Group effort: Be an organization that is greater than sum of its parts through effective collaboration.
- Planet first: Ensure that all our products & services are in harmony with the environment.

मुंबई उच्च न्यायालयाचा पालिकेला आदेश : गर्दीच्या ठिकाणी उपलब्ध होणार

महिलांसाठी आता मोबाईल टॉयलेट

पुणे : शहरातील गर्दीच्या ठिकाणी महिलांसाठी पुरेशी स्वच्छतागृहे उपलब्ध नसल्याने यापुढे अशा सर्व ठिकाणी मोबाईल स्वच्छतागृह उभारण्याचे आदेश मुंबई उच्च न्यायालयाने पुणे पालिकेला दिला. शहरात महिलांसाठी पुरेशी स्वच्छतागृहे उपलब्ध नसल्याने महापालिकेच्या विरोधात 'मिळून सार्‍याजणी' संस्थेच्या वतीने मुंबई उच्च न्यायालयात जनहित याचिका दाखल केली होती. याचिकेच्या सुनावणी वेळी न्यायालयाने आदेश दिले.

पुणे शहरातील महिलांसाठी स्वच्छतागृहांच्या दुरवस्थेबाबत 'लोकमत'ने वेळोवेळी आवाज उठविला आहे. शहरात जागा उपलब्ध नसल्याने मध्यवर्ती भागातील ...

लोकमत शुभवर्तमान

Figure 45- Shramik toilets in Pune

Sramik has a special group that conducts an awareness building program around benefits of sanitation and correlation between health and productivity. The firm charges Rs.1,000 to Rs. 2,500 per day for events and Rs. 6,000 per month for construction sites. According to Shramik "More important than the product is the service. High–end toilets are the need of the hour"

For those in need

Shramik has been experimenting with different models in urban slums across Delhi and Pune on the back of four projects with Michael & Susan Dell Foundation. Working closely with NGOs, the firm has adopted a pay-per-use model here.

3S also refurbishes and maintains existing toilets in slums. The firm charges slum dwellers Rs. 30-Rs. 50 per family, per month.

Price of products from Shramik varies from Rs. 5,000- Rs. 75,000 which includes products like portable toilets , wash units , urinals etc

Figure 46- Fixed type Shramik toilet

CHAPTER 8: RECOMMENDATIONS

CHAPTER 8: RECOMMENDATIONS

This chapter talks about the different proposals for Amravati which will lead to improved sanitation in the city. It is clear that sanitation is not just about infrastructure but other strategies like awareness and behavioral change also need to be focused. Following recommendations will help to achieve the goal of sanitized city in most sustainable way and with a fast pace.

8.1- AWARENESS IN CHILDREN AND YOUTH

Figure 47-Toilet for every child

Children act as key element in sanitation schemes. Poor sanitation has its adverse effects mostly on children. 1 out of 5 child deaths are due to diarrhea. Not only this but poor sanitation also badly affects physical and mental growth of child. In long run this leads to harming valuable human resource of the nation since children are defined as future of nation.

Proposed work

"The Supreme Court has ruled that separate toilets for boys and girls as well as drinking water facility were integral to right to education and ordered that all schools, including those run by minority community, must make provision for them."

(source-The times of India May 11, 2014)

Amravati city has literacy rate as high as 91% and children and youth are closely linked with education systems. Hence awareness campaigns should be started from school level.

- Every school and college in the city should provide toilets separately for male and female students with 1 toilet for 25 student ratio.
- Specially designed toilets should be provided for differently able students maintaining the ratio of 1 toilet for 80 students. All these should be designed ergonomically.

- Hand washing and drinking water points should be provided by the schools and colleges. All of this will help to make sanitation practices habitual in younger population.
- In first phase of city sanitation plan at least 1 hr per week should be engaged in schools for hygiene and sanitation education. This may include education about healthy sanitation practices, best out of waste competitions (to teach the importance of reuse and recycle), slogan competitions for city sanitation and field trips.

Source: National School Sanitation Manual, Government of India

Benefits in future

Concept of hygiene and sanitation can be deeply induced in children and it is observed that children can influence elders. This will benefit the city in the long run as the future population will be much more sensitive about the issue of sanitation.

8.2- AWARENESS THROUGH SOCIAL MEDIA

In today's age of technology the impact of social media cannot be ignored. This can be used very well to create awareness about healthy sanitation practices in the people.

Proposed work

- Frequent mass messaging can be done suggesting healthy sanitation practices and importance of hygiene. This type of services is cheap as 100000 messages for INR 5000.
- Use of E-mails and other social media like Facebook, twitter can be done for awareness generation.
- Local cable networks and news papers can also host awareness campaigns by running regular programmes about importance of sanitation and healthy practices
- NGO s can be very helpful to conduct house to house awareness campaigns. These door to door campaigns will be very effective for the urban poor.

- Informative boards in parks, at traffic signals and other gathering places can be helpful for the desired behavioral change.

Points to be considered in awareness programs

- Extensive use of local language and images should be done
- Importance of sanitation
- Segregation of waste at source
- Importance of hand washing
- Providing information of government schemes for toilet construction
- Campaigning against open defecation

Benefits in future

This type of awareness programmes creates a mass impact on the population without requiring much of the financial aid.

8.3- ACTIONS AGAINST OPEN DEFECATION

Figure 48-Awaress to behavior change

Open defecation is one of the major issues to be solved to achieve city sanitation. Following steps should be taken to reduce the open defecation in Amravati City

1- Zones identified as open defecation areas are marked in red in the map. With a total no of 32 open spaces. Toilet complexes should be constructed immediately within the distance of 200 m from these areas.

2- Underutilization of public open spaces leads to abandoned lands which generally become centers of open defecation hence projects for beautification for such grounds should be promoted. Plantation can be done to improve overall quality of environment.

3- Information boards should be installed in these open grounds depicting evils of open defecation.

4- Direction boards for toilet complexes should be installed in nearby area. Toilet complexes to be painted in bright colours to increase their visibility.

5- Cost effective techniques should be used for the construction

6- Toilet complexes should be designed in the following manner
Two modules are developed for toilet complexes

a. Single toilet complex

Since the space in market area is less hence these toilets can be made at regular intervals in market areas and dense areas.

b. Multi toilet complex

Other zones where open defecation is observed like slums and other residential areas these multi toilet complexes should be provided. Design of these complexes should be as follows

A module of toilet with 3WC for male and 3WC for female is designed with a small shop on one side The small shops included in toilet complexes should be rented on yearly basis for running shops like mechanic shop, electrician, cobbler shop, mobile recharge shops, magazine and newspaper shop etc. any food related shops to be refrained in this case.

a- Instead of paying rent for the shop the shopkeeper should be given the responsibility to maintain the toilets and pay for the water and electricity bills for the same.
Monthly Water supply bill for 6 toilets with 15l flush per use- INR 950
Monthly electricity bill for 8 hr use of 4 cfl 50 W bulbs- approximately INR500
Maintenance and cleaning – INR 500
This sums to INR 1450 which is less than average shop rent in the city. Hence this model can be applied successfully

8.4- CITY WIDE UNDERGROUND SEWAGE NETWORK

Existing System

Septic tanks are commonly used by people in Amravati city. Currently there is no underground sewerage system. But it is proposed in draft city sanitation plan of Amravati city. Construction has started in some areas.

Proposed Sewerage Scheme in City sanitation plan Amravati:

- Seven drainage districts (Amravati (5) and Badnera (2)) have been proposed for design of sewers .
- The general topography of Amravati city is such that it has slope in same direction. All these rivulets meet Pedhi river
- 6 pumping stations are proposed since the distance from source to STP is more than 1000m
- 3 STP s are proposed
  Lalkhedi 30.50
  Amravati 62.50 MLD
  Badnera12.0 MLD
  Proposal is made for the estimated population of 2025

Findings and proposal

Though the underground sewerage is proposed in the city sanitation plan but it is not prioritized in the same. The construction was supposed to complete in 2013 but till mid June 2014 only 10 % construction is done. A working sewerage network is backbone of any sanitation system hence it should be given required importance

Benefits in future

8.5- SERVICE LANES- NEW CORRIDORS OF THE CITY

After completion of citywide underground sewage network the existing service lanes will get a totally new face. Nearly 1 % of the city area is wasted in such 2 or 3 m wide service line can be reclaimed.

Proposed works

1- After completion of underground sewage network surface drains passing through the service lines should be used only for storm water.
2- All the storm water drains should be covered with GI gratings to avoid clogging during monsoon
3- Only the storm water drains should be connected to the rivulets(nallah)

Benefits for the future

1-As soon as the service lanes get cleaned up all this valuable city area can be reclaimed. This reclaimed area should be used as pedestrian patches with no vehicles. This will provide the neighborhood safe backyard area which can be utilized for pedestrian movement through the neighbourhood, children's play area, small public spaces, second entrance for the houses which can be used by owners, tenants, maids etc

2- Due to reduced activity and filthy condition of service lanes currently the city has a common profile of high compound walls on the back side It is a very common case that most of the times thieves enter from these service lanes as they are very much ignored by the people. This revitalization of service lanes will lead to generation of activities in this

area. Gradually trend of regular height compound walls and service entries will start in the city as beautiful backyard spaces will develop.

3-This will help in building the feeling of neighbourhood community and will be beneficial for the overall development of the city

8.6- CITY WIDE SANITATION

Other than the above proposals there are some other important proposals as follows

1- According to reports garbage in Amravati city consists of 15% recyclable and 35 % biodegradable waste. This is because waste segregation at source is not practiced and hence most of the recyclable and biodegradable waste ends up in being categorizes as debris and sent to landfill sites. To avoid this following measures should be taken
   a- Segregation at source should be promoted at household level. Two dustbins (white and green) can be given out to each household. Information of different types of garbage types and there segregation can be given along with. Cost for this venture can be managed as this will reduce the need of manual garbage segregation and human labour involved in that can be eliminated.
   b- For non domestic sources like hotels or marriage halls currently the municipality charges 300 Rs per cart per trip to collect biodegradable waste. Such centers generate more than 40 kg food waste each day. Biogas plants need 25 kg feed each day to run economically. Hence biogas plants should be made compulsory for such centers. Alternative of shared biogas plants can be given for hotels and restaurants in densely populated areas.
   c- In Amravati city each ward has primary or secondary schools. Biogas plants can be set up in school premises and biodegradable waste from the surrounding households can be fed to these biogas plants. Biogas thus generated can be used for preparation of mid day meals in schools.
   d- All these recommendations will reduce the costs of transportation, segregation and processing of waste for the municipal corporation.
2- Uniforms should be made compulsory for the sanitation workers. They should be also provided with rubber gloves and other safety measures. Regular health checkup should be advised for the sanitation workers. Workshops in local language should be arranged for educating them in the field of sanitation.
3- Contamination of natural drains should be strictly banned. Higher fine should be charged for dumping garbage or waste water in the natural drains.

CHAPTER 9: CONCLUSION

CHAPTER 9: CONCLUSION

Investing in sanitation generates massive returns on health, the environment and the economy. In fact, the overwhelming evidence is that there is no single development policy intervention that brings greater public health returns than investment in basic sanitation and hygiene practices.

*(Source:-*WaterAid at the UN International Year of Sanitation Launch, 2008)

Amravati is one of the important cities in Maharashtra state. With growing urbanization problems like growth of slums and poor sanitation have rising in the city. But if necessary steps are taken in time these issues can be treated from the root. Sanitation is one of the very important issues which affect all the subsystems of the city. Investing in sanitation promises multi sectorial returns. It not only saves lives but ensures healthier children, boosts education, augments environmental security and enhances economic welfare. There is an urgent need to acknowledge issue of sanitation.

Author believes that there is a need to establish an integrated sanitation system for supporting the new growth of the city. Optimal sanitation in Amravati city will have an extreme positive impact on the overall quality of life for the users and residents.

REFERENCES

- Environmental Status Report of Amravati City Amravati Municipal Corporation
  Office of Public Health Officer, AMC, 2010
- http://indiasanitationportal.org/category/category/approaches/community-participation
- Ministry of Urban Development. 1995. *Manual on Sewerage and Sewage Treatment, 2nd edition*. New Delhi: Government of India Press.
  http://urbanindia.nic.in/moud/publicinfo/manual_sewage.htm
- Tayler, K., J. Parkinson, and J. Colin. 2003. *Urban Sanitation: A Guide to Strategic Planning*.
  UK: Practical Action Publications
- National Urban Sanitation Policy (NUSP)Ministry of Urban Development Government of India
- Pune city sanitation plan
  Dasra,2012.*Squatting Rights Access To Toilets*
- in Urban India
- Amravati city sanitation plan (Draft)
- A Guide to Decision making
- Technology Options for Urban Sanitation in India
- A case study Centre of Science for Villages
- Connected e-toilets in Kerala soon, Business standardFriday, June 13, 2014
- CDP toolkit-book-second-revised-2012 (JNNURM)